L. ZELMER

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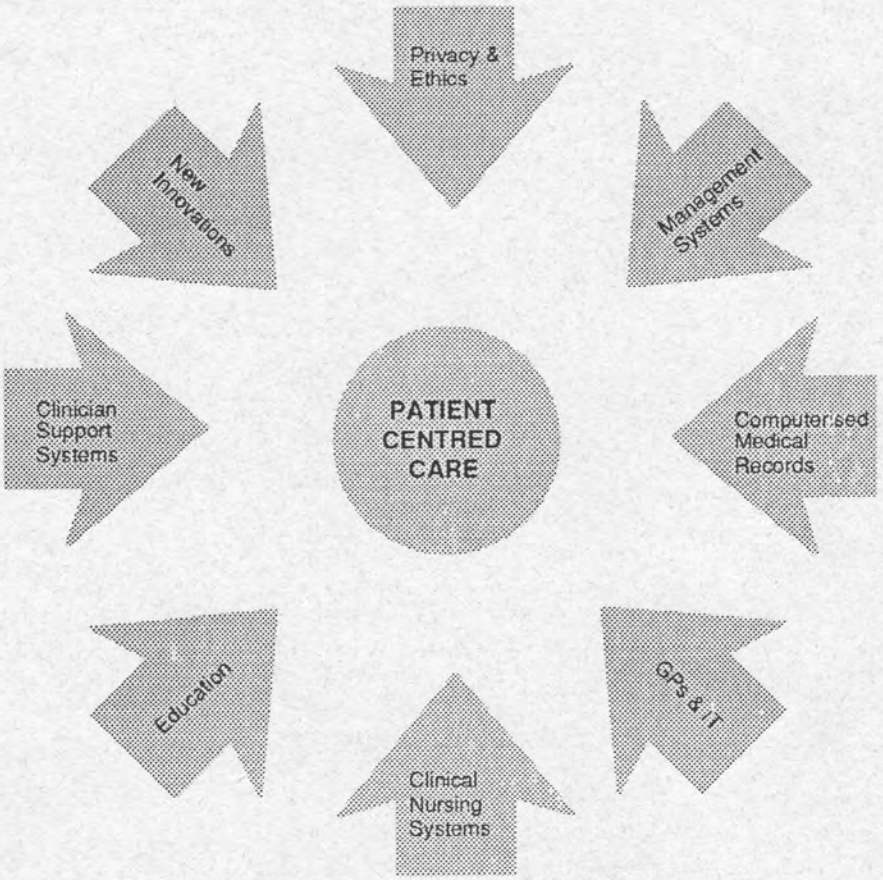

"TECHNOLOGY BRINGING PEOPLE TOGETHER"

CONFERENCE PROGRAM AND PROCEEDINGS

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OASIS RESORT, PRIMBEE

INTERACTIVE MULTIMEDIA FOR DIABETES EDUCATION: A PROGRESS REPORT

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ABSTRACT

Staff and students at Central Queensland University have been working since mid-1993 on the development of an interactive multimedia package to assist students and others to learn how to manage diabetes. The computer-based package, to be distributed via CD-ROM, has been developed through the initial design and prototype stages, and funded by CAUT for implementation in 1995. This paper reviews the progress to date.

1. INTRODUCTION

As discussed in a 'work in progress' session at the 1995 APITITE Conference (Zelmer and Lye, 1994), staff and students of the Central Queensland University (CQU) Faculty of Health Science and Department of Mathematics and Computing have been working since mid-1993 on the development of an interactive multimedia package to assist students in learning how to care for diabetic patients. The work to date has included the basic design of the package, the development of a prototype to test some of the design concepts, and a successful funding application to implement the project.

As our CAUT (Committee to Advance University Teaching) funding application indicated:

> This project seeks to reduce the tedium of teaching repetitive materials with a self-paced learning and evaluation tool for introductory-level university students, health workers, diabetics (there are hundreds newly diagnosed each year in Australia) and their families who require considerable information to effectively manage a diabetic condition. A user-tested multimedia teaching program on compact disk (CD) will provide students in pre-professional health programs with a tool for their own learning and for patient education; multiple entry points enable the lecturer and student tailor the program to meet individual needs.

This paper reviews the work to date and identifies some of the constraints for the implementation phase in 1995.

2. DESIGN CRITERIA

The Faculty of Health Science (Zelmer and Zelmer, 1994) provided the general design specifications and rationale:

- The intended users are generally divided into three groups: nursing students, health workers, diabetics and their families. Since diabetes can affect any one regardless of age (Insulin Dependent Diabetes Mellitus (IDDM) usually occurs in children or young adults), the lowest level would include users less than 12 years old.

- The program will integrate audio (voice), video clips, animation, graphics, colour and text to create a multimedia system. Use of graphics or pictures will give a better understanding of a situation than merely describing it with words. Similarly, animation would help to explain a complicated process that would otherwise need a lengthy text-based explanation.

- Colour pictures and graphics will enhance visual discrimination and present a clearer perception to the user. This makes the screen livelier and more interesting. Having audio or voice output will transform a silent machine to a talking tutor. This trains the user to listen to the 'patient' (represented by the talking picture in the design developed) carefully before any action is taken. In short, real life situations are brought to the computer.

  The multimedia interaction and reality, it is hoped, will also result in increased satisfaction with the learning materials and an increased retention of the information contained in the activity, resulting in more effective learning.

- Lessons or tests are not to be set up in a strict linear fashion. Modules are to be in the form of interactive case studies; scenarios involving relationships between a nurse and the patient would be ideal where the user could learn from a 'simulated' experience. The user would then 'answer' the required questions as part of completing the actions required by the simulation.

- The design should be flexible, allowing the user to make selections for the case study they are interested in. It should also provide different levels of difficulty for several user levels.

- Information (help in navigation as well as technical support in diabetes management) is to be provided upon request and should cover basic topics on what diabetes is about, basic anatomy and physiology, diabetics' diet, exercise, danger signs and terminologies. This information might be organised in topical order using a tree structure. Multi-level information could be achieved through the use of hyperlinks which allow cross referencing of related topics.

- The program must be stimulating and at the same time non-threatening. It should be able to attract the attention of users and encourage them to solve the case studies at their own pace. This will make learning interesting and fun.

- One program objective is to provide the instructor or lecturer with a tool for student evaluation. This will enable the instructor to check the student's progress and monitor the difficulties the students face when they are going through the lessons.

- This tracking mechanism will record the student's activities in the order or sequence of events. A student should be allowed to start from the basic level and slowly proceed to the higher level, another student might attempt to solve some more complicated lessons, skipping basic topics.
- A hard copy printout of reference material is not required as users may readily obtain similar information from libraries and health centres. The design should mainly focus on interactive learning.

3. INITIAL DESIGN

Figure 1 shows the initial screen design, developed during the first half of 1994 in consultation with Zelmer and Zelmer as one of Lye's assignments for a class in Computer Applications in Learning and Training (CALT, a CQU Honours Computing Unit). This basic design places all of the navigation tools at the bottom of the screen and provides two main interaction areas. Graphics, animations and technical information (x-rays, charts, and

diagnostic information) are presented on the left side of the screen, here represented by a 'movie' player, although the material could be presented through any appropriate media. User activities are presented on the right.

In a typical scenario activating the video will allow a patient/client to describe her/his situation. Allowable activities will be presented on the right (including a text version of 'questions' posed in the video) and answers may also be entered here. If the user requests additional information such as the patient/client history, a pop-up box will present the requested information.

Functionally the design uses a Problem Based Learning (PBL) approach, where learning is achieved through the process of problem solving. The user is given a problem, presented as a clinical case study, where s/he must gather and organise the facts of the case, and decide how to resolve the situation through a process of free inquiry, reasoning and decision making. The case study problems, not a set syllabus, provide the stimulus and framework for learning.

The case situations must be designed in such a way that they lead the user through different paths depending on their response to the problem presented. As well, the different paths might present an alternate form of the problem depending upon the level of difficulty selected by the user (or set by the instructor). This will cater for users with differing experience and knowledge levels.

If, however, the user wants to get more information directly, s/he could obtain the required information through the 'help' option. This will permit the user to look up specific topics, either to aid in solving the problem or just for additional information.

An overall concept map must also be provided in the HELP option and, as well as showing how the user is progressing through the current case, will show all the available case studies on different topics. This will allow the user to choose the topic s/he wants. In the prototype design, there will be only one case study, based on foot care. It will contain at least five questions which can be completed in any order. In some of the more complicated and critical topics, users may be required to work in a linear fashion, particularly where clinical procedures must be done in a specific order.

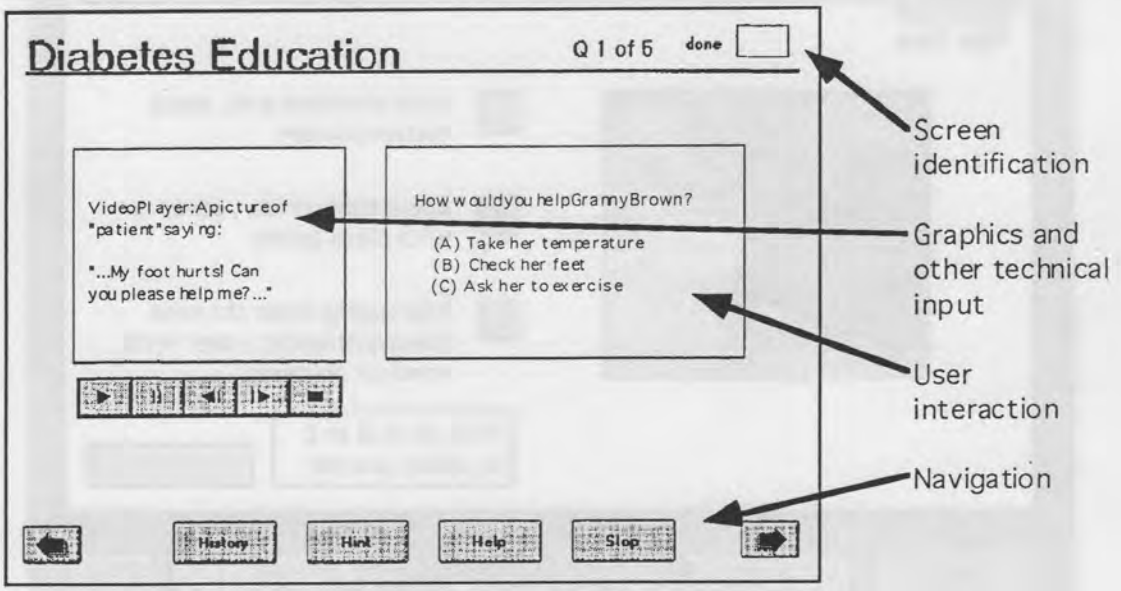

Figure 1, Basic Screen Design

Potential problems and constraints identified at the initial design stage included a relatively large file storage requirement which will be overcome through the use of CD-ROM for distribution, a need for reasonably high resolution screen images necessitating good quality colour monitors on the delivery computers, and a dependence upon a content expert who can provide technical information and case details to build realistic computer-based learning cases.

4. DEVELOPING THE PROTOTYPE

Fortunately the Health Science client approved the design for continuation to the prototype stage. The development to the prototype stage was also achieved by one of the authors as an assignment for the second CALT unit and focussed on a single topic area—foot care. The prototype was developed on a Macintosh™ platforms as Health Science uses Macintosh™ computers for most of its computer-based learning activities the authors have good access to appropriate development tools (video capture board, colour digital camera, slide and flat image scanners, software tools, et cetera) on this platform. Ultimately it is hoped that the completed package can be delivered on a variety of platforms.

The development tool used had to be able to handle multimedia presentations within the design specifications, particularly the requirement for user interaction, with cross-platform development (Intel and Macintosh) a definite advantage. Macromind Director® (now Macromedia Director®) was ultimately selected because of its simpler interface and greater control over text, animation, video, and graphic objects.

The prototype demonstrates the required user interaction with a very simplistic case study on foot care, complete with a minimal database of information on diabetes and related terminology. Similarly, the rudiments of the help functions are present, although the package operates only in 'practice' mode (no testing mode), and does not yet have more than one level of difficulty or any record of user progress.

User testing of the prototype resulted in several changes (Figure 2) from the original design, particularly in the placement of navigation buttons and the words used to describe their function—Quit rather than Stop, for example. The users also requested the not yet implemented conceptual map of the package to assist in navigation. Additional user testing will obviously be productive.

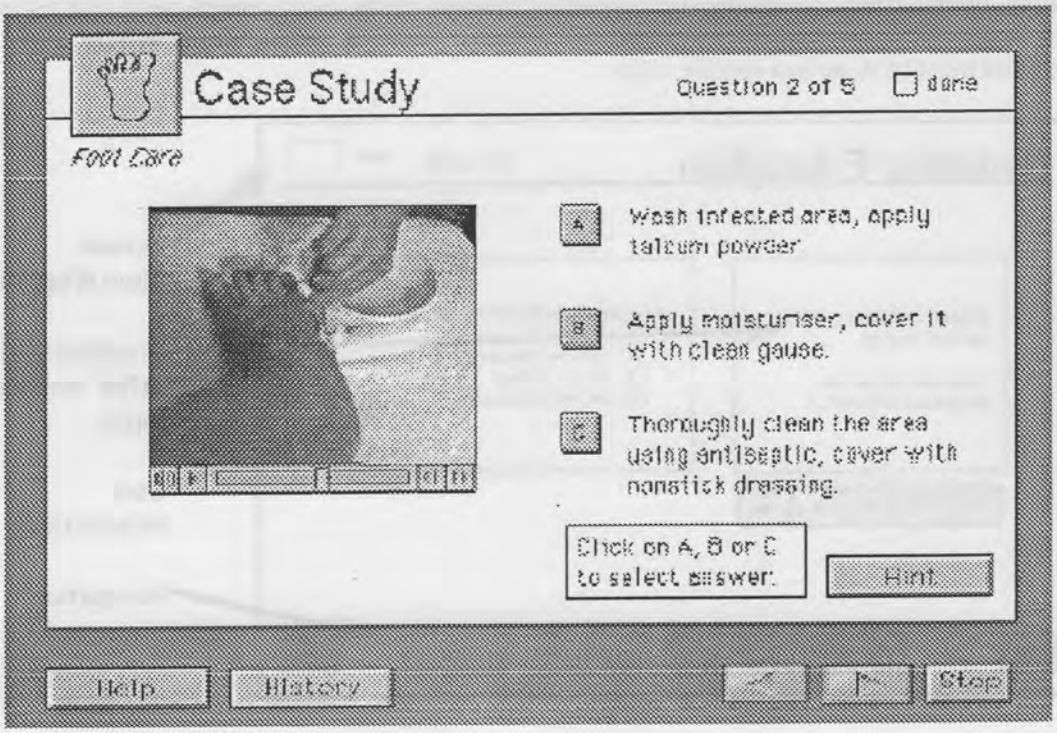

Figure 2, Prototype Screen Design

As expected, the files required for even this limited prototype are extensive, with a 37 second video clip on foot care, for example, requiring 7,299 Kb in compressed form. Hopefully the total package size can be kept within the 650 Mb limitations of the CD-ROM. The video display (monitor) on the designated delivery platform was considered to be somewhat limiting by the prototype developer as its size did not allow for extensive text and other materials to be displayed. While we wait for user testing results, it is the opinion of the package designers that this is a plus rather than a negative—minimising the amount of information that will be present to confuse the user at any one time.

A more significant problem resulted from the conflicting time commitments of the subject matter expert, resulting in some of the prototype content not being checked for accuracy. While there is funding in the CAUT project to obtain some released time for the subject matter expert to devote to this project, it will be necessary to optimise the use of this person's time.

5. IMPLEMENTATION

The project has a designated reference group composed of academics, clinicians, and subject matter experts which will guide the overall project as well as overseeing content accuracy. Staff within the Department of Mathematics and Computing have agreed to serve on a technical committee which will review aspects other than content and general project management.

The CAUT funding provides for release time during 1995 for both content and learning specialists as well as some funding for developing graphics and related materials. It also provides for most of the non-capital costs related to producing the package (mastering the CD-ROM, duplication, et cetera), provided the package is completed during 1995.

The CAUT funding does not, however, provide funds for travel or other costs related to field testing or evaluation. While the time lines are such that evaluation probably cannot be done during 1995 in any event, field testing in a number of locations is critical and the associated costs must be addressed. Fortunately, Lye, who worked on the design and prototype stages of the project as a student, will be able to continue working on the development of the package and will likely conduct an initial evaluation as part of her Masters degree research.

As noted above, this package is being developed on the Macintosh™ computer platform. Software development tools include Hypercard®, Canvas™, Photoshop™, and Macromedia Director®. Much of the development will be done on a Macintosh LC III, which is also our target delivery platform, with a Centris™ 650 available when required. Video capture on the LC uses a VideoSpigot® card.

6. REFERENCES

Zelmer, Amy E and Zelmer, A C Lynn (1994). Project specifications at a Faculty of Health Science client meeting, 17 and 28 March.

Zelmer, A C Lynn and Lye, Ngit Chan (1994). Work in Progress: Interactive Multimedia for Diabetes, APITITE '95, Brisbane.