The Evolution of Computer-based Tutorials Towards Web Delivery

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Introduction

The Biochemistry Department at Melbourne University has been committed to the use of computer aided learning (CAL) since the early 1980s. Limitations of early modules written in the department were increasingly apparent, as computer technology became more versatile and sophisticated. However, these modules represented considerable investment of time in academic content, multiple choice question formulation and graphic production, and in an environment of reducing resources and increasing demands, preservation of this investment was important. We explored the possibilities of salvaging the value of our early CAL modules and presenting the content to students in a more accessible format. This paper outlines our approach to preserving the academic content and increasing the versatility of early DOS based CAL modules by converting them to Windows based and web deliverable formats.

Methods

Q tutorials were authored using the *Q Instruction Package* (Elsevier Biosoft, Cambridge, UK, 1987,1991) from 1985 until 1995. Graphics were produced in drawing programs (generally *CorelDraw*) or scanned from textbook or journals, and were in self-executable format (*.exe). The program used to convert *Q* tutorials to *ToolBook* format was developed 'in-house'. *ToolBookII* (Version 5) was used for its capacity to convert tutorials to HTML. The HTML editor *HotDog* Version 4 (Sausage Software) was used to write HTML files, and produce image maps.

Results

Between 1985 and 1995 a total of sixty DOS based *Q* tutorials were produced (Elliott *et al*, 1995). These tutorials were written to support lecture and practical material for second and third year Agricultural Science, Dental Science, Medical and Science courses. They contained original text and multiple choice questions, supported by graphics. Students were given feedback when answering questions and a score at the end of the tutorial. Navigation was linear and users could access a screen offering a 'Page selection', although page content was not identified on this screen.

The *Q* tutorials presented users with either a text, graphic or question screen, moving linearly from one to the next. The direct conversion to *ToolBook* produced tutorials that were accessible in Windows. These could be easily and quickly enhanced. Graphics could be placed beside relevant text (Figure 1) facilitating description of the graphic material. Manipulation of image size was also easier, and there was greater flexibility with respect to file format. Additional information was presented as "pop-ups" in layers accessible to the user on 'mouse click'. These features were used in the tutorial "An Introduction to Biochemistry".
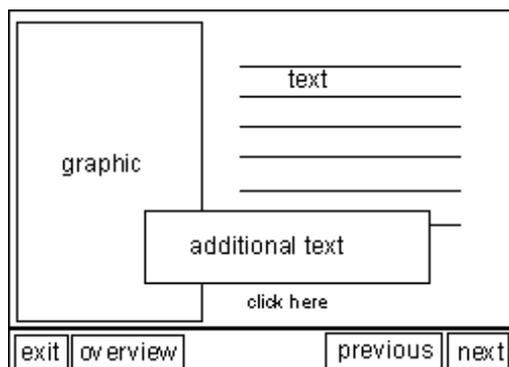
Figure 1. Layout of "An Introduction to Biochemistry"

Conversion of the *ToolBook* tutorials to HTML resulted in the loss of features and a need for considerable modification. It was therefore more efficient to convert the *Q* tutorials directly to HTML. This direct conversion added the flexibility of platform independence, and web delivery. The converted tutorial was then enhanced with frames, hyperlinks, *JavaScript*, image maps and animated graphics. A tutorial written in *Q* for second year medical students, on "The Molecular Basis of Insulin Action" was converted to HTML (Brack, 1997). This module is currently under revision and evaluation is planned for the second semester of 1998. The tutorial on "Calcium Homeostasis" was written directly in HTML (Brack, 1998). Production of this module is in progress.

The use of seamless frames allowed for easier navigation with a hyperlinked menu of sections always on screen. This navigation frame was either placed down the side or along the bottom, each with different advantages. A side menu is consistent with many current web site designs and would therefore be familiar to users. In addition, the side menu broke up the screen into dimensions that were easier to view particularly when text was presented. The navigation at the bottom of the screen was most efficient in space taking only 17% of the screen. Graphics and text could be presented together in HTML (Figure 2). Frames were used to combine visual and text information in a variety of combinations with some user control. Hyperlinks from text were used to access relevant graphics or to move between sections.
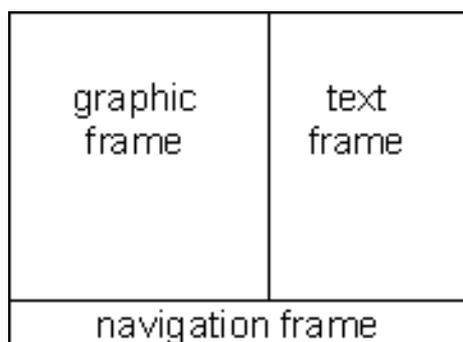
Figure 2. Frame structure of HTML tutorials

The multiple choice questions were presented using *JavaScript* forms. This allowed for feedback to students.

Image maps were used for navigation, providing access to material from a visual perspective. Animated graphics were easily produced, and careful timing, cycling and linking of animations allowed users to step through with some control. This is illustrated in the animation in the tutorial "The Molecular Basis of Insulin Action".

Discussion

Early investment in CAL has provided essential support to the teaching of fundamental areas of biochemistry. The key feature of early tutorials was the feedback to students and scoring of answers. In addition, information from disparate sources could be brought together further distinguishing the tutorials from the textbook format. In the 1990s the need to redress the educational focus of teaching and learning was recognized, and CAL modules designed from an experiential perspective are currently in production. However, the academic content held within existing tutorials was of continuing relevance. Conversion of these tutorials to Windows and web formats made the material more accessible to students. In the evolution of our CAL material from DOS based to Windows and eventually web deliverable tutorials the functional advance has been in the flexibility of navigation and user control. The learning material has become more accessible to students and has kept pace with the advances in technology expected by students.

Summary

Conversion of DOS based *Q* tutorials to *ToolBook* format resulted in Windows delivery, enhanced graphic presentation and more flexible access to information. The further conversion of *Q* tutorials to HTML formats also allowed cross platform (Mac and PC) and web delivery.

The use of simple HTML tags and *JavaScript* in web deliverable tutorials allowed for easy and rapid enhancement of the material from the *Q* tutorials. The enhancement was to greater flexibility in navigation both between and within sections of the tutorials, and more extensive and flexible linking of media elements (text, graphics and questions).

These conversions preserved the academic content of the early modules, and resulted in rapid delivery of enhanced CAL material to students.

References

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