Building a web-based course
for Cambridge medics: deconstruction, reconstruction, integration.

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Preface

In the spring of 1998, the Board of the Faculty of Biology of the University of Cambridge sanctioned a project to transform a long-standing traditional course in Medical Sociology, delivered to the first-year undergraduate medics, into a stand-alone computer-aided learning (CAL) package. The course consisted of 10 hour-long lectures, a number of tutorials (known in Cambridge as 'supervisions') and, at the end of the course, a formal written examination. The same course was also being delivered as part of the Cambridge Diploma of Public Health, which involved many small groups being taught the same material. It was this factor which made distance delivery and self-directed study desirable and increased the project's cost-effectiveness.

I was appointed that summer as Research Associate and Multimedia Developer with responsibility for developing and rolling out the project. A steering committee consisting of lecturers, medical sociologists and myself met monthly at first, to oversee the project. We had few preconceptions as to how the final result would look and feel; as far as we were aware (a researcher had been recruited to scour the web for anything similar) nothing of this nature had ever been produced before. At that time, CAL was ubiquitous in the sciences but rarely applied to the humanities. During the course of the project our attitudes shifted away from the formal, structured constraints of CAL towards the more open, creative possibilities offered by interactive multimedia (Imm). This subtle shift from computer to medium has informed our approach and allowed us to deliver an engaging educational experience by integrating many media resources, such as video, photographic images, animations, graphs and texts held together in a narrative structure. The paths and processes that led to this outcome are what this paper sets out to document.

1 Media decisions

"I don't explain, I explore" Marshall McLuhan

1.1 Content and delivery

It is no trivial task to transform 10 hour-long lectures into stand-alone educational multimedia. The content, that is the Medical Sociology course itself, already existed having been delivered annually to undergraduates for the past twenty years; consequently some of the statistical data was rather out of date and though this provided a good opportunity for updating, it also increased the workload on the lecturer. High quality content deserves high

quality mediation: we wanted to explore and utilise all the opportunities for engagement that multimedia could offer, given the constraints of web-based delivery. We had opted for web delivery for a number of reasons - not least because the web browser was fast becoming a universal interface1 and we were convinced that even the most technophobic students would understand how it worked. We also felt it essential not to overload the student with the additional burden of having to learn new technical skills as well as learning the subject matter itself. Because it was intended to deliver the course exclusively via the fast Cambridge University Data Network (CUDN) many of the bandwidth constraints associated with modem delivery no longer applied. Therefore we were able to offer photographic images, animations, QuickTime video and importantly, a real-time narration. This meant that we could retain a lecture-like experience whilst still exploiting the possibilities of interactivity. With richness of content, however, the time taken to produce it increases. We used a ratio of 300 hours of production for each hour-long lecture.

1.2   Director and Shockwave

The industry standard software package for multimedia production is Macromedia Director. It is a versatile product with its own powerful programming language, Lingo. Director 'movies' as they are known (often confused with QuickTime movies, which are video clips), can be 'Shocked', that is, converted into Shockwave files which will embed and play in a web browser with the requisite plug-in installed. Although the Shockwave plug-in does not ship with Netscape or Explorer, it can be downloaded free of charge from Macromedia's site and installed very easily. We decided to develop the course in Director and deliver it as a series of linked Shockwave movies.

2   Form follows function

"In an architecture of content, the information becomes the interface" Edward R. Tufte

2.1   Narration versus text

Lectures themselves are multimedia productions, using images, graphs, texts and sometimes video. The media elements are embedded in a narrative structure; a lecture is a story, or series of stories and the lecturer is a story-teller. If we could retain the narrative structure for our multimedia version, we would be able to give the student a lecture-like experience whilst still offering interactivity in the forms of choices of paths through the material and discovery of 'hidden' additional information within certain sections. It is widely accepted that, in general, people prefer not to read large amounts of text from a computer screen. There was also evidence that narration was preferable to on-screen text to minimise cognitive overload and aid retention. Kalyuga et al (1999) showed that psychological research suggested that working memory had separate processors (in separate areas of the brain) for auditory and visual inputs2. Capacity could be improved by using both - in effect, parallel processing. In another study on how multimodal presentation affects information processing, Dubois & Vial (2000) found that "auditory information in co-reference with an image fosters learning more than textual information in co-reference with the same image3." Therefore it seemed highly desirable to use a narration rather than on-screen text, and this was to offset the additional time it would take to digitise and edit the narration.

2.2   The role of narrative

The role of the narrative in comprehension has also been explored:

"Narrative structure is fundamental to comprehension to the extent that when it is clearly absent from certain forms of multimedia, this can seriously undermine comprehension of the material."4

Laurillard (1998) goes on to assert the importance of narrative structure in determining how the instructional message is understood by the learner.

2.3   Navigational design

Each lecture was to be replaced by a module. This module was composed of a number (typically around 25) of individual Shocked Director movies. The advantages of having a number of small movies (rather than one large one) were that download times were much quicker and by mapping the individual movies a simple navigation interface could be constructed which was easy for students to understand and use. A common complaint is being 'lost in cyberspace'; we needed our students to feel comfortable, oriented and in control. There is little point in numbering sections sequentially if learners can choose in which order to tackle them. Therefore it was important to provide a very simple and intuitive interface which could nevertheless offer a high degree of functionality. A simple Navigation Panel was devised which firstly showed the student where they were, where they'd been and the overall scope of the module (i.e. what was left to do). Each sub-section of the module (a separate Shockwave file) was represented by a square. Borrowing web browser conventions, the active square was coloured pink, the visited squares (ie. completed sections) were green and the rest grey. As the cursor moved over the section, it's title appeared in a text box just below the panel. Each square was itself hyperlinked so that a learner could 'jump' direct to any section; this was especially useful for revision. Students were expected to work through each module in one sitting (in keeping with the lecture theme) so the panel state was not designed to persist once a different module was loaded.

3   The role of information design

"When I'm working on a problem, I never think about beauty. I think only how to solve the problem. But when I have finished, if the solution is not beautiful, I know it is wrong."
Richard Buckminster Fuller

3.1   Rules of good design

It is an often overlooked truism that bad design costs the same as good. The rules are straightforward - use colour (on the web, it's free); use a colour wheel to choose harmonious colours (choosing colours separated by $120°$ produces good results); reduce saturation (it's much easier on the eye); avoid clutter (this reduces cognitive load and looks tidier); keep gridlines light and well spaced (this keeps them in the background whilst allowing the information to come forwards)5.

3.2   Animations and rollovers

When the lecturer is removed from the lecture, so too are the nuances, asides, gestures, jokes and visual clues. Without a lecturer to point to salient features of a graph, for example, learners can find it extremely difficult to make sense of the information it contains. We used animated arrows synchronised to the narration to simulate the lecturer's pointer. Where changes over time need to be shown, graphs can be animated to achieve this. To prevent screen clutter, hidden text or figures can be revealed by a "rollover"; this is where a cast member is visibilised, usually near the cursor as it moves over a predefined hotspot. The rollover is temporary, persisting only as long as the cursor is over the hotspot. It is a simple yet elegant form of interaction, provides a high degree of 'discoverability' and requires no other action on the part of the learner.

4   Macromedia Director and deconstruction

"To make cinema or television, technically, is to send twenty-five postcards per second to millions of people, either in time or space, of that which can only be unreal" Jean-Luc Godard

4.1   Director as postmodern tool

Godard could have been referring to any time-based medium. Director, intrinsically a postmodern tool, uses the metaphor of the theatre (and so, inevitably, invites a theatrical approach): the Stage, which is the visible portion of the movie; the Score, where the movie's content is organised over time, determining when images appear and sounds play. (Scripts or Lingo instructions are also assigned in the Score.) All of the media elements are stored in the Cast, and are themselves Cast members. Cast members can include sounds, digital videos, text, bitmap and vector images, and scripts. To use Director to work a lecture into a module one must first deconstruct the material into its component parts; if the medium is the message then the package is the process. The very act of using Director informs the final outcome and its implicit theatricality can subtly alter the material it mediates.

4.2   De- Re-construction

To deconstruct and then reconstruct the material is to alter it. The transformation and translation of a lecture into a multimedia experience is a deconstructive process, involving interpretation by the mediator. In order to interpret the material, the mediator (or *multi*mediator) must first understand it, engage with it and then de- and re-construct it. In "Postmodernism: what one needs to know", Grassie declares that :

"There is no direct experience of reality without interpretation; and all interpretation is in some sense corrupted by the cultural and personal prejudices or prejudgements of the interpreter.6"

The lecturer, through the medium of the lecture, passes on knowledge to the learner. When the lecture is transformed into educational multimedia, a further process is introduced: the

lecturer must first share the knowledge with the developer who now mediates between the lecturer and the learner. If the outcome is true distance learning, the learner is completely removed from this process, and future models should consider including the learner at the earliest stage. Trust and understanding between lecturer and multimediator are essential and because the multimediator's role is an interpretive one, great care must be taken to ensure that the lecturer's original meaning is retained. This is further complicated by the effects of 'chunking'.

4.3   Chunking

'Chunking' is a method (and itself another form of de-re-construction) of breaking down each portion of text into bite-size pieces. A chunk is the smallest amount of information that can hold together as a sensible entity. In "Writing for New Media: the Essential Guide to Writing for interactive media, CD-ROMs, and the Web", Bonime and Pohlmann warn to keep it self-contained: "the info-chunk must not be too dependent on what precedes and follows it7". Again, this makes sense if you allow the learner to decide their own direction through the material. It also alters the grammar. Phrases like 'therefore it follows that' and 'as we shall see' have no meaning if they are disconnected from the subsequent or previous statements they refer or are connected to. Self-containment presupposes that a learner may come to this particular place without previous reference and that what they find there should still make sense. Inevitably, and especially where a logical argument needs to be built, a chunk will be a fairly large piece of information; we have had to span a single chunk over several sections leading to a lengthy linear piece of narrative. In a didactic context, this is sometimes unavoidable, even desirable, and is the main reason why we have arrived at what we have called a 'semi-linear' structure, with linear sections where an argument needs to be followed sequentially and branching sections where menu items can be explored in any preferred order.

5   Conclusion: the future

"We look at the present through a rear-view mirror. We march backwards into the future"
Marshall McLuhan

5.1   Evaluation

At the time of writing, the Interactive Medical Sociology Course is being studied and evaluated by the first cohort of Cambridge students, who will sit a formal examination in March 2001. Evaluations are submitted by web-based form, and there is space for comments. Broadly, the response has so far been positive although the students are divided as to whether they would have preferred text to the narration. Some have had technical problems trying to install the plug-ins; most of these problems have been resolved. One college does not have any sound cards so the students have been unable to follow the course in their own college although they have been able to use facilities in the University computing labs. Students also complained that the absence of lectures meant a lack of structure to the course in that there were no particular times allocated to it. Others, however, found being able to choose their own times to work on the modules a positive advantage, showing that it is impossible to please everybody.

5.2 Evolution

Issues and opinions raised by the evaluations will inform the second generation of the course. The text versus narration debate will continue; in any emergent medium there will always be muddied and confused views until the conventions begin to crystallise. We will consider including guidelines for the students to manage their own learning; certainly we must acknowledge that by putting this course online we have shifted the responsibility for 'attendance' firmly onto the student. Feedback from this year's students will improve the course for the next cohort and allow it to evolve into a more effective, engaging and interactive learning experience.

Acknowledgements

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