

## **From linear lecture to interactive multimedia module: a developer's perspective**

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### **Abstract**

Computers, hitherto viewed as tools, are becoming an emergent medium in their own right. In embracing this new medium, educational multimedia developers can create engaging and stimulating interactive learning modules, especially appropriate for the humanities. This paper describes the decisions taken along the way and explores the processes involved in transforming a traditional lecture in medical sociology into an interactive on-line learning module.

### **Introduction**

A traditional lecture is a linear arrangement of ideas, presented to an audience at a particular time and place. It often utilises a variety of media: slides, video, graphs and charts, photographic images, texts - all inter-connected through a narrative structure.

There are a number of obvious parallels that can be drawn between lectures and theatre.

A lecture is a performance, delivered to an audience in a theatre with props and lighting and often from a stage. It may be repeated many times on many different occasions yet it is never exactly the same twice. It has a plot or a number of plots which the audience may or may not be able to follow. Information may be conveyed. The audience may laugh, be engaged, puzzled or inspired; emotional responses may be evoked.

To transform a lecture into an interactive self-directed multimedia module removing it from its time and place is a great challenge and the processes involved can alter the material, often subtly, sometimes in more fundamental ways. The amount of time that this entails should not be underestimated: this project used a ratio of 300 production hours for each hour long lecture.

Until recently, computing and programming were technical activities carried out by hardware and software engineers. Computers were viewed as tools. Yet the danger in considering a computer as a tool is that we limit its potential and by focusing on the more 'scientific' aspects, we ignore the creative and artistic.

In "Computers as Theatre"<sup>1</sup>, Brenda Laurel observes that it was only when artists replaced the engineers as film-makers that movies became a medium in their own right. This is now happening with computers. Laurel invites us to extend our boundaries:

"Thinking about interfaces is thinking too small. Designing human-computer experiences isn't about building a better desktop. It's about creating imaginary worlds that have a special relationship to reality - worlds in which we can extend, amplify, and enrich our own capacities to think, feel, and act."

She urges us to "think of the computer, not as a tool, but as a medium". Once we begin to see the multimedia computer as a medium in its own right, we can begin to build engaging and information rich environments ripe for exploration. We can include dramatic elements, designed to evoke an emotional response. We can utilise imagery to reinforce a particular message and stimulate deep learning. We can begin to think holistically about multimedia as an emergent single medium with its own vocabulary. Consequently, the whole that we construct will always be greater than the sum of the parts.

The analogy of early cinema offers some interesting insights into our current position. A famous early work is "The Arrival of a Train at La Ciotat", filmed in 1895 by the Lumière brothers. This is naturally, a black and white silent movie which shows a steam train arriving at a station and passengers disembarking.

The style is (to our modern eyes) documentary and the camera itself is stationary throughout.

Yet early audiences for this apparently neutral film feared that the train would come crashing out of the screen and into the auditorium<sup>2</sup>. Watching the clip from our modern perspective, this mistaken perception seems laughable. But if we can understand that audience's reaction to a new medium we go some way to understanding our current relationship and engagement with computer as medium: we are in a similar position to that early cinema audience - both fascinated and terrified.

## **Background**

Medical Sociology is currently delivered to 1st year undergraduate medics at the University of Cambridge in a traditional 10 hour-long lecture series. There is a one and a half hour written examination and supervisions provide the students with opportunities for further discussion and clarification.

A two year project has been established to translate the lectures into a computer-aided learning (CAL) package: future generations of Cambridge medics will be able to work through the material in their own time and space and at their own pace. The lectures will cease, but the supervisions are to continue.

A steering committee, consisting of Cambridge lecturers in medicine, sociology and associated disciplines plus a multimedia developer was set up to oversee the project.

## **Method of delivery**

The first choice faced was whether the CAL package should be delivered online or via CD-ROM. The latter could obviously store and deliver much larger files, making it particularly attractive for multimedia, but the disadvantage was that it cannot be updated. Web delivery offered more flexibility and also had the advantage of high-bandwidth intranet delivery coupled with the ability to specify the end-users' browser configuration. This allowed rather more control than one would normally have when creating distance learning products for more general consumption.

The web, in the few short years since its inception, has achieved ubiquity. People are familiar with the browser interface, which means that a developer's resources and time can be concentrated on the core content and functionality: the interface is provided, and everyone understands the 'meaning' of a browser, a 'back' button, a hyperlink. The web is becoming or perhaps, has already become, a medium in its own right, with its own vocabulary.

The web is also platform independent - in theory at least: in practice a large amount of cross platform testing has been undertaken with a commensurate amount of tinkering 'under the hood' to try and ensure stability under normal usage. (But this project is using near cutting edge technology, and the closer you are to the edge, the more likely you will fall over.)

A web browser can display a number of multimedia formats, including text, images, animations, sound and video. Some formats such as QuickTime video and Macromedia Director require the installation of additional components before they can be viewed. Because we are delivering the package within the electronic confines of the campus, we are able to specify which version of browser is required and which plug-ins must be installed.

The web, as emergent medium, also has its own constraints. Multimedia files can be large and take significant time to download, although streaming technologies can minimise 'empty screen' waiting times. These allow the client's browser to start displaying data before the entire file has been transmitted. The file

(typically a QuickTime video clip) then continues to download in the background whilst it is playing. This can cause jerkiness if the portion that is playing 'catches up' with the section that is downloading, but web users are generally quite forgiving of this behaviour: it occurs fairly frequently.

## **Media choices**

A hotly debated choice was whether to use narration or text only. Sound files can be very large and are time consuming to produce and edit whereas text files are small, fast and easily editable. But computer screens are far from ideal for reading large quantities of text and it was felt that a narration would provide a more 'lecture-like' experience. In addition, streaming web technologies coupled with the fast intranet made the filesize trade-off less important.

There was another good reason for choosing audio. In discussing the limitations of human working memory, Kalyuga, Chandler & Sweller (1999) had noted that 'many conventional instructional materials require learners to unnecessarily split their attention between diagrams and text'<sup>3</sup>. Yet psychological research had suggested that working memory appeared to have separate processors for audio and visual media leading to improvements in capacity. This made sense intuitively - if a student is looking at a diagram, she can't read an accompanying text at the same time, whereas she can certainly hear a narration.

Student feedback indicated general approval of our choice of narration over text. This comment was typical: "The narration is definitely good as it keeps you working through it at a reasonable pace without skipping bits like you may do in text."

A wide variety of media including animations, photographs and video have been used. The bulk of the resources have been created 'in-house'. Some photographic library material has been incorporated, but has generally been manipulated in some way - being cut out from a background, for instance. Encouraging lecturers to think in terms of visual imagery to emphasize or explain a point has not proved difficult; it seems a natural process. A fair amount of time has been devoted to image research and manipulation, as it can sometimes take a while to find a particular image.

The course being mediated was largely a humanities based one. This requires a different order of mediation to a 'hard' science topic. Computers as tools are excellent at number-crunching simulations. But a more humanities-based topic is discursive and requires more delicate handling. Imagery and thus design are important for both reinforcement of a message and evoking emotions. When discussing poverty, for example, why should we not have some feeling of the squalor and oppression? Won't the experience help us to understand (rather than just remember) the underlying principles? Surely these are the very methods that a good lecturer would use to engage interest and stimulate further exploration of a subject. Visual imagery can provide a powerful method of stimulation; such images can 'stick' long after the words have faded from memory.

Video clips can also be integrated into the package. We used clips of actors in various roles - illustrating social class attitudes, for example, or role-playing the different types of doctor/patient relationship. These clips provide the learner with a valuable overview and perspective: it would not be possible in real-life to see the same patient and doctor engaging in a consultation with different outcomes depending on their relationship! Thus, textbook examples can be brought to life.

## **Method of presentation**

It may already be apparent that the technical and creative components of a multimedia system inevitably

weave in and out and collide with one another. Tom Boyle has acknowledged that "there is a tension between power and imagination in design and the constraints of delivery"<sup>4</sup>. Delivery and presentation are two extremes of the same continuum. As one moves towards the user interface, presentational aspects are emphasised: conversely, as one moves towards the network, the delivery system or infrastructure becomes all important. They are, of course, as inseparably linked as style and content, sometimes cake and icing, more often sandwich and filling. Technical issues such as insufficient bandwidth present themselves as jerky irritations to the user. Experienced web-users are fairly forgiving however; they are used to things not working! (Even sites such as Microsoft or Netscape fall over occasionally). One difficulty is that most non-developers only see the presentation side, thus missing the nine-tenths lurking below the surface. This 'iceberg' is where most of the development time takes place, yet there are precious few results to be seen whilst this work is going on.

Consequently, lecturers can have unrealistic expectations of multimedia systems; one role of the multimedia developer is as mediator of the lecturer's material. As mentioned in the opening paragraph, a lecture tends to have a linear structure whereas an engaging interactive product would allow the user at least some control over the order in which sections were tackled. This approach means that lectures need to be deconstructed: this can be a painful process for both lecturer and developer.

There is a good argument for the multimedia developer to not be an expert in the subject they are trying to mediate; if they can retain the 'students' eye view' this means they can critique the pedagogical aspects of the package as they go along. 'What did you mean by this?' is a question that has cropped up time and again and as the answer unfolds, the developer goes through the same learning processes that the students do.

### **Lecture to multimedia module**

The initial expectation that a lecture would map one-to-one on to a multimedia module was soon dispensed with. If learning technology is to be effectively integrated it must improve on rather than simply translate the traditional component it is replacing (Thomas, Carswell, Price & Petre, 1998) <sup>5</sup>. If we merely wanted to faithfully reproduce the lecture, we should make a video of it and distribute the tape to the students. It is clear then, that a multimedia production should take full advantage of the new medium that computers can offer. This can be a positive experience, and the deconstruction process should be welcomed (despite the pain!) for the new approaches it can lead to. In developing this interactivity and reworking the material, it was found that the very structure of the lectures was changed. Some sections from separate lectures that overlapped could be merged. Some topics which previously had been rather marginalised seemed to lend themselves very well to multimediation and consequently were amplified and expanded.

### **How interactive?**

Heppell (1993) makes the distinction between the narrative and the interactive function<sup>6</sup>. He also emphasizes the importance of the narrative function for didactic purposes. Summarised as 'stop', 'start', 'watch' and 'listen', these are predominantly passive roles.

The interactive function is typically much more user-oriented. It is characterised by terms like 'browse', 'investigate', 'explore', 'choose' and 'do'. Responsibility is shifted towards the user.

Multimedia can operate in both the narrative and interactive modes. At one extreme, a purely narrative product would involve no student interaction at all. This is rather like a traditional lecture, a video or a series of web pages with 'next' as the only option. Progress is unidirectional and non-branching. At the other end of the scale, a totally interactive product might offer a myriad of routes and user choices, many

entry points, no perceivable middle or end. If not carefully designed, this might prove hyperactive; exhaustion or bewilderment could result.

Yet both approaches have their merits. It was decided to strike a balance, and produce a 'semi-linear' package with linear sections to build arguments and interactive sections to allow for student exploration. Decisions such as this recognise the need to 'go with the flow' of the information. Some didactic sections require a linear approach, other sections lend themselves more to interactivity with branches allowing for student choices, exploration and engagement.

A couple of simple rules were applied: where arguments a and b lead to point c, this of necessity constitutes a linear section, where students must work through the material from a start to a finishing point (unidirectional). Where one has a list of headings or series of bullet points, this constitutes a branching section, where students can tackle the items in any order. Thus the content informs the design: "the information becomes the interface" (Tufte, 1997) <sup>7</sup>.

## Navigation

For a user to feel in control it's important for them to know where they are, where they've been and the overall scope of the module, or where they've got to go next (Preece, 1993) <sup>8</sup>. When we pick up a book, this is explicit. The pages are numbered, we can see how large it is, how many chapters it contains, where we are in relation to the rest of it. In a multimedia environment we lose many of these vital clues. There is no sense in numbering screens if you intend to allow students to tackle the material in their own preferred order. There may be no indication of how long it will take to work through the material.

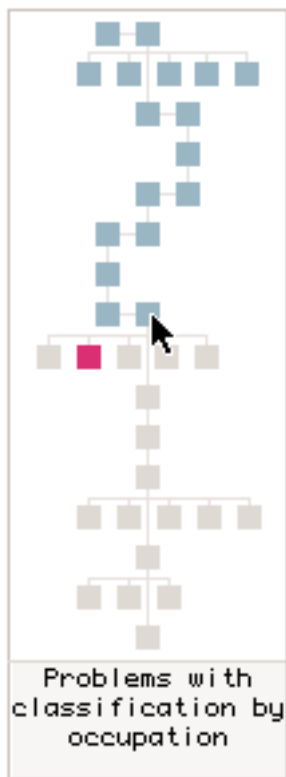


diagram1 - Navigation panel

Given this loss of spatio-temporal clues it becomes all the more important to simulate them for the user. A Navigation Panel (diagram 1) has been devised which functions on a number of levels. Firstly, it maps the scope of the module. Each square represents a subsection of the module, and the squares are arranged in an appropriate pattern relative to each other. The linear sections lead from one to another; the interactive sections from a 'tree' of branching choices. The 'shape' of the module is entirely determined by its content and it's an enjoyable experience to see what shape it turns out to be.

The Navigation Panel also serves as a map of an individual user's progress through the module. Visited squares are green, the current square is pink, making it easy for the user to see where they are and where they've been at a glance.

A third feature of the panel is that it is hyperlinked so that the user can jump from one section to another. This is not recommended the first time around as it could prove confusing, but it is a useful feature if the user wishes to review a section at a later stage. When the user moves the cursor over a square, a short description appears in the text box at the bottom of the panel.

## **Visual clues**

Another common complaint is that without the lecturer's verbal and visual clues, reading a graph can be difficult and this is certainly an important issue for both understanding and retention. Indeed, it's part of the 'job' of a lecturer to point out certain features in order to draw the students' attention to them. To overcome this problem, a variety of red arrows have been utilised. These arrows mimic the action of a lecturer's pointer and are animated to draw attention to salient features being described by the narration. Synchronisation is vital, and these sections run in 'real-time'.

Graphs can also be animated to show changes over time or how subdivided elements have been combined. We have taken the view that it is advantageous to show explanations in a number of ways, offering different routes into the information. Obviously, the more routes one offers, the more time-consuming the project becomes- a balance must be struck between catering for many different learning styles and the amount of time one can afford to spend on each small section of the project.

## **Future refinements**

Two modules - 'Society & social classification' and 'Social class & disease' are complete. The delivery date for the entire project is October 2000. It is anticipated that around 15 modules will be created to present the material and will cover subject areas such as 'Disease & ethnicity', 'Social aspects of mental illness', 'Family & social networks', 'Social aspects of reproduction', 'Sex, gender & health', 'Death & bereavement', 'Lay beliefs & stigma', 'The sick role', 'Illness behaviour', 'Doctor/patient relationship', 'Features of professions & professionalism', 'Ethics', and 'The social role of medicine'.

These modules will follow the same structure as the first two, complete with their own navigation panels. Once they are all complete, then a 'master' map of the entire project can be devised. This will form the front page and main entry point into the modules.

Accompanying lecture notes will be provided in Portable Document Format. This means that students will be able to print out the notes for themselves. These notes will be complementary to the modules and will not merely be a text version of the narrative. Where graphs are used in the module, these will be reproduced in the notes, serving as an aide-memoire. A glossary will also be provided for each module along with a bibliography.

An important and potentially powerful refinement would be to have the entire narration indexed and searchable by keyword. To achieve this, a text version of the audio narration will be stored in an online database. A simple search interface will allow the user to type in a keyword or phrase and the database will then return all instances of that word or phrase in the form of links directly to the relevant subsections of the modules.

## **Conclusion**

Interactive multimedia has the potential to inform, engage, enlighten and entertain. By using a computer as a medium in its own right, with its own aesthetics and vocabularies, we open up further these stimulating possibilities. Choosing the appropriate ways of presenting the information in order to improve learning outcomes is important and goes hand in glove with understanding the constraints of the medium and delivery system.

There exists a tension between educators and developers, based on mistrust and lack of commonality of

purpose. Lecturers' misgivings can be overcome by emphasis of the benefits of a sympathetic and integrated multimedia approach and the new insights that it can offer. The de/reconstruction process can be a positive experience, offering both lecturer and students a fresh perspective on the material, through the eyes of a new medium.

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## **Websites**

Photodisc photo library: <http://www.photodisc.com>

Interactive Medical Sociology online: <http://www.medgraphics.cam.ac.uk/medsoc/>

Portable Document Format: <http://www.adobe.com/products/acrobat/adobepdf.html>

Shockwave plug-in: <http://www.macromedia.com/shockwave/download/>

QuickTime plug-in: <http://www.quicktime.com/>