

Hathaway on CD: An Interactive Multimedia Case Study of a School

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Abstract

This paper describes the background and rationale for developing an interactive multimedia case study of a primary school for use by off campus teacher education students. Issues related to developing our own expertise, resource limitations and project management will be examined. Both the content of the Hathaway on CD and the tools for working with this content will be described and demonstrated. The paper concludes by pointing to future work and reflecting on lessons learnt.

Keywords

hypermedia, multimedia, CD-ROM, case study, flexible learning, development

1. Background

Since 1993, when I completed a PhD looking at educational uses of hypermedia systems, I have worked towards building a capacity to effectively create and use hypermedia systems at Deakin University. This became a more realisable goal earlier this year with my appointment to a Course Development Centre position focusing on the design and use of interactive multimedia environments within Deakin University.

In 1994 we received a (very) small amount of funding to produce a CD-ROM version of a case study used in the off campus Faculty of Education unit, "Changing Classrooms". The Hathaway case record provides students with access to a large amount of information on a Sydney primary school together with a number of tasks requiring students to read, analyse and synthesise the case record. The existing materials are distributed as about 100 pages of paper-based text, drawings, photographs and a 45 minute video tape and are used in a large course of around 300 students at the BEd level. The case record has been a central part of the Changing Classrooms unit for a number of years and several evaluations have shown it to be an effective pedagogical tool (Altrichter, Evans and Morgan, 1991; Saville, 1993). *Hathaway on CD* is currently under development and will be the first media and information-rich CD produced and designed within Deakin for teaching use. The CD-ROM will be used in different ways in BA, BEd, MEd and EdD / PhD courses and for some short training programs.

2. Reasons for choosing IMM for this project

The main objectives for producing an interactive multi-media (IMM) case study were to:

- produce materials which would be useful in the Changing Classrooms unit;

- provide the catalyst for developing our skills in the design, production and use of IMM resources; and
- provide a model for the production and use of similar resources in the future.

The *Hathaway on CD* project is based on literature from a number of fields including the efficacy of the case study as a pedagogical tool, the value of using IMM titles for supporting student learning and the need to develop flexible learning environments.

2.1. Use of case studies in educational settings

Case studies have long been used as an educational methodology in many disciplines (Curtis and Gluck, 1993). Typical use involves presenting the study and requiring students to analyse the information or make recommendations for actions. One of the strengths of instructional case studies is the presentation of complex “real life” situations where there are multiple perspectives and truths. Cases often contain masses of data which must be sifted and analysed to uncover critical issues, thus students must come to terms with the complex connections between events and information.

The strengths of the case study method also present a problem. While the case study is by necessity a simplification of the real world situation, it is important that there is enough contextualising information to emulate the richness and complexity of reality (Stenhouse, 1978). The presentation of the case study in a linear, paper-based format, often results in further simplification and loss of realism. It is not only the author of the case study who is faced with difficulties; the student is often faced with a heavy reading load and the prospect of becoming overwhelmed with the mass of data involved in a long paper-based case study. IMM provides an ideal environment for presenting the depth and richness of the case study without overwhelming students. In addition, it is possible to develop a very detailed case record, which can be used several times to examine from different issues.

The Hathaway case study seemed an ideal project for an IMM title. We had a vast amount of highly interconnected heterogeneous data. Also the need to simplify and “shoehorn” the case record into a 45 minute video tape (over 10 hours of raw video was collected) and the 100 pages of paper had imposed a severe reductive bias on the existing materials. Thus, the added complexity, size, heterogeneity and interconnectedness of a CD-ROM based case study would more closely emulate the school environment school and the process of case study research.

2.2. Value of IMM educational environments

We are all familiar with the plethora of claims for the value of using IMM environments in educational settings. While many of the current claims are based on intuition and gut reactions, there is a core of research which can be used to support the value of IMM in educational settings.

A large body of research highlighting the importance of students recognising the context bound nature of knowledge (Allinson and Hamond, 1990). The interconnected node and link structure of hypertext and IMM environments has been found to be an effective way to represent and communicate this interconnectedness (Jones, 1990; Spiro and Jehng, 1990).

As well, studies have shown that readers of hypertext documents tend to be more self-directed and active when compared to readers of linear documents (Jonassen, 1991; Kinzie and Berdel, 1990; Landow, 1989). While the majority of these studies have examined student use of hypertexts which have been written by others, several suggest that students will similarly benefit from the ability to annotate and add information to the hypertext. Horton (1990) recommends that all hypertext systems allow the reader to add new nodes and annotations, and Evans (1993) highlights the importance of providing students with tools to allow them to

comment on existing information. In addition to allowing people to add to the hypertext, the literature on computer supported collaborative work, suggests that there will be great value in providing environments which encourage many students to interlink ideas in a multiuser environment (Harasim, 1990).

The *Hathaway on CD* project is based on the assumption that changing the environments in which students work can limit or expand their capacity to learn. Spiro and Jehng (1990) claim that different media impose a “reductive bias” on the content. This effect was first encountered in the Changing Classrooms unit when we moved to using video, for while video captures, better than text, the interactive complexity of the classroom, paradoxically, it can also relegate the student to a more passive role. IMM offers a range of information formats, preserves some of the simultaneity of “real” schools and places the student in a role that demands active participation.

2.3. Emphasis on flexible delivery through information technologies

There is a general trend towards “flexible” means of delivering educational programs. Ten years ago these initiatives would have been developed under the guise of “distance education” or “correspondence” and would have focused on educational provision for people in remote areas. With the merging of educational institutions, course rationalisations and the merging of “on”, “off” and “cross” campus delivery, all educators are looking for ways to provide flexible and cost effective educational opportunities. Life-long learning, restructuring, and the pace of change also mean that students living close to educational outlets choose to study using flexible delivery because of time, work, family commitments.

The development of new course materials is also influenced by the increasing possibilities offered by information technologies. In the last two years, access to CD-ROM related products has dramatically improved. Until now, except in specialised courses, it was not realistic for distance educators to assume that a student has access to CD-ROM technology. However, a recent Government statement suggested one million CD-ROM units will be available in Australia in the next three years (Commerce in content, 1994) and another survey estimated CD-ROM capability is available in 40% of primary schools and that this figure is rising steeply (Creative Nation, 1994).

3. Research and development issues

3.1. Skills development

While significant in its own right we also wanted this project to have a long term impact on staff development and the culture of the university. Thus we worked hard to get a broad base of people participating in the project. In addition, the development and use of IMM demands a closer integration of the work of course development teams and academic staff and requires a rethink of the “service provider” role to which media specialists are often assigned.

3.2. Stretching the dollar

The cost of developing a commercial quality CD-ROM is estimated at between \$100,000 and \$300,000 (Commerce in Content, 1994). We were painfully aware that we did not have the resources (money, hardware, or people expertise) to approach the production the way that commercial operators might. However, we did set out to develop a fast, reliable, inter-linked package, which featured an intuitive and aesthetically pleasing graphic interface, and a range of helpful tools to assist users of the CD-ROM. We also had the benefit of access to existing materials which included a considerable amount of quality video footage. Thus overall, our outlay for content was kept to a minimum. The resulting title is not a flashy consumer orientated product, but rather an information and media rich, user friendly, learning resource.

We focused on creating a flexible shell or template which can be reused in other IMM projects. While IMM opens design doors and possibilities, it is important to set boundaries and develop ways of capitalising on earlier efforts and learnings. This approach means that the time and resources involved in this project will be used in future projects.

3.3. People power

The Hathaway Project involves individuals working in the following roles:

- video and audio producers, graphic artists and editors creating and processing individual media elements;
- a multimedia producer who integrates these elements into a usable title;
- a specialist in the use of multimedia who designs and researches the functionality of the IMM title; and
- independent, formative evaluators.

Also involved are academics familiar with the content of the case record and the types of educational goals and experiences we want to create. Their roles include:

- segmenting the current case record into nodes of information;
- creating thematic links between these nodes of information;
- organising and indexing nodes of information;
- collecting or generating “missing” nodes;
- writing interpretive materials and creating thematic links through the database; and
- developing novel unit tasks and flexible assessment profiles appropriate to the needs of students, unit requirements and the unique learning environment of *Hathaway on CD*.

Finding ways of working together took time. At first discussion would frequently circle around and around the same issues. One of the problems seemed to be that, while we all came to the project with different kinds of expertise, it was difficult to see what we each should be doing. We agreed that the project should be driven by content rather than technology, but finding ways of actually working on the content was not easy. Some looked for direction in the management of the process, some wanted a defined set of course objectives and found the aims / process orientation of the academics difficult to grasp.

3.4. Making it happen

With time we found that a number of productive starting points did emerge. These included:

- taking small sections of the material and creating on-screen “mock-ups”;
- following-up technical and other problems by creating small demonstrations (these included the choice of software platform, copyright and other legal issues, video-digitising problems);
- developing an overall “concept” map which did not separate different forms of data but attempted to link themes and ideas; and

- looking at other multimedia products from a wide variety of sources, including reference discs, games, simulations and entertainment discs.

When embarking on a project of this nature it is essential to have a structure that allows people to work to their strengths, to achieve their personal goals and to ensure that these are in concert with project and institutional goals. Like many team based projects, the process is important, and because you are involved the time consuming activity of breaking new ground, you need to elicit a high level of institutional support for your work.

4. Hathaway on CD

In designing *Hathaway on CD* our goal was to develop an IMM environment that combined the educational elements listed below (many of which have been well-tested in conventional formats), using multiple interlinked representations in different media and focussing on outcomes in the form of specific writing tasks. The Hathaway CD provides its users with access to extensive multimedia information. Some of this information is directly concerned with teaching and curriculum issues, some relates to the Hathaway community (an inner-city area with a large migrant population), and some concerns the effects on the school of the policies and practices of DEET and the NSW Department of School Education.

In the process of creating *Hathaway on CD* we included some information which was not available in the original Changing Classrooms materials. Also additional, new information was included such as news clippings and video footage on a recent fire which destroyed the school. We estimate that the CD-ROM contains the following amount of information:

- about 300 pages of text, drawings and images;
- approximately one hour of video (some of which is down-sampled to audio and one frame per second video); and
- around one hour of audio material.

Hathaway on CD offers information on children, teachers, parents and the wider community who are involved with, or located near, Hathaway School. To give an indication of the breadth and type of material involved, the following list summarises some of the content.

- Community information includes items such as graphical mappings of demographic data in Sydney, e.g. population density, language background, nationality, and income levels.
- Maps of the local area and plans of the school contain many clickable points linked to video footage from that point and “walk” users through the area. An interview with the architect gives information on the conceptual design and culture of the school.
- Examples of lesson plans, handout material for lessons, children’s class work, and video footage of learning activities are provided. Notices to parents, copies of the school newspaper, information posted on notice boards around the school etc. are also stored.
- Video clips of interviews with teachers, planning meetings, classes in action, and children talking about themselves and the school etc. and interlinked transcripts.
- Overviews of the school history, curriculum materials, copies of policy and procedure documents and interviews with teachers on the particular challenges of working in an open-plan environment are also provided.
- For Changing Classrooms students a section describes unit tasks, and assessment.

5. Tools for working with the information

Based on previous research (Evans, 1993) I suggest that the educational outcomes of using an IMM package depends on the interaction between features of:

- the content of the package and the way the content is represented;
- the tools included in the package for working with the information;
- features of the users; and
- the tasks users are assigned.

Hathaway on CD contains a range of tools designed to assist users in their information seeking, navigation around the database, and extraction and synthesis of information.

5.1. Tools for navigating and moving

Navigation tools include page and section selection buttons, next and previous buttons and history and retrace steps options. Primary concerns in the design of the tools were speedy response times and intuitive use.

5.2. Tools for finding information

Broadly speaking electronic environments provide two different styles of tools for people to find information—query based searching and browsing.

Browsing type tools emphasise quick presentation of and movement between information and allow the user to select what is relevant to them. These systems often use point and click type interfaces and the user navigates around the data base following thematic links. Bates (1989) has likened this style of information search to a opportunistic and serendipitous walk through a forest by labelling it a “berry-picking” search. In contrast, a query based search system allows the user to enter a search query which is processed and returns a list of all relevant locations. The search engine might use an indexing language and index terms or a full text search of the database.

Each of these search methods has advantages and disadvantages which depend on characteristics of the user, the task they are doing and the underlying information. For example, while users find it much easier to recognise information when it is displayed (browsing) rather than specify it on a blank query screen, query based searching allows the user to see all relevant locations and then select their own starting point. In contrast, in a browse search, the user might find all the relevant locations in one part of the database but may not look in another part of the database.

In the light of the advantages and disadvantages of different information search systems, *Hathaway on CD* provides both methods and allows the user to select the one that is most relevant to them and to the task at hand.

5.3. Tools for recognising and understanding information

Once information is displayed the user has to understand it and recognise its relevance before it can be used. Electronic environments can provide many tools for doing this including:

- using multiple interlinked representations of information;
- highlighting relevant parts of the data;

- providing links to related information; and
- providing interpretations of the information.

Hathaway on CD provides all of these tools and presents information using a range of symbol systems (text, images, video and sound). This is important because certain information can be better represented using different symbols, e.g. some images are worth much more than a thousand words. An example of this in the Hathaway context is the video news footage of the fire that destroyed the Hathaway School.

As Spiro and Jehng (1990) have noted, exclusive use of a single media type or format imposes a “reductive bias” on the complexity of the information which can be represented, e.g. books and video must be ordered in a linear sequence, and usually video and audio do not encourage browsing or random access to the materials. Thus, the message must be simplified to fit within the constraints imposed by the medium. IMM environments allow the use of multiple interlinked representations using different symbol systems (text, graphic, sound, video, animation) and can communicate information with a richness and in ways not previously possible. For example, within *Hathaway on CD*, the video based interviews are linked to a text transcript that runs simultaneously. The user can go to various parts of the video or the transcript by manipulating advance or rewind buttons on either. This design feature has also enable the use of query based searches of video material as well as text based information.

People differ in their ability to understand and use different symbol systems, e.g. some people prefer to have a text description of how to get to a location while others prefer a map. The real advantage of multimedia systems is that they can provide multiple representations using different symbol systems and allow users to select the representations that are of most use to them for the task they are undertaking. This has been a primary design focus in the organisation of the Hathaway materials e.g. maps and floorplans of the school buildings are complemented with video walkthroughs and still photos of various aspects of the building. Likewise material relating to specific educational activities of teachers and pupils in the school is accessed through multiple sources which may include written lesson plans, videos of planning sessions among teachers, video footage of lessons, interviews (including text based transcripts) with teachers and children, representations of work completed by children, copies of letters to parents describing the learning activities, and still photographs of related art and craft displays and exhibitions etc. Not only does this give the user a choice of relevant information sources, but it adds a rich, contextualising, multi-layered dimension to the materials which reflect the complexity of school life.

5.4. Tools for collecting, using and understanding information

If hypermedia technologies are powerful tools for presenting and organising information then end users as well as developers must have access to tools that enable them to use, link, and organise relevant information. While many interactive multimedia systems offer powerful tools to the author for representing information (e.g. link creation and annotations), they offer few similar tools to the user. In the worst case the user is forced to print relevant information on paper or perhaps cut and paste it into a document using a word processor. Once the information is removed from the interlinked IMM environment it loses much value. Tools for collecting information in *Hathaway on CD* include automatic histories, annotated bookmarks, and research notes.

Some claim that hypermedia offers a constructivist environment because it allows the reader to access information by following thematic links based on their own needs. But if these links have been created by other people then the user is greatly restricted. Thus we need to give users tools to use hypermedia in ways not imagined by the developers (e.g. general purpose search tools) and allow them to create their own links which others can follow. Users of *Hathaway on CD* will create links and record their learnings and observations in a research book stored on

their own floppy or hard disk. Students will prepare assignments or annotated pathways through the CD-ROM based case study and submit them via floppy disk or email. If the person reading the assignment clicked on any embedded link the appropriate part of the case record would be displayed and the students interpretations could be verified by looking at the surrounding information. Assignments could also be prepared using any wordprocessor as long as the numeric pointer was not changed the annotated location would be displayed.

6. Expected outcomes for users

We expect students who use *Hathaway on CD* to have:

- increased levels of self-direction and learner control;
- a better understanding of individual information elements through the use of multiple interlinked plans, video walk throughs, still images and textual descriptions;
- improved access to thematic connections created by the unit team and understanding of the relations across the entire database;
- a better environment for exploring their own thematic questions through the data base using the word search and powerful indexing language built into the system;
- tools to assist them to maintain orientation and to deal with the complexity of the information. One such tool will be an automatically constructed history log within which the user can annotate useful locations to return to in future;
- assistance to synthesise and organise relevant information by allowing them to construct their own documents which point to the underlying CD;
- opportunities to work collaboratively by distributing partial results and to comment and annotate with others work; and
- access to an archive of exemplary student work which will be distributed on floppy disk.

7. Where to from here and what have we learnt?

The next steps in the Hathaway project will include more usability testing and educational outcomes testing in which students will work through sample tasks. Other priorities are to make tools for entering information more robust, expand some content areas, and add several guided tours of the material. We would also like to begin thinking about other projects and opportunities to use the Hathaway design shell in other content areas.

While we are still in the development stage of the Hathaway Project some things are already clear. These insights may assist others embarking on similar projects, and are listed here as closing comments and food for thought.

Producing a multi-media product is organisationally complex. It is important that roles and responsibilities are well defined but because people are developing their own skills it is also important that there are opportunities to redefine these roles. Also roles and responsibilities which might have been unrelated before now become connected. Some degree of frustration and backtracking are to be expected.

We were able to get approval for this project because the task was seen as one of reconfiguring existing materials rather than starting from scratch. However, we soon ran into gaps requiring

additional information. Also the IMM format allowed us to see issues, connections and contradictions which were previously hidden under the weight of the paper based case record.

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