

HIV Hypermedia Project: Evaluation and Update

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Abstract

The HIV Hypermedia Medical Education Software was first released in late 1993 and distributed to medical schools, general practitioners and other health-care related individuals and institutions. Evaluation took place throughout the design and development process. There were four major forms of eliciting user feedback: informal discussions during development; informal discussions with users of the finished package; expert review of the completed package; and a voluntary questionnaire. Despite a poor response rate, the questionnaire revealed valuable information and indicated that most users would continue to reference the program. We incorporated this feedback into an updated version of the package, now ready for release. This paper is a review of our evaluation process with our further aim being to improve the evaluation methods themselves.

Keywords

CAL, hypermedia, evaluation, methodologies, HIV

1. Introduction

The HIV Hypermedia Medical Education Software is a hypermedia educational package containing extensive information on the care and treatment of HIV / AIDS. It is used by clinicians and clinical students as an aid and a reference. Development began in 1991; the package was distributed in late 1993; and a second release is now due in 1995.

Four years ago hypermedia, interactive multimedia and computer assisted learning (CAL) were considered 'cutting edge' innovations. The HIV Hypermedia project began just as Windows was becoming a common desktop environment. Today CD-ROM encyclopedias outsell equivalent paper texts (Nielson, 1995) and most primary, secondary and tertiary students encounter computer assisted learning (CAL) as part of their daily routine. The exponential growth of the World Wide Web (WWW), a hypermedia system on the Internet, has helped ensure that hypermedia is an accepted, pervasive and fashionable medium.

Popular enthusiasm for the new media may outweigh actual benefit. For example, Monash Medical Informatics (MMI) has participated in a pilot study of doctors using the Internet. Most doctors reported an initial burst of enthusiasm for the hypermedia WWW followed by the acknowledgement that email was the major on-going usage of the new technology. Hype alone will not guarantee the continuing use of electronic resources. Authors and educators must make informed decisions to ensure that programs are appropriate. Evaluation is mandatory to ensure that CAL is actually 'assisting' learning. This paper outlines our experiences in evaluating and updating the HIV Hypermedia software.

2. Hypermedia: Evaluation Issues

Hypermedia development involves a number of issues that are necessary background to this paper. In essence, hypertext is simply 'non-sequential writing' (Nelson, 1967). (In 1995, Nielson began to use terms 'hypertext' and 'hypermedia' interchangeably (Neilson, 1995) and we will follow his convention.)

So what is special about hypermedia? Marchioni and Shneiderman wrote in 1988:

'Hypertext systems ... encourage informal, personalized, context-oriented information-seeking strategies' (p.71).

No study formally quantifies this opinion. Hypertext is supposed to increase 'user control' of the learning environment although some believe that many hypertext systems do not do this (Schwier, 1993). Some studies such as the Intermedia experiences of Ess (1991) and Landow (1989), do indicate an improved learning experience. The whole debate over the value of hypermedia creates problems for evaluation, as the learning benefits of the media are somewhat unclear.

One of the most demonstrated difficulties with hypermedia is the 'lost in hyperspace' phenomenon (Nielson, 1990). This occurs when users become confused about their context within the information. This disorientation may be the result of users' normal cognitive resources becoming overloaded (Wright, 1991). Any hypermedia developer must combat this problem by providing adequate navigation tools, a supportive content structure and a user-friendly interface. Evaluation of any hypermedia project must investigate disorientation, however, as Wright (1991) remarks:

'The cognitive complexity of hypertexts increases the importance of evaluation, but also makes it less straightforward' (p. 1).

3. The HIV Hypermedia Medical Education Software Version 1

It is necessary to describe the original HIV Hypermedia Medical Education software before discussing its evaluation. This educational CAL package was designed as a self contained resource or reference rather than an integrated part of an existing course of study. The 'stand-alone' format fulfils a specific need for continuing clinical education in the health-care sector. The program runs on IBM compatible personal computers, preferably a 486 with 4 Megabytes of RAM, running a Microsoft Windows platform. The software is authored in Multimedia Toolbook 1.53 (Asymetrix).

The package was intended for a wide cross section of the health care community. Its aims are general rather than specific. The stated objectives are (Bearman, Kidd and Cesnik, 1993):

- (1) to teach the basic concepts of management of HIV / AIDS;
- (2) to reinforce that HIV is not just a virus or a medical condition but has a range of social implications;
- (3) to encourage those with a basic knowledge of the area to further their understanding of the disease process; and
- (4) to provide a practical information resource for practising doctors and health care workers.

In response to these objectives, the package was designed to consist of three different modes of education. The first section is a reference 'book', created in hypermedia format. The 'book' is richly linked, contains scanned images, animation and large quantities of textual information. The second section comprises a small number of patient management tutorials with multiple choice questions.

These tutorials have hypermedia links to the reference ‘book’ allowing users to maintain a linear flow but also utilising some of the advantages of hypermedia. The third section contains ‘page turners’ that describe the fundamentals of prevention and management of, and education about, HIV. These tutorials are not in hypermedia format, as their content contains didactic ‘messages’ that should be viewed in a linear fashion.

The hypermedia reference book utilises a number of devices to assist in navigating the information. First, consultation with HIV experts resulted in the package being structured in a clear and logical fashion, using a metaphor of a medical textbook. Another device is the presence of context dependent maps, to assist orientation. These show the user graphically where they are within the hierarchy, but do not indicate what information the user has already seen. Finally, an index overview is available, so that the users can rapidly scan topic headings.

4. Evaluation in Design and Development Phases

Some time after the release of the HIV Hypermedia Software, we encountered the concept of the ‘integrative evaluation’ approach, proposed by Hedberg and Alexander (1994). While we never used the word ‘evaluation’ in the design and development phases, clearly this was what we were doing. Input from experts and users was considered integral to the design and development processes. Hedberg and Alexander’s approach to design and development is partially listed, with some minor alterations, in Tables 1 and 2, alongside a discussion of our utilisation of evaluation methods.

Activities	Information	Methods	Utilisation of the method?
<i>Design</i>	<i>Analyse needs in order to provide information for planning.</i>	<i>Interviews with experienced teachers.</i>	Yes. Content was based on experienced and expert teachers.
		<i>Review of literature - teaching on subject.</i>	Yes.
		<i>Review of assessment tasks.</i>	No. Package was not intended to be part of an assessment regime.
		<i>Review of learners, learning context, both technological and non-technological learning strategies.</i>	Yes.
	<i>Formative evaluation in order to make informed decisions with respect to design of program.</i>	<i>Review of literature - student learning.</i>	Yes. Literature was reviewed primarily with respect to learning in technology - as the medium was fixed, this was appropriate.
		<i>Rapid prototyping / storyboarding with experts & users.</i>	Yes. A package overview was created in association with content experts. Prototyping was used, but was not that rapid.

Table 1. Evaluation Methods in Design Phase, italics based on Hedberg and Alexander (1994)

Activities	Information	Methods	Utilisation of the method?
<i>Develop</i>	<i>Formative evaluation in order to make informed decisions with respect to the development of the program.</i>	<i>Observation via video, interviews etc of users / experts.</i>	Yes. This was not formalised, but observation of users and experts took place.
		<i>Stimulated recall, think aloud as using, critical incidents.</i>	No.
		<i>Peer review.</i>	Yes.

Table 2. Evaluation Methods in Development, italics based on Hedberg and Alexander (1994)

In retrospect, the strength of our evaluations rests in the design process, as the development phases had a lack of formalised measures. Informal observation of users and experts was useful, and certainly altered the development in an on-going fashion, but did not give the quality assurance provided by definitive evaluations. The major omission in our development cycle was the lack of *stimulated recall, think aloud as using, critical incidents* - where the user expresses their experiences in a free form manner. According to Hedberg and Alexander (1994), the specific question answered by information collected through this method is: '*What and how are students learning? (Using this program)*'. In other words, these methods evaluate the learning process. This is of particular importance to hypermedia developers, as there is some uncertainty over hypermedia being a valuable educational tool.

5. Evaluation of the package in use.

More formalised methods were employed upon distribution of the package, providing concrete feedback as illustrated in Table 3.

<i>Activities</i>	<i>Information</i>	<i>Methods</i>	<i>Utilisation of method?</i>
<i>Teach</i>	<i>Summative evaluation in order to determine the worth of the program in context of its use.</i>	<i>Pre & post tests, questionnaires, interviews.</i>	Yes. A voluntary questionnaire was distributed. Informal discussions with users.
		<i>Expert / peer review.</i>	Yes. Extensive

Table 3. Evaluation Methods (Teaching), italics based on Hedberg and Alexander (1994)

The questionnaire mentioned in Table 3 returned measured feedback from clinicians and medical students using the package. Response was voluntary, which resulted in a poor return rate. Approximately 115 copies of the software were distributed but only 11 of the questionnaires were returned. This is around 10% of the user population. Such a poor response rate severely diminishes the significance of the questionnaire but the feedback was still highly useful.

The questionnaire had a fairly standard design. It asked some general user details, elicited some information about the context of use and then asked fourteen questions, to which the user could strongly agree, agree, disagree, strongly disagree or give no comment. The nature of these questions are listed in Table 4. There was also provision for the user to leave general comments.

Question related to:	No of questions
Content	3
Presentation of content	3
Navigation	5
Use of technology	2
On-going use	1

Table 4. Topics covered by the questionnaire

Hedberg and Alexander (1994) propose that 'pre & post tests, questionnaires and interviews provide answers to the question: What changes in understanding have students undergone as a result of using the ... program in this context?' The HIV Software questionnaire raises questions of learning process as well as learning outcomes - thus the emphasis on navigation. This is not inappropriate for hypermedia projects, as there are still many unknown factors in the real use of the medium. However an emphasis on learning process during development perhaps would lessen the need for further information gathering.

The returned questionnaires contained, in general, very positive responses to the program. Nine out of the eleven respondents indicated that they would use the package again as a general source of reference, and of the other two, one was running the program on an inappropriate hardware platform. Most users were very happy with content, presentation of content and use of technology. In general, people felt that the content was both interesting and informative.

There were definite indications that people were getting 'lost in hyperspace'. While the maps were seen as a useful and usable way of navigation, five out of the eleven agreed that it was easy to become disoriented (although five people disagreed, and one person strongly disagreed with this statement). This point was emphasised by some comments, such as:

'navigation system could be better'

'include a search facility, a bookmark facility ...'

Even making allowances for a small sample size, we believe that these comments defined an area that required more work, although it was difficult to ascertain the precise reasons for disorientation. We felt that the issue of 'cognitive overloads' should be investigated further, to try and ascertain if the balance between information gain and navigation effort has been achieved. It may be that some people will always find hyperspace disorienting.

Users made a range of other comments. There were several requests for more patient management problems, as well as complaints about speed, typographic mistakes, poor image quality and so on. Issues such as speed and image quality relate more to the user hardware / software setup than the software itself. There were also a number of very positive remarks such as:

'thoroughly enjoyed'

'liked the concise nature of material'

'provides useful information'

'.. cases - are an excellent way to learn'

In addition to the questionnaire, the software was distributed free of charge to a number of leading HIV experts for evaluation. Their response was enthusiastic but they also provided valuable critiques of the content. Once funding for the update became certain, the entire information content of the package, as well as the package itself, was sent to one of the original contributors for comprehensive review. He defined a number of omissions in the package, particularly relating to new approaches to HIV. This was incredibly valuable feedback. It is worth noting that there is a variation of opinion between experts in the area of HIV management, and we had to balance expert opinions against each other.

6. Updating: a chance to respond to evaluation

The rapidly changing nature of HIV treatment and medicine makes updating HIV / AIDS teaching materials mandatory. Fortunately, our granting body, the Commonwealth Department of Human Services and Health, recognises this and has funded an updated version of the HIV Hypermedia Medical Education Software. Additionally, we used this opportunity to resolve some of the problems identified by evaluation. This was a considerable amount of work. We needed both to replace outdated information and fix the identified inadequacies of Version 1.0. In the end, the content was increased by 20% and the whole package needed to be restructured in response to the revised content.

It was impossible to incorporate all feedback into Version 2.0, nor was it deemed appropriate. CAL design generally requires balancing the advantages, disadvantages and implementation difficulties of various features against each other. We decided to concentrate on three major areas, as defined by users, HIV / AIDS authorities, CAL designers and our own expertise. These were:

- (1) *New content area.* The management of HIV / AIDS has developed a large prophylactic component, whereby preventative methods are used to pre-empt possible illness. This recent approach to HIV medicine needed to be included in the package.
- (2) *Increased number of tutorials.* Version 1.0 contained only two patient management problems. This small number of tutorials was an obvious deficiency which was noticed by users.
- (3) *Additional navigation tools.* Disorientation had been identified by users. Experts and users had suggested additional navigation features. It was obvious through our own interactions that it sometimes was difficult to find an answer to a particular questions.

The addition of new content did not pose any major problems aside from some changes to the overall structure of the package. It was very simple to develop more patient management problems particularly as the process of peer review inspired some HIV experts to provide us with appropriate material. The new version contains five new patient management tutorials. Finding a solution to the navigation problem was less straightforward. We took three approaches.

- (1) A restructuring of the hierarchy, reducing oversized sections and removing any inconsistent or irrational divisions. The overall perception of the book remains essentially the same, but some particularly illogical structures were removed.
- (2) A free-text searching system was incorporated into the package, and was made possible by the release of Multimedia Toolbook 3.0a (Asymetrix). This allows searching across the entire package, not just the reference book, as some information is 'hidden' in tutorials.
- (3) A history mechanism was placed on the maps. It is hoped that this will allay disorientation by providing a user context. Other navigation mechanisms were primarily directed toward the structural context.

These last two features may not improve the problems of user confusion. Wright (1991) states

‘cognitive costs and cognitive benefits must be considered together’ (p. 3)

and the addition of a free-text searching system and a history mechanism may provide more confusion than clarity. This remains an issue for on-going evaluation.

The interface was also updated and reviewed, as a few small critiques had been made. In the overall process we tried to retain as much consistency between versions as possible.

Version 2.0 is almost complete. We are currently waiting for clearance from the Department of Health and Human Services before we can finalise and distribute the package.

7. On-going evaluation

We are now undergoing a process of reviewing our evaluation methods. It is easy to see problems in hindsight and some changes in approach are evident. First, we need to have more concrete feedback on learning outcomes. This is important, because although the users say that content was interesting and informative, there is no definitive evidence that it is useful to their clinical work. Second, we need to find out more about the learning process, in particular the use of links, navigation tools and various

tutorials to assist understanding. There is an opportunity for this to be conducted before the release of the package, while waiting for government clearance. Formalised observations of users, both while using the package, and while speaking their thoughts aloud should be implemented at this stage. This will provide a much greater insight into some of the questions relating to the hypermedia format. Finally, we have to determine the size of the user disorientation problem, and whether it is something that we can solve. In the process of looking at disorientation, we need to determine which navigation tools are being used and in what manner. The problems of hypermedia navigation cannot be resolved overnight, but this should not deter further investigations.

There is a need to revise our method of post-distribution data-collection. It is difficult to overcome the problem of poor response rate to the questionnaire. It may be necessary to pursue actively users who indicate their willingness to participate in a survey.

We should also consider evaluating long term use of the package. Much of the feedback was received after a few days use. It is important to discover if individuals continue to use the package as a reference, and how their interactions vary from those of novice users.

8. Conclusions

Evaluating the HIV Hypermedia Medical Education Software was a useful and positive process. Our survey indicates that users of Version 1.0 were generally pleased with the package. The use of evaluation methods in the design and development phases were integral to this success.

After distribution, users and experts provided feedback on the usefulness of the work. This gave us some general guidelines for improvement. The major problem with this phase of evaluation was the poor response rate to the questionnaire. In hindsight, evaluation was probably not given the priority that it deserved and this has diminished our ability to make informed judgements about improvements to the package. This is particularly true in the area of hypermedia, where the literature is unclear about the purpose and value of the delivery mode.

The on-going nature of this project allows for evaluation of the evaluation methods. This is a good opportunity to modify and improve our evaluation techniques, both during development and distribution. Possible improvements include: the formalised observations of users to ensure valid data; the provision of incentives to users to participate in feedback; the focussing of the survey design on learning processes and outcomes.

Updating the package was more work than anticipated, but has given good results. We believe that Version 2.0 is a better piece of educational software, both in terms of content and instructional design. The next series of evaluations will tell us if this is true.

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