

The Design of Web-Based Hypermedia Courseware in Higher Education

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Abstract

This paper is concerned with the research, development and evaluation of two Web-based hypermedia courseware applications in higher education and presents some overall conclusions. The evaluation results indicated that the Web can support effectively the delivery of HE modules and can provide a valuable learning experience.

Keywords: *Instructional Design, Educational Hypermedia*

1. INTRODUCTION

Recent developments in Information and Communication Technology systems offer new capabilities for the delivery of instruction throughout all educational settings. At the moment universities are exploring ways of providing flexible learning systems that will meet the ever-increasing demands of a complex and diverse student group. Moreover, in cases where the number of students have increased dramatically without an analogous increase in teaching staff, or in cases where universities in different countries are offering collaborative degrees, the employment of modern technology for teaching and learning is seen as the only way to maintain and promote the quality of the instruction.

2. WEB-BASED COURSEWARE IN HE

Courseware is a relatively recent appellation for Computer Based Learning, which refers to the use of computers for the delivery of instruction in an interactive mode. Cognitive conceptions that derive from modern learning theories, stress that learning is an active, constructive, cumulative, self-regulated process in which the learner plays a critical role [1]. Current discussions concerning effective learning in higher education emphasise that techniques associated with active and flexible learning should be used to help students achieve the goals of higher education. Active learning is the term used to emphasise the importance of ensuring that students engage actively in the learning process, rather than passively accept the work as a component of course requirements. The term flexible learning promotes a shift from formal whole-class didactic teaching towards individual or the group management of learning through the provision by the teacher of structured resource materials [2].

There has been a lot of interest, recently, in hypermedia-based courseware that uses the Web as a delivery platform. Web-based hypermedia courseware is being introduced to education at an accelerating rate supported by major national and European Government funding. This is because the Web inherits all the characteristics of hypermedia systems that make them attractive for teaching and learning. These are their ability: to integrate varied formats and voluminous amounts of information; to be enabling rather than directive systems; and to facilitate

interactions among people and machines as well as among groups of people [3]. In addition, the Web can integrate all existing media in a digital hypermedia format; it can provide the technology for synchronous and asynchronous communication between teachers and learners irrespective of time and location; it can be a content provider as it is the largest and more diverse information resource in the world today; and above all it is cross-platform. The fact that Web-based educational hypermedia can hold considerable promise as a revolutionary way to enhance learning, does not guarantee its success as an educational tool, however.

One of the most commonly cited problems with educational hypermedia is related to the design and structure of the educational material. The design of educational programs on the market is often ineffective from an educational standpoint, thus hypermedia programs do not satisfy the claims or potential of hypermedia [4], [5], [6]. It appears that Web-based instructional authors have not had access to an instructional model, which has been empirically tested, because most of the studies in this area are exploratory since this medium is so new in education. However, there is a large body of knowledge in the field of instructional design from which one can draw suitable conclusions for the design process of Web-based educational hypermedia.

It is recommended that a precondition for effective Web-based courseware design in higher education is careful consideration of the traditional body of knowledge in the field of instructional design which should act as a foundation for future developments in the design process. This body of knowledge includes theories of instruction and courseware design factors that concern hypermedia structure, learner control, feedback, interactivity, and screen design elements. In addition, the end-users' input should be sought as it can confirm the above and enhance further our understanding towards the implementation of this new medium in higher education.

Based on this recommendation, a framework is proposed in terms of its design, user input and evaluation for the development of Web-based courseware in higher education aimed at supporting the delivery of physical modules. The following five stages describe the proposed framework.

- Stage 1 Review of the area of instructional design in order to identify design and development considerations potentially applicable to the development of Web-based courseware that aims to support the delivery of physical modules in higher education.
- Stage 2 Acquisition of end-users' input through a survey aimed at determining the users' preferences in terms of general Web-based educational design practices.

- Stage 3 Development of prototype courseware based on the results from Stages 1 and 2.
- Stage 4 Evaluation of prototype with end-users - Formative evaluation.
- Stage 5 Revision based on evaluation results from Stage 4.

It is suggested that a Web-based courseware developed according to the proposed framework could effectively support the delivery of physical modules by promoting learning and providing significant improvements in users' performance and satisfaction in higher education compared with conventional teaching methods.

The validity of this approach was tested through two empirical studies that were concerned with the summative evaluation of two Web-based courseware applications, which were developed according to the proposed framework on Interactive Digital Entertainment (IDE), for Level II, BA Honours Multimedia Design students at De Montfort University, U.K, and Programming and Software Engineering (PSE) for MSc students studying Computer Aided Engineering at De Montfort University (DMU) in collaboration with the Fachhochschule Bielefeld and PhD students in engineering field studying in Moscow's Buaman Technical University, Russia in collaboration with DMU, UK. The URLs for these two Web-based courseware applications are as follows:

IDE

<http://severn.dmu.ac.uk/~nick/STILE/IDE/main.HTM>

PSE

<http://www.cms.dmu.ac.uk/~elisa/STILE/CAE/main.html>

Since the evaluation of the empirical studies was intended to investigate both the users' performance and satisfaction with using the Web-based courseware a multi-faceted approach was employed. This approach was largely based upon a summative evaluation method suggested by Marchionini that addresses both the processes and the outcomes of learning [3].

3. CONCLUSION

The results from the evaluation of the two empirical studies indicated significant improvements in users' performance and satisfaction compared with conventional teaching methods. Thus, the proposed framework can indeed offer a solution for the development of Web-based courseware that aims to support the delivery of physical modules in higher education. In addition, the results indicate that the end-users input was very important for two main reasons. Firstly, it was a very significant 'ingredient' of the proposed framework, and secondly, it offered a set of empirically tested interface design guidelines for Web-based courseware that aims to support the delivery of physical modules as follows:

1. The structure of a Web-based courseware should be as clear and simple as possible and self-explanatory so that a student can use it without external help.
2. The effective use of a content map and sophisticated search facilities are important to avoid user disorientation and ensure rapid access to any piece of information. Thus,

the main navigation tools should always be on display to increase speed of use and save backtracking.

3. External links - those that refer to a document elsewhere in the Web and not within the study material - and communication channels should be opened in a second browser in order to enable students to still view the instructional application.
4. Graphical backgrounds within each Web-based lecture should be consistent, but different from other lecture's background to help students realise when a link is part of another lecture.
5. Links to further information at the end of Web-based lectures might be distracting for students because they will attempt to visit them and not concentrate fully on the main content of the lectures.
6. The effective use of communication channels has the potential to enhance the learning process and should always be included in Web-based courseware aiming to deliver distance learning.
7. At this stage of technological development complex graphics and video should be used sparingly because current bandwidth limitations results in unacceptable download times for multimedia rich elements which frustrate the learning process.

4. REFERENCES

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