

## ⑦ Instructional design issues in developing Web-based learning materials

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### Introduction

The World Wide Web is increasingly being used as a medium for delivering instructions in the teaching and learning processes. Khan (1997) defines Web-based instruction as follows:

Web-based instruction (WBI) is a hypermedia-based instructional program which utilises the attributes and resources of the World Wide Web to create a meaningful learning environment where learning is fostered and supported (p.6).

As a novel mode of learning, rather different from the conventional learning environments due to its hypertext/hypermedia-based structure, the Web allows a more flexible and an open teaching and learning approach, which a conventional learning environment was unable to provide. It generates novel learning strategies that promote knowledge construction by learners, rather than the conventional knowledge transmission by teachers to learners. Thus, the Web functions very well as a 'knowledge construction tool' or a 'cognitive tool' (Jonassen, 1996).

Instructional design becomes an important task in making Web-based teaching and learning effective and meaningful. The hypertext/hypermedia environment allows designers more flexibility and multi-dimensional ways of structuring instruction. However, designing and delivering instruction on the Web requires 'thoughtful analysis and investigation of how to use the Web's potential in concert with instructional design principles' (Ritchie & Hoffman, 1997, p.138). It has been argued that constructivist ID models that support knowledge construction by learners in meaningful learning contexts are more appropriate in a Web environment, than traditional objectivist ID models (McManus, 1996; Jonassen et al., 1997).

Instructional designers face the challenge of creating motivating, interesting as well as productive Web learning environments (Duchastel, 1997). Hypertext, delivery of multimedia and high interactivity are identified as three key features of a Web environment that are important to the designer (Starr, 1997). These can be effectively used to enhance conventional teaching and learning approaches.

## **The study**

A doctoral study was conducted at University of Wollongong to examine the design processes adopted by a group of Sri Lankan teacher educators to develop Web-based learning materials. The design patterns embedded in these Web sites were explored mainly by analysis of them using a checklist and having semi-structured interviews with the participants. In addition, participants' reflections, informal observations and informal discussions contributed in triangulation of data. Analysis focused on: Arrangement of information (learning strategy, structuring, navigation), Activities and feedback, Resources, Communication strategies and Presentation features observed in the Web sites.

## **Design patterns of the Web-based learning materials**

All Web sites had the following common basic components: An Overview/Introduction, Objectives, Topics/Sub topics, Activities, Feedback, Help, References/Resources. The learning strategy applied in most of the Web sites was to provide some information, give some questions as an activity, provide answers as feedback, and indicate some resources at the end to obtain further information.

Many Web sites (7) presented information mostly in large chunks and some small chunks, as descriptions to be read from the screen, similar to that from a book. Only two presented very brief information in point form and used activities to engage learners in finding out information and building up understandings by themselves. A majority of Web sites (9) had sequentially-arranged information with linear guidance which directed the learners page by page using forward arrows or links. Two Web sites had flexible environments where all the topics were at a similar level, and the learners could navigate to any section they desired to.

The most common purposes of Activities and Feedback used in the Web sites were to, "recall facts" or "apply the learnt facts" by asking questions and providing direct answers. Two Web sites provided activities for the learners to engage with and find more information on the topic, and one of these allowed the learners to build up their own learning through many group activities and only some guidelines were provided as feedback.

A number of Web sites (6) included a special resources page, where additional information on the topic or external Web links were provided. Three Web sites had many external Web sites linked as resources to find out additional information. Only one Web site had many external Web sites linked within each section, in order to facilitate learners to complete the activities.

A majority (10) indicated the instructors' e-mail addresses for users to communicate with them. Yet, there was only one instance where the learners were given the opportunity to interact with the instructor via a feedback form. Except for one Web site that provided an online discussion space for the learners to 'chat', none of the others facilitated any communication among the learners.

Some Web sites (4) had many different background colours and font colours to "motivate the learners", while some had a single background colour and a single font colour throughout, to keep it "academic." In many Web sites (8) images were used to indicate links, separate sections, to highlight points, or to make the Home page attractive. Yet, a few Web sites (4) had images to elaborate concepts. Some had a large number of animated images.

## **Discussion**

Most Web sites demonstrated a well-structured learning environment, where simplified content was provided to the learners through a linear sequence of events. This instructional approach reflected a 'top-down' approach of the instructor transmitting knowledge to passive learners. Thus, a majority of the Web sites indicated more features reflecting instructivist learning environments that support traditional objectivist ID models. Many Web sites demonstrated features of Gagné and Briggs' model, which is based upon behavioural and information-processing theories, and suggested a learning hierarchy and a linear approach to learning (Aronson and Briggs, 1983).

In many cases, neither the power of hypermedia to facilitate learners to take control of their own learning, nor the linking ability of the Web to external resources to encourage exploration by learners, have been adequately utilised. Hence, instead of using the Web-based instruction to reduce the dominance of text book and teacher and increase

learners' self-control in learning, most of these Web sites demonstrated a learning that was imposed and controlled by the instructor.

Many authors consider 'task focus' to be an important design issue, and recommend taking advantage of the Web's features that encourage learner exploration and collaboration (Duchastel, 1997; McKnight et al., 1996; Oliver et al., 1996). Yet a majority of the participants' tendency was to use the activities and feedback only as self-evaluations to 'reinforce learning'.

Interactivity has been provided only to some extent. For instance, hypertext links were mainly used to move from page to page to read the sequentially placed information, or to navigate to the activity page and then to the feedback page. However, as Hedberg et al. (1997) claims, 'choosing between a set of options or turning pages of cute animations' does not provide a real interactivity unless the users were required to think before a response. This did not occur in most instances. The lack of provision of opportunities for the learners to communicate with the instructor or with each other reduced the interactivity as well as collaboration.

Some tended to utilise only the useful features of the Web, not all those available, and also were concerned not to 'abuse the power of hypermedia' (Shotsberger, 1996), while the others used these features extensively. This supports the previous findings that novice designers pay more attention to 'surface characteristics' in a presentation, rather than the actual design of it (Gros et al., 1997; El-Tigi & Branch, 1997; Maddux, 1998).

Only one Web site gave a main emphasis to the activities and demonstrated taking advantage of the hypertext/hypermedia environment to create a task-based learning environment, to facilitate 'knowledge construction' by learners, and also to enhance collaborative learning through social interaction. These features indicated a constructivist learning approach. While only this Web site demonstrated a 'cognitive tool' approach, and another tended towards it, all the others functioned mainly as a 'tutor' or a 'presentation tool' (Somekh, 1997). As Jonassen et al. (1999, p.11) described, 'knowledge was embedded in the technology...and the technology presented that knowledge to the students'.

## **Conclusion**

The rapid evolution of the Web and its popularity as a learning tool necessitates that educational institutions integrate Web-based learning into their programmes. This requires designing materials for the Web and often the educators are expected to do that. This is a challenging task for educators, who are often novices to new technology.

Course design and learning material development is an ongoing important issue for educators, whether technology-based-learning is involved or not. Yet the flexibility permitted by the new technology such as the Web enhances content design and delivery. The importance of careful use of ID is that it ensures effective use of the new technology to enhance and improve the teaching and learning processes.

The presence of simple Web authoring tools that allow even novice users to develop Web sites very easily might give a false impression that developing Web sites is simple and just developing the technical skills is sufficient to produce them (Gros et al, 1997). Web-authoring is a very complex process, especially when developing learning materials. It is very important to realise that it is not just a simple process of transferring text-based content to the Web.

While creativity of the designer is also very important, and the Web materials need to be attractive and motivational to the learners, the emphasis given to the learning approach is far more important. Thus, educators need to realise that successful applications of new technology in education, such as Web-based learning, will depend mostly on how well the features of the technology are managed to create a meaningful learning environment, rather than just attractive presentations.

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