ABSTRACT

It is postulated that one of the main problems with e-learning environments is their lack of personalisation. This article presents a comprehensive review of the current work in the field and proposes a framework for research in promoting personalisation in Web-based learning environments. The concepts of adaptability, adaptivity and the limitations of completely adaptive systems are discussed. The conception of more interactive environments that are both adaptable and adaptive, which can assist the teacher in making interesting pedagogical decisions while tutoring in a virtual environment is proposed. Two versions of an algorithm that can be used to offer personalisation in the framework described are developed and discussed in this article. The algorithm is basically a method devised to select the most appropriate learning object from a pool of potential objects that exist in the repository.

Keywords: education; e-learning; personalization; Web-based learning

INTRODUCTION

Traditional distance education helped remove many barriers to education due to its relatively low price and high flexibility in the study modes. Students were given the opportunity to study at their own pace while working a full-time job. This also motivated mature students to resume their studies without getting back to the school bench again. Nowadays, in this technology driven world, a new concept of distance education is emerging. Different interchangeable terms have been used to denote this concept: e-learning, online learning, Web-based learning and so forth. The concept of Web-based learning and the use of the Internet in teaching and learning have received increasing attention over the recent years.

Using the Web as only a new kind of delivery medium for educational materials does not add significant value to the teaching and learning process. The integration of technology in learning needs to address the very important issue of enhancing the teaching and learning process, rather than just being seen as a new flexible delivery medium (Nichols, 2003). E-learning, if used effectively can help address the
many shortcomings of the traditional distance education methods as well as the inherent problems the classroom teacher is faces on a daily basis with a classroom of learners with different learning and perceptual styles and competencies.

The current research investigates the problems of personalisation in Web-based learning environments. It is in fact postulated that one of the main problems with e-learning environments is their lack of personalisation (Ayersman & Minden, 1995; Cristea, 2003; McLoughlin, 1999; Rumetshofer & Wöß, 2003). This research relates to Phase 3 of the University of Mauritius Learning Object Repository (UoM LOR) project (Santally, Govinda & Senteni, 2004) that investigates the possibility of adding adaptation elements in the authoring of courseware through the combination of learning objects. The elements that are focused upon relate to what is called the psychological traits of the students (Rumetshofer & Wöß, 2003) namely their learning styles, cognitive styles and controls.

The Phase 3 of the UoM LOR project research has three main goals:

1. Devise an algorithm that will cater for personalised instruction by selecting the most appropriate learning object based on the existing student model.
2. Develop the specifications of an adaptive instructional design framework to promote personalised and authentic activity-based learning experiences for the learner in a Web-based learning environment.
3. Investigate the effects of adaptation to individual psychological traits (learning styles, cognitive styles and cognitive controls) of learners on the learning process through an implementation of the developed specifications using a learning object approach.

This article describes the adaptation framework and reports the observations made when two versions of the same adaptation algorithms are applied to a set of learning objects in a bid to identify the most appropriate one for any student with a particular individual profile. The student profile consists of a set of psychological attributes that are stored for the user namely the learning styles, cognitive styles and cognitive controls. The first version of the algorithm treats all modeled aspects to be of equal importance while the second one assigns importance weightage to each of the modeled factors. The aim is to observe the effects on the eventual selection of learning objects for the same students when the importance weightages are applied and randomly adjusted in the adaptation process.

A REVIEW OF LEARNING STYLES, COGNITIVE STYLES AND COGNITIVE CONTROLS

The terms learning styles and cognitive styles have been often used interchangeably in literature. Jonassen and Grabowski (1993) distinguish between learning and cognitive styles by explaining that learning style instruments are typically self-report instruments, whereas cognitive style instruments require the learner to do a task which is then measured to some trait or preference.

Learning Styles

People prefer to learn in ways that are different from other people of the same class, culture or religion. This individual preference of how to learn is called the learning style preference. Education research and practice have demonstrated that learning can be enhanced when the instructional process accommodates the various learning styles of students (Buch & Bartley, 2002).

Dunn (1996) postulates that gifted learners can learn proficiently without using their learning style preferences, however, low achievers significantly perform better when they capitalise on their preferences. Furthermore, a decade of research demonstrates that both low and average achievers earn higher scores on standardised...
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