Chapter 1.13
Learning Styles and Adaptive ICT-Based Learning Environment

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ABSTRACT

This chapter has two aims. First, to provide an overview of learning styles research and secondly, to provide an overview of research in adaptive hypermedia learning environment systems, those where different learning styles are considered and used to create a personalized learning environment. For most distance education institutions individualization of the learning environment for each student is not an option because economies of scale are the determining factor of cost reduction. However, the latest advances in database management, artificial intelligent systems and intelligent agents provide a technological infrastructure for individualizing the learning path for every learner at a lower cost. This chapter focuses on learning styles and how we can integrate and use them as a source of adaptation in an adaptive hypermedia learning environment systems.

INTRODUCTION

Teachers and researchers have long recognized the differences between learners and the impact these differences can have on learning. Concern for these differences has been the focus for academics and practitioners for decades and led to research on learning styles, i.e., "the composite of characteristic cognitive, affective, and physiological factors that serve as relatively stable indicators of how a learner perceives, interacts with, and responds to the learning environment" (Keefe, 1979). Research efforts in the theory and application of learning styles have proliferated a wide spectrum of models and instruments. Coffield, Moseley, Hall, and Ecclestone (2004a), who provided the latest and the most comprehensive overview of the learning style theories and instru-

ments, have identified and critically discussed 13 major models of learning styles among the 71 models reported in literature.

Important messages emerge from the learning style research both for educators and course designers. Teachers should identify the learning styles of their students, encourage them to reflect on their own learning styles, and provide a teaching approach and support that will cater for individual learning styles. Course designers should create a learning environment that would address differences between learners. Though the idea of individualization is not new to education many of the larger distance education institutions offer little individualization for the students because economies of scale are the determining factor of cost reduction.

In the last few decades, with the emergence of information and communication technologies (hereafter labeled ICT) and their use in education research, we have witnessed new revival of interest in the individualization of learning and learning style research. There is a strong belief that ICT will provide the necessary foundation to individualize instruction, even in further education with large class sizes and a modular curriculum. At the same time emerging ICT raises expectations, as was pointed out by Kolb, the teacher's role will change from "dispenser of information, to coach or manager of the learning process" (1984, p. 202).

In the distance education we may achieve true individualization of the learning process by using emerging technologies such as intelligent agents and artificial intelligence systems which could store relevant data into a database and generate ad hoc completely customized course material, (i.e., an individualized learning path) for every single learner, according to their individual needs and preferences. An intelligent system which uses information about learners' preferences to dynamically organize course material is labeled an adaptive learning environment. If this learning environment involves the use of hypertext and multimedia (and most recently is Web-based) then we are describing an adaptive hypermedia learning environment (hereafter labeled AHLE). Peter Brusilovsky (1996, 2001) provided an overview of adaptive hypermedia systems from the early 1990s until now. He shows that the research on adaptive hypermedia systems in the last decade produced framework, techniques, prototyping models and authoring tools to create courses deliverable in the AHLE.

There are many different criteria for the adaptation of the learning environment to suit individual learner's needs and preferences. In this chapter we are focusing on the use and integration of learning styles as the only criteria for adaptation of the learning environment.

This chapter has four objectives: (a) to summarize and present learning style models in a systematic manner using proposed learning styles meta-models, (b) to review systematic efforts to establish and implement adaptive hypermedia systems in education, particularly those based on using learning styles as an adaptation criteria, (c) to discuss the problems and limitations of the current approach in using learning styles in adaptive hypermedia systems, and (d) to discuss the implication of the adaptive hypermedia systems based on learning styles on pedagogy, course design, and developers of an adaptive hypermedia system.

OVERVIEW OF LEARNING STYLE MODELS AND INSTRUMENTS

There is a proliferation of definitions, concepts, models, and instruments related to individual learner's preference which makes it very difficult to summarize and classify learning styles models. What makes such an effort even more difficult is that there is no clear separation between the various models, as De Bello (1990, p. 217) suggests, "there are many areas of overlap among the models."