ABSTRACT

In this chapter we present a system supporting instruction designers in the design and deployment of e-learning courses. The system includes integrated modules for several authoring activities, such as the definition of knowledge content objects, and the creation of assessment and self-assessment tests. The distinguishing characteristics of the proposed system is that it is based on a suite of visual languages, enabling the modelling of different aspects of the construction process for Web-based distance courses. The languages include a Learning Activity Diagram, which extends UML Activity Diagrams to make them suitable for modelling distance course structures; a Self-Consistent Learning Object language used to define knowledge contents; and a Test Maker Language for specifying assessment and self-assessment tests. The use of visual languages provides an intuitive and friendly system user interface that allows instruction designer to easily compose and analyze the distance course structure and keep track of the knowledge acquisition process individually for each learner.

Keywords: courseware; e-learning; instructional designer; modelling languages

INTRODUCTION

We are living a phase where learning is vital to many aspects of our life. This entails a continuous elaboration and augmentation of knowledge, which can be enhanced through educational and informative tools, and built upon advanced devices, such as desktops, laptops, tablet PCs, PDAs, TV and mobile phones. Moreover, when connected to the Internet, these devices might replace traditional classroom and distance courses. E-learning provides the technical infrastructure to let us define, support and deploy knowledge for new emerging paradigms of teaching (Schar & Kriger, 2000). Thus, traditional learning activities, such as lectures, homework and assignments, are replaced with new, powerful and fascinating teaching opportunities known as well as e-learning activities.

E-learning exploits Web technology as its basic technical infrastructure to deliver knowledge to the learners’ environ-
As the current trend of academic and industrial realities is to increase the use of distance learning, in the near future a higher demand of technology support is expected. In particular, software tools supporting the critical task of instruction design should provide automated support for the analysis, design, documentation, implementation and deployment of instruction via Web.

Muraida and Spector (2002) and Kasowitz (1997) review much of the work done in automated instruction design support tools. In particular, Muraida and Spector assert that there is “a lack of instructional designer expertise, pressure for increased productivity of designers, and the need to standardize products and ensure the effectiveness of product.” Thus, tools supporting instruction design during all the phases of the learning process definition are desirable. Goodyear views the instruction design as falling within four main approaches (1997). These approaches allow the instruction designer to generate e-learning activities from given specifications by means of tools supporting the design of course structure, the selection of presentation templates, the reuse of design elements and the coordination of activities accomplished by a design team. Moreover, Goodyear also proposes an approach for analyzing and designing distance courses that is divided into neat parts (1999). The first part of Goodyear’s approach resembles the work of other people (outside education) interested in the design of technology that supports the work of information systems designers, requirements engineers, human factors specialists, and so on. The second part is focused on the design of good learning tasks, exploiting traditional analysis and design processes. Often, these tools are not able to compensate the lack of expertise of instruction designers. Jones, Shirley and Lynch (2003) have presented an Information Systems Design Theory for the design of Information Systems to be used in Web-based Education. Vrasidas (2002) presents and discusses a system to develop hypermedia approaches as part of courses and learning environments delivered on the World Wide Web. It details the structuring of information, branching and interactivity, user interface and navigation through Web-based distance courses.

As opposed to these approaches, which are based on traditional models of instruction design, there are approaches and tools relying on object-oriented models. Douglas (2001) proposes an instruction design methodology based on the object-oriented paradigm. Designer’s Edge (2003) provides another interesting approach and tool for instruction design based on the object-oriented paradigm.

Despite the fact that there exists a large number of software tools, none of them supports the component-based instruction design through the reuse of learning content objects. Many instruction design approaches proposed in the literature are based on traditional pedagogical learning approaches, or on the object-oriented paradigm. Indeed, existing models of instruction design have been influenced by linear or object-oriented software development processes. It is worth noting that both approaches can only partially support knowledge content reuse, since only one level of granularity (or at most two) is permitted when trying to reuse predefined content objects.

New trends seek means to exploit ideas and benefits of component-based approaches for implementing and delivering learning environments. In particular, the idea is to reuse learning components at different granularity levels. At the topmost level there exists self-consistent learning contents that may be composed of learn-
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