

Chapter 2.19

Integrating Visual Representation of Knowledge with Learning Management Systems: Design Principles for Advanced Computer-Based Learning Support

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ABSTRACT

After a review of literature pertaining to representative constituent parts of contemporary learning management systems (LMS) and features of other systems that support visual representations of information and knowledge in support of learning, a summarization of desirable design elements for a system that is meant to support distance learning is developed and elaborated. These elements include the potential benefits of having an explicit realization of a viable pedagogical theory as the underlying basis for the software, the possible benefits of integrating a variety of capabilities in as simple and usable a fashion as possible, the value of presenting a customizable

interface, and the desirability of providing for sharing and reuse of instructional resources. The chapter concludes with a description of a prototype system that embodies many of the principles laid out in the paper.

INTRODUCTION

Interest in distance learning as a means of providing anytime-anywhere education is rapidly increasing today (Honawar, 2005). Most distance learning course delivery is based upon a variety of software capabilities that span a wide range from basic Web sites with e-mail through sophis-

ticated Learning Management Systems (LMS) that transparently provide seamless presentation of a variety of electronic media and many other services. Modern systems that support distance learning include a variety of market-leading LMS products such as WebCT (2005), Desire2Learn (2005), and Sakai (2005). Other systems such as Tuft's VUE (2005) and the Florida Institute for Human and Machine Cognition's Cmap-Tools (Cañas, Hill, Carff, Suri, Lott, Eskridge, Arroyo, & Carvajal, 2004) provide significant networked pedagogical support through visual representations of information and knowledge, without attempting to be full-featured learning management systems.

These systems embody a variety of approaches and technical support features for distance learning facilitation. Most have features such as support for e-mail, threaded discussions, instant messaging, student and faculty access to course instructional materials, grade posting capabilities, sophisticated search, and the like. However, some important differences do exist. The basic goal of this chapter is to point the way to a synthesis of ideas from LMS capabilities, systems presenting visual representations of information and knowledge, and other ideas, to a new type of system to support distance learning.

This chapter starts with an overview of software that provides support for distance learning, followed by some representative LMSs and other pedagogically-motivated software that supports visual representations of knowledge. Based upon this review, a framework for computer-supported learning technologies that arise from a pedagogical grounding and that provide advanced capabilities for effective distance learning course delivery is developed. The framework is based upon a number of principles that point the way to possible design features for well-integrated, next-generation software systems that support distance learning. Following this discussion, a prototype software system that illustrates a realization of many of the principles will be described. The

next section of this chapter contains background information pertaining to software support for distance learning.

OVERVIEW OF SOFTWARE FOR DISTANCE LEARNING

This review contains descriptions of basic issues pertaining to computer-mediated delivery of distance learning courses, and a range of features and concerns pertaining to modern online learning support software. This review is in service of laying the groundwork from which basic principles pertaining to the design of distance learning systems can be culled. A later section in this chapter enumerates and describes these basic principles.

In an extensive survey of European use of LMS technology, Paulsen and Keegan (2002) conclude that the typical tool suite includes course development tools that are often standard Web page development software, student and tutor tools, and administrative systems. Development tools may or may not be part of an LMS. Student support tools might include chat and e-mail, videoconference tools, and so forth. These tools may be part of a tool suite, or separate applications. Paulsen and Keegan conclude that teacher tools to track student progress are limited and that at that time, not a single LMS provided an integrated comprehensive examination capability. This fact reveals a trend in LMS evolution toward inclusion of assessment capabilities. Collis and Strijker (2002) make the distinction between an LMS as a system that provides capabilities to track learner progress, and a learning content management system (LCMS) that provides capability and support for the development and tracking of content. These capabilities might be made to work together via an application program interface (API) if they do not exist in the same application suite. Integration into the same application potentially provides improved simplicity of use.

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