Task-Oriented Information Organization and Retrieval in Online Learning

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INTRODUCTION

The number of institutions offering online courses has been growing steadily. According to the U.S. National Center for Education Statistics (NCES, 2003), approximately 90% of public four-year institutions and about 50% of private institutions were offering, or planning to offer, distance education programs in 2000–2001. By 2006, 90% of public two- and four-year institutions actually offered distance education courses (NCES, 2006). In response to the increasing interest in and demand for online instruction, various course management systems (CMS) have been developed, including commercial systems, such as Blackboard, Angel and Desire to Learn, and open source systems, such as Moodle and Sakai. The CMSs, defined as software systems specifically designed for teaching and learning, are useful tools for online instruction. They make it easy to organize and deliver content, including lecture materials, and to link the course web site to other related web sites. They also provide tools for communication, learning assessment and activity management (Colaric & Jonassen, 2001; Morgan, 2003).

With the increasing popularity of online learning, the primary environment for connecting students with their instructors, their classmates, and course content is changing from the traditional face-to-face model to the online environment defined by a CMS. Instructors who are already challenged with keeping up with constant changes in their fields of expertise and online technologies, are left with little time to understand how their course materials should be organized and presented through the CMS. This usually results in course materials being organized based on an individual instructor's mental model and preferences. The course organization by the instructor, however, may not guarantee effective retrieval of course materials by learners. While learners may be able to find the information that they need and desire by exploring the course structure and organization, retrieving information can often be inefficient and time-consuming.

Studies show that different instructors and students prefer different ways of organizing course sites (Caplow, 2006; Moore, Downing, & York, 2002). Such preferred organizational differences between the instructor and learners become more problematic when learners begin the course with little orientation to the structure of the particular course site. Earlier research suggests that the course structure (Romiszowski & Cheng, 1992) and the interface design of an online course (Eastmond, 1995) have an impact on student satisfaction and learning in online courses. A transparent and easy-to-use interface of the course is crucial in facilitating the online learning.

In this article, a faceted approach is proposed to organize course materials, which can support efficient execution of learning tasks by students in online courses. A faceted approach to classifying information differs from the traditional methods in that it does not assign a fixed slot to a subject within a hierarchical structure. Using clearly defined and mutually exclusive aspects/dimensions of a subject, a faceted classification allows a subject to be classed under multiple locations, rather than one. These aspects or dimensions used for classification are called 'facets' of a class or subject, a term introduced into classification theory by the Indian classificationist S.R. Ranganathan in the early 1930s (Taylor, 2006). Since a faceted classification system allows learning material to be classed and placed under multiple facets in a systematic way, it helps students to access and retrieve learning materials more easily.

In this article, we will first review issues related to the CMS used for online courses. Then, we will discuss different approaches to organizing and retrieving course

materials, reviewing recent efforts to improve the CMS for the better organization and presentation of course materials. Finally, we will propose a task-oriented framework for organizing course materials, based on faceted approach. Using an existing online course as an example case, we will illustrate how the faceted system can support learning tasks and activities. This paper will shed light on how the organization of information can help students carry out learning tasks efficiently in online courses, and suggest future research on the organizational scheme for online courses.

BACKGROUND

CMSs and Their Influence on Online Learning

The 2003 EDUCAUSE survey (www.educause.edu) reports that CMS systems rank sixth among the areas requiring the most institutional resources for a higher education institution (Crawford & Rudy, 2003). This finding suggests that academic institutions are well aware of the need to strategically plan the integration of CMSs into their information technology infrastructure. In 2007, the Campus Computing report (http://www.campuscomputing.net) noted a growing trend of colleges and universities adopting an open source CMS to save the licensing costs. While 3% of these universities adopted *Sakai*, an open course system, the number of institutions using *Moodle* almost doubled from 4.2% to 7.8% between 2006 and 2007 (Green, 2007). This report also indicated that approximately 17% of private four-year colleges chose to use *Moodle* in 2007 up from 10% in 2006.

Financial and usability issues are often key factors in selecting a CMS. Due to limited resources, most academic institutions cannot afford to support multiple CMSs even if they adopt open source systems. As different CMSs have different system configurations, interfaces and tools, supporting more than one system often requires a significant amount of additional work and technical support. As a result, many institutions choose to support only one CMS. Instructors' concern arises when they have invested time in making the course materials fit the structure of a specific CMS and their institution decides to discontinue using it. Although most management systems are similar in their basic functions, they usually have quite different interfaces and features that require a significant amount of time and effort to learn.

Content organization is one of the important issues related to meeting the needs of online learners (Moore & Kearsley, 1996). Content organization is usually influenced by the particular CMS as well as by an instructor's individual mental model. A CMS with tools that limit choices for navigation paths and force a more compartmentalized way of organizing information, for example, can result in unnecessary frustration among students in finding information. For online courses, the goal should be to create a learning environment with a transparent interface. One requirement for a transparent interface is terminology that students are accustomed to using with course materials (e.g., syllabus, assignments, guidelines, etc.). As students and instructors gain more experience with online environments, "new" terminologies become a part of their vocabulary (e.g., learning modules, discussion boards, chats, online classrooms). Typically, a CMS will provide a combination of new and old terminologies for labeling sections, but interpretations of such labels vary depending on individual experiences in online learning environments (Moore et al., 2002). When combined with the problem of compartmentalized structure, confusing or ambiguous labels make it difficult for learners to find the course materials they need.

Different Approaches to Organizing Information: Hierarchical vs. Faceted Classification

To facilitate the organization and retrieval of information, people classify things by grouping similar items together. The most popular way of classification is a hierarchical one. In a hierachical system, materials and resources are arranged in a hierarchy of classes, divisions, and subdivisions. In such hierarchical systems, a topic is "pigeonholed" into one location that can be reached through only one path. Unless users have a good understanding of the structure, and can decide on the main class into which a particular resource is classified, they may need to use a series of trial-and-error attempts to locate the resource. For example, in a CMS, course materials are often grouped by main categories, such as *course information*, *assignment*, *discussion*, and *resources*. Although using this structure within a CMS