

# Using Learning Management Systems to Support Students' Collaborative Learning in Higher Education

Stephanie D. Teasley & Steven Lonn, University of Michigan, School of Information and Digital Media Commons,  
1075 Beal Ave, Ann Arbor, MI 48109-2112  
Email: [steasley@umich.edu](mailto:steasley@umich.edu), [slohn@umich.edu](mailto:slohn@umich.edu)

**Abstract:** Learning Management Systems (LMS) are web-based systems for the distribution, management and retrieval of course materials, and to support communication between students and instructors. A LMS can also support peer collaboration by providing students with the capacity to create their own project sites. In this paper we present data from system logs, surveys, and interviews to investigate how one such system, CTools, is used by students at a large public university to facilitate peer learning.

## Overview

Technology-enabled learning is increasingly important in today's higher education and "courseware" systems appear to be one of the most rapidly diffusing e-learning technologies (Dutton, Cheong, & Park, 2003). Courseware refers to web-based systems that allow instructors and students access to instructional materials, to make class announcements, and to submit, track, and grade student assignments. There are popular commercial products such as WebCT ([www.webct.com](http://www.webct.com)) and Blackboard ([www.blackboard.com](http://www.blackboard.com)), institutionally developed products such as Angel (Penn State, <http://ais.its.psu.edu/angel/>), and open source products such as Moodle (<http://moodle.org>) and Sakai ([www.sakaiproject.org](http://www.sakaiproject.org)). A recent report showed that over 90% of all universities and colleges are using one or more courseware-type products for student and faculty use (Hawkins, Rudy, & Nicolich, 2005). In this paper we use the term Learning Management System (LMS) instead of courseware or Course management System (CMS), because the system we study here is employed for learning purposes both inside and outside the course setting.

Early adopters of LMS in higher education have typically come to these applications because they promise to make teaching more efficient. LMS are also being adopted because they are a symbol of innovation and thus create a competitive advantage in the education marketplace and provide opportunities for enabling institutional innovations in learning and education (Dutton, Cheong, & Park, 2003). Although most LMS are used for the distribution, management and retrieval of course materials, these systems are increasingly incorporating functionality that supports communication between students and instructors and among students. Communication tools within LMS provide the kinds of active online engagement preferred by today's generation of students (e.g., discussion tools, chat rooms, wikis, and blogs) and provide opportunities for using these systems according to constructivist approaches to learning rather than simple transmission of knowledge models. In a recent study of WebCT and Blackboard use conducted at Williams, Brandeis, and Wesleyan, more students than faculty reported that the use of these systems "improved learning" (Hanson & Robson, 2004). On our campus, 74% of students felt they learned more from courses when the LMS was used. Our research agenda includes investigating the modes and quality of learning afforded by our LMS.

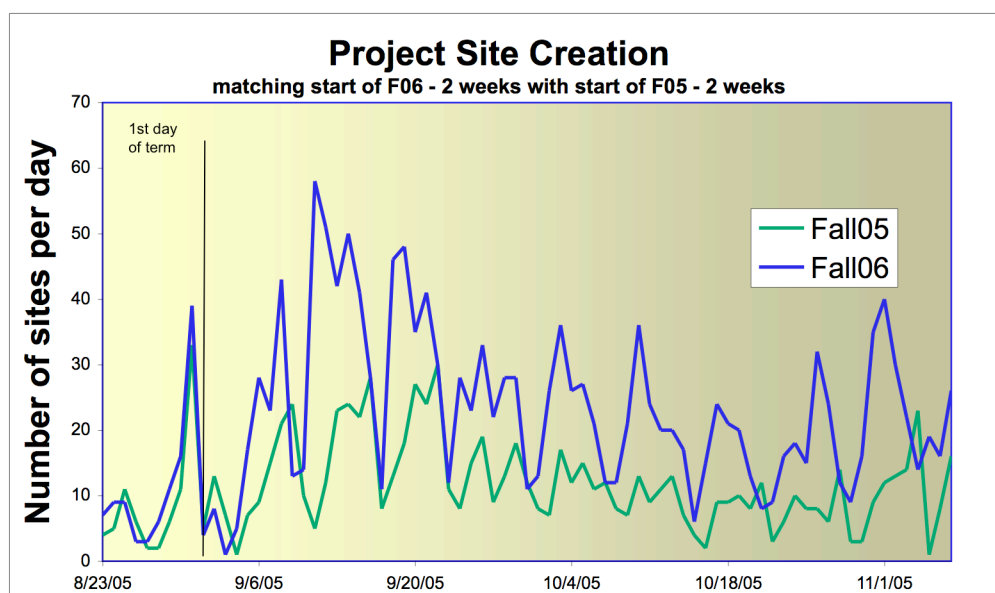
In this paper we investigate how students use the project site capability of our LMS, CTools, to support working with their peers. Students' perceived value of the LMS has led to a wide proliferation of student-initiated project sites created specifically to support learning activities taking place outside of the classroom and outside of the course website. Students are creating project sites to support the activity of group projects required by courses and for student-led study groups (coined "eProject" and "eTeam" by Dutton, Cheong, & Park, 2003). Providing project space inside the LMS provides students with the convenience of having one integrated environment for both course and project work, and is especially valuable when students find themselves in groups where the members are rarely collocated outside of class time. We are interested in how project sites are used to support collaboration, looking specifically to see how project sites may support peer learning beyond making group work more efficient.

In this paper we use a variety of empirical methods to gain a systematic understanding of how project sites are being used by students to support their own learning. We begin by characterizing the use of CTools for student projects using an analysis of log data from our system. Second, we examine data from an annual web-based

survey to see how the use of project tools affects students' perceptions about project work and their own learning. Finally, we report on work in progress consisting of a survey of student project site users and in-depth case studies to illustrate the types of students' project site use.

## CTools Use on Campus

Our university has offered a LMS for voluntary adoption by faculty since 1997. The current version of our system, CTools, is built on the Sakai architecture (see [www.sakaiproject.org](http://www.sakaiproject.org)). Approximately 80% of our faculty report using CTools and 98% of our students have had at least one class using CTools. In the current term (Fall 2006), there are over 3,800 course sites and over 17,000 individuals log in to the system one or more times on an average day. All faculty, students, and staff at our university can also create their own project sites in CTools and subscribe any number of members to that site. As our LMS has become part of the basic IT infrastructure for our campus, the number of project sites has increased dramatically. Figure 1 shows the growth in project site creation for the first two months of the Fall 2005 and Fall 2006 terms. For the Fall 2006 term, students initiated 1,110 new project sites which is 64% of all project sites (n = 1,750) created between August 23 and November 16.



**Figure 1.** Fall 2005 and Fall 2006 Project Site Creation

In the CTools environment, both course sites and project sites appear as tabs across the top of the browser window, but users see only the tabs for the specific course and project sites to which they are subscribed. Faculty and student users are automatically subscribed to course sites by the registrar's office, but project sites members are added by the site creator. Project sites offer much of the same functionality as course sites; users can make announcements, post to a shared calendar, contribute and edit resources, and participate in discussion boards, chats, wikis and soon, blogs. Prior research on project sites (Teasley, Rader, Morgaine, Angell, & Narvid, 2006) has shown that sites are used primarily for posting materials to resources (98% of all sites), but users also made announcements (39% of sites), added events to the calendar (22% of sites), posted to a discussion (15% of sites) and posted to chat (15% of sites). Wikis and blogs were not yet available to users at the time of the previous analysis.

In April, 2006, we surveyed all instructional faculty at our institution and sampled from 25% of the undergraduate and graduate student population. The response rate was 19% from faculty (n = 1,360) and 27% from students (n = 2,485). Our survey asked general questions about preferences, use, and benefits of information technology in classes; as well as more specific questions about CTools features, usability, and open-ended questions on improvements for CTools. We included a number of questions from the 2005 ECAR Study of Students and Information Technology (Caruso & Kvavik, 2005). Although intended primarily to understand the course-related activity within CTools, we did ask several questions about project site use. Specifically, we asked respondents to indicate their experience with project sites and to rate the overall value for three categories of use: research, student

work, and administrative tasks. Not surprisingly, we found that more faculty than students had experience using project sites for research (25% vs. 10%) and administrative work (22% vs. 9%), although both types of users rated the value of these two kinds of site use highly (83-90% of all users rated them “valuable” or “very valuable”). Experience with project sites used for student work was similar for faculty (20%) and students (23%), and was also rated equally highly by both groups. Specifically, we found that 91% of faculty and 89% of students rated this kind of use as valuable or very valuable. This suggests that both the students who use the projects sites as well as the faculty who have experience with how students are using them believe that the sites are adding value to students’ educational experience. A review of the names of student-initiated project sites created in the current term illustrates some of these uses: using project sites for a course’s required group projects (e.g., in a Mechanical Engineering class; “ME395Team3,” “ME395sec6team4”), science lab groups (e.g., “Lab Group 2”), and group study sites (e.g., “History Honors Com,” “EDUC 695 Lit Review”).

Log data from Fall 2006 shows that the student-initiated project sites had an average of 4 members per site (mode), although sites ranged in size from 1-1008 members. An examination of the tools on the sites showed that 97% of the sites have resources, 82% have announcements, 60% have chat, 59% have a threaded discussion, and 32% have a wiki. These findings suggest that while most students may be using project sites to broadcast information out to a large group (e.g. resources and announcements), many students may be using the interactive capability of the sites (e.g. chat, discussion, wiki) to build collective knowledge and learn from one another.

## Ongoing Research

In March 2007, we conducted a student survey of project site creators (N=306, 31% response rate). Preliminary results from this survey indicate that the majority (70%) of the project sites students used the most were created for course-related projects. The survey results also indicated that the LMS tools students value most for collaboration are Resources, Announcements, and Email Archive. The majority of survey respondents (53%) participated in one or two project sites in Fall 2006, and 52% visited those sites a few times each week. Sixty-two percent of students reported that they participated in a project site for only one term, and 17% of students participated in project sites for more than one calendar year.

Based on data from the event logs and surveys, we will select several project sites to study in depth by interviewing the student users of these sites and examining the everyday use of their project sites. By analyzing interview, survey, and log data sources in concert, we plan to capture how students use project sites to shape the nature of their self-directed collaborative learning experiences with peers.

## Impact

We believe that the findings from this research will help demonstrate how CTools and other LMS can be used to support collaborative learning in higher education. As these systems become ubiquitous in higher education, it will be increasingly important to move the focus from faculty use to student use to determine how students can leverage the capacities of these systems in service of their own learning.

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