Are We Managing Learning with Learning Management Systems?

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Abstract: Although Learning Management Systems (LMS) are ubiquitous in higher education, little is known about how faculty and students use them for blended learning. In this symposium, we present data from online surveys, system log data, and case studies to investigate the practice of university teaching with LMS to provide feedback about how to successfully implement these systems. We examine instructors' and students' attitudes about LMS and their use of these systems at different levels of analysis, looking across many institutions and increasingly narrowing the focus to several specific teaching vignettes. We organize our investigations of how instructors and students value the LMS by examining three types of use: Learner-Content interactions, Learner-Instructor interactions, and Learner-Learner interactions. We identify common themes and differences revealed by our analyses to make recommendations that are intended to improve teaching and learning with these systems.

Symposium Overview

Recent surveys have shown that Learning Management Systems (LMS) have become ubiquitous in higher education (Hawkins & Rudy, 2008; Smith, Salaway, & Caruso, 2009) and their use in K-12 education is growing rapidly (Picciano & Seaman, 2009). Although these systems have become basic infrastructure for learning in higher education, we know very little about using LMS to enhance teaching and learning. Few studies have looked specifically at hybrid or blended learning environments (e.g., augmenting traditional face-to-face instruction with online learning applications). Of these studies, most have been conducted by "professors and other instructors who are conducting research (on) their own courses" (Means, Toyama, Murphy, Bakai & Jones, 2009, p. 49). With so many instructors using these systems on so many campuses, we believe it is possible to generalize "lessons learned" about LMS use at a level of granularity beyond reports from individual classrooms. These lessons can help improve the practice of university teaching with LMS, as well as provide important feedback for considerations of how to successfully implement these systems with younger students.

In this symposium, we present four papers that carefully examine instructors' and students' attitudes about LMS and their reported use of these systems, beginning with a wide-angle lens looking across many institutions and increasingly narrowing the focus to several specific teaching vignettes. *Paper 1* uses a survey conducted at 11 American universities looking to examine how LMS use differs between research and non-research institutions. *Paper 2* takes a similar approach, but contrasts LMS uses between one residential campus and one commuter campus within one institution. *Paper 3* investigates qualitative survey data to analyze how the use of a LMS impacts instructors' use of in-class time. Finally, *Paper 4* describes three case studies of exemplary LMS use within the disciplines of nursing, engineering, and music. By focusing our analysis at different scales, we can better understand the ways in which LMS are being used in numerous higher education institutions, the factors that may be driving these uses (e.g., research vs. teaching emphasis, residential vs. commuter students), the ways instructors and students are choosing to use them, and the effects these systems may have on students' classroom experiences.

A typical LMS provides a number of specific tools supporting diverse functionality ranging from "materials management" to organize interactions between the student and the course content (e.g., syllabus, course readings, lecture slides), "interactive teaching" to organize interactions between the instructor and students (notifications, assignments, quizzes), and "peer learning" (peer review, group projects, student wikis) (Lonn & Teasley, 2009). With the diversity of tools available within these systems, investigations of the effects of LMS on teaching and learning must clearly specify functionalities and the particular instructional uses of those functionalities. The legacy of research on learning technology has clearly demonstrated that how a tool is used is more critical than the tool itself (Salomon, Perkins, & Globerson, 1991). Therefore, in this symposium, we organize our investigations of how instructors and students value and use LMS functionalities by examining three types of instructional uses for those functionalities: Learner-Content interactions (LC), Learner-Instructor interactions (LI), and Learner-Learner interactions (LL) (see also Moore, 1989, Bernard et al., 2009).

Paper 1: A Multi-Institutional Analysis of Interactions Supported by a LMS

Andrew E. Krumm and Steven Lonn

Introduction

Researchers of distance education conditions demonstrate that different interaction types can support different learning outcomes (e.g., Bernard et al., 2009). In this paper, we explore how instructors and students value specific uses for a LMS grouped under specific interaction types: Learner-Instructor (LI), Learner-Content (LC), and Learner-Learner (LL) interactions. For this study, we recruited 11 American universities using the same LMS, asking instructors (N=2,570) and students (N=6,980) to indicate their perceptions of LMS functionalities in an online survey. Using this large and diverse sample, we addressed four research questions: (1) Do instructors and students value interaction types differently? Do respondents value interaction types differently based on (2) their university setting, (3) the number of courses they have used a LMS, and (4) their preference for using IT in courses?

Method

To construct LC, LI, and LL interaction types, we coded participants' responses on items asking them to rate how much they value particular uses of a LMS. Using a 5-pont Likert scale, respondents rated how much they valued, for example, "Posting a lecture outline or notes before the lecture." We coded each item using Moore's (1989) and Bernard et al.'s (2009) descriptions of interaction types. After coding each item, we employed principal component analysis to extract single components for items coded under the same interaction type: LC (4 items, eigenvalue = 2.613, alpha = .817), LI (7 items, eigenvalue = 4.05, alpha = .878), and LL (4 items, eigenvalue = 3.117, alpha = .904).

Each extracted component, i.e., interaction type, served as dependent variables in three separate two-level hierarchical linear models (HLM). Survey respondents were modeled at level-1 and university effects at level-2. Within each model we included four independent variables in line with our four research questions: a research/non-research university dummy variable, an instructor/student dummy variable, a number of courses for which one has used a LMS variable, and a how much one uses/prefers IT in courses variable. We also included five control variables: perceived expertise with computers, frequency of LMS visits, general perceived value of a LMS for course activities, and perceptions of value for IT to improve teaching and learning. All non-dummy variables were grand mean centered to improve the interpretability of each model's intercept. The research/non-research dummy variable was modeled as a level-2 predictor while all other variables were modeled as level-1 predictors.

Results

In line with our four research questions, we identified differences between instructors and students for LC and LI interaction types (RQ #1), between participants in research and non-research universities for the LL interaction type (RQ #2), and among the number of courses for which one has used a LMS for LC and LL interaction types (RQ #3). Use of IT was a significant predictor across all models (RQ #4).

Students, on average, valued LC ($B = .09$, $p < .05$) and LI ($B = .208$, $p < .001$) interactions more than instructors. Number of courses for which one has used a LMS had a positive statistically significant effect for LC interactions ($B = .031$, $p < .05$) and a negative effect for LL interactions ($B = -.057$, $p < .01$). Participants in a non-research university were found to value LL interactions more than those in a research university, controlling for all other factors ($B = .39$, $p < .05$). No other research/non-research university differences were identified.

The performances of control variables were largely consistent across all models. Expertise with computers had a small but negative effect for only the LI model ($B = -.068$, $p < .05$). How often one visits a LMS was a positive predictor across all models (LC, $B = .126$, $p < .001$; LI, $B = .151$, $p < .001$; LL, $B = .105$, $p < .001$). The perceived value of a LMS for improving course activities was a strong, positive predictor across all models (LC, $B = .274$, $p < .001$; LI, $B = .269$, $p < .001$; LL, $B = .167$, $p < .001$) as was the perceived value of IT to improve teaching (LC, $B = .108$, $p < .001$; LI, $B = .143$, $p < .001$; LL, $B = .157$, $p < .001$) and learning (LC, $B = .214$, $p < .001$; LI, $B = .185$, $p < .001$; LL, $B = .134$, $p < .001$).

Discussion

In answering RQ #1, we observed that students value LC and LI interactions more highly than instructors, controlling for all other factors. Students, on average, value LC interactions only slightly more than instructors and value LI interactions to a much higher degree than instructors. These observations signal that students may value access to content but value access to their instructors more. Individuals, whether instructor or student, within non-research universities valued LL interactions .39 standard deviations more than individuals within research universities (RQ #2). Whether a respondent was located within a non-research university was the

largest single determiner for how much one values LL interactions. The specific LMS uses that make up this interaction type provide few clues as to why there exist such distinct differences (e.g., Students work together on task/assignment; Students read/comment on each others' work; Students generate/share instructional materials; Students part of ad-hoc student groups or teams). These practices, in general, do not appear to favor one institutional type over another at the grain of size of research/non-research universities.

The effect of one's experience with a LMS is also interesting with respect to differences across interaction types (RQ #3). Controlling for all other factors, a one unit change in the number of courses for which one has used a LMS, which equates to approximately 3 courses, is associated with a .031 standard deviation increase in how much one values LC interactions and a .057 decrease in how much one values LL interactions. Why more experience using a LMS leads to an increase in one interaction type and a decrease in another may have to do with how much one values IT that is different from a LMS. As the number of courses for which one has used a LMS increases, he or she may value other IT for LL interactions. This conclusion is tangentially supported by the strength of the IT related questions within the LL models, and the strength of one' use/preference of IT in particular (RQ #4). Within the LL model, one's use of IT was a much stronger predictor than the same variable within the other two models, respectively. In general, examining how much instructors and students value uses for a LMS across 11 universities has provided an important wide-angle lens on issues to be explored within campuses, classrooms, and instructors.

Table 1: Statistically Significant Parameter Estimates for each Interaction Type

	LC Interaction Type		LI Interaction Type		LL Interaction Type	
	B	**Std. Error**	**B**	**Std. Error**	**B**	**Std. Error**
Level-1						
Intercept	-.162*	.065	-.37**	.113	-.308*	.102
Student[1]	.09*	.037	.208***	.05		
Num. courses use LMS	.031*	.015			-.057**	.02
Use/Preference of IT	.059**	.02	.13***	.023	.163***	.024
How often visit LMS	.126***	.013	.151***	.015	.105***	.017
Expertise with comp.			-.068*	.028		
Value LMS	.274***	.016	.269***	.02	.167***	.021
IT valuable teaching	.108***	.02	.143***	.025	.157***	.028
IT valuable learning	.214***	.023	.185***	.028	.134***	.031
Level-2						
Non-Research Univers.[2]					.39*	.147

*p < .05, **p < .01, ***p < .001; Reference category = (1) Instructor, (2) Research University

Paper 2: Commuter vs. Residential: LMS Perceptions & Use on Two Campuses

Steven Lonn and Andrew E. Krumm

Introduction

In this study, we used the same survey described in Paper 1 to specifically explore differences in respondents' attitudes about LMS use and actual experience with a LMS between instructors and students at two campuses of a Midwestern university: a large residential campus and a smaller commuter campus. We also analyzed aggregated log data from the LMS to see if students' system use was consistent with their beliefs. Although there have been some multi-campus studies of LMS (e.g., Harrington et al., 2004), none have focused on the possible differences between residential and commuter institutions. Online technologies have been found to significantly affect the nature of interactions between commuter students and with their instructors (Krause, 2007). The specific research questions we address in this paper are: (1) Do instructors and students at the two campuses differ in their perceptions of different types of interactions supported by LMS? (2) When other factors, such as number of courses using the LMS, are taken into account, do differences between campuses still exist? (3) How does actual LMS use compare to survey attitudes and perceptions?

Method

The sample for the online survey included instructors (residential n=612, 16% response rate (r.r.); commuter n=64, 19% r.r.) and undergraduate students (residential n=1182, 22% r.r.; commuter n=805, 19% r.r.) who taught or were enrolled in at least one course with a LMS site. We then used the system's event logs to create an aggregated data set representing the activity in the sites in which the student respondents were enrolled (residential n=1,565; commuter n=287).

As in Paper 1, the survey data was categorized as LC, LI, or LL interactions. We analyzed the results using three HLM models. We identified five factors of interest: (1) differences between campuses and (2) between instructors and students, (3) number of courses for which the LMS has been used (4) how often the respondent visits LMS course sites and (5) how much one uses/prefers IT for course activities. We included four control variables: perceived expertise with computers, perceived value of a LMS for course activities, and perceived value of IT to improve teaching and learning.

Results

The first phase of our analysis investigated individual survey items, grouped by interaction type. In general, instructors rated nearly all survey items at a 4.0 or above on a 5-point Likert scale, meaning that they "agreed" or "strongly agreed" that all of these activities within LMS were valuable. When first investigating differences between residential and commuter campus respondents, there were no significant differences between instructors for Learner-Content, Learner-Instructor, or Learner-Learner interactions. Student respondents, however, significantly differed on several survey items. The students' ratings of the survey items were also generally high at a 4.0 or above for most LC and LI items, but somewhat lower for LL items (means between 3.37-3.83). Compared to the commuter students, the residential students rated all four of the LC items higher, five of the seven LI items lower, and all four of the LL items lower. Many of these differences were significant (see Table 1).

Table 1: Significant Differences Between Campuses in Students' Ratings of LMS Activities

Learner-Content Items	**Residential**	**Commuter**	**Mean Difference**
Access online readings / supp. materials	4.57 (n=951)	4.39 (n=641)	.18***
Access lecture outline before lecture	4.34 (n=920)	4.21 (n=568)	.13**
Access lecture outline after lecture	4.48 (n=947)	4.32 (n=598)	.16***
Learner-Instructor Items			
Students ask questions before lecture	3.63 (n=669)	3.93 (n=493)	.30***
Students ask questions after lecture	3.83 (n=742)	4.03 (n=527)	.20***
Take online exams and quizzes	3.35 (n=666)	3.71 (n=477)	.36***
Learner-Learner Items			
Students work together on task / assignment	3.51 (n=712)	3.70 (n=492)	.19**
Students read / comment on each others' work	3.37 (n=610)	3.81 (n=489)	.44***
Students generate / share instructional materials	3.55 (n=665)	3.83 (n=501)	.28***
Students part of ad-hoc student groups or teams	3.22 (n=511)	3.54 (n=384)	.32***

**p<.01, ***p<.001

We also ran 3 HLMs in order to identify factors that might affect how much a survey respondent values a particular interaction type. On average, respondents from the commuter campus valued LI ($B = .428$, $p < .001$) and LL ($B = .363$, $p. < .01$) interactions more than their residential counterparts, controlling for all other factors. Also, students more favorably rated LI interactions more than instructors.

Finally, we calculated the average percentage of total events for each LMS tool by aggregating the events for the LMS course sites. The respondents on the residential campus used three of the four LC-oriented tools more than their commuter campus counterparts while the commuter campus users used four of the eight LI-oriented tools, and all five of the LL-oriented tools more, by percentage, than the residential campus users. The specific differences that were significant are shown in Table 2.

Table 2: Significant Differences Between Campuses in Percentage of Use of LMS Tools

Category	**Tool**	**Residential Campus** (n=1565 sites)	**Commuter Campus** (n=287 sites)	**Mean Difference**
Learner-Content	Content Sharing	57.74%	52.43%	5.31*
	Drop Box	4.83%	2.55%	2.28***
Learner-Instructor	Email Archive	0.52%	0.08%	0.44***
Learner-Learner	Chat	0.75%	1.65%	0.90*
	Discussion	1.26%	2.97%	1.71**
	Forums	0.56%	2.92%	2.36**
	Messages	2.93%	6.18%	3.25***

*p<.05, **p<.01, ***p<.001

Discussion

When we examined the reasons underlying the overall positive ratings of the LMS activities, a distinctive pattern emerged: residential students rated Learner-Content survey items more highly than commuter students and commuter students rated Learner-Learner items more highly than residential students. Ratings for the Learner-Instructor activities were mixed. The log data supported these findings showing higher activity in the most heavily used LC-oriented tools for the residential campus and higher activity in the LL-oriented tools for the commuter campus. Taking other factors (e.g., frequency of LMS use) into account, the differences between the residential and commuter campus remain significant for LI and LL interaction, but not for LC-related uses.

Commuter students may have relied on LMS interactive tools to communicate with instructors and students with whom they do not otherwise have opportunities to do so face-to-face (Pascarella, 2006). Furthermore, commuter campus instructors may structure their courses to include more student interaction through the LMS as a consequence of diminished face-to-face time that is likely to be more easily accomplished at the residential campus. Further study is needed to better understand exactly how residential and commuter instructors structure the use of the LMS for course-related activities in order to help instructors and students at both types of campuses use this technology to its fullest potential.

Paper 3: How Does LMS Use Affect Instructional Time?

Tanya Cleveland Solomon and Kara Makara

Introduction

In recent years, the ubiquitous use of online learning environments in American higher education has increased the need to understand their effectiveness as pedagogical tools (e.g., Apedoe, 2005). This pervasive use also necessitates understanding their influence on the *quality* of students' experiences and interactions in online and blended learning environments (e.g., Bernard et al., 2009). Chickering and Gamson (1987) posit seven principles for good teaching practice in undergraduate education that have been used extensively to evaluate and improve face-to-face pedagogy in higher education. In this paper, we employed four principles most relevant to understanding the nature of interactions between students and instructors in the context of blended learning. The first principle relates to instructors' and students' perceptions of the form and quality of LI interactions. The second principle relates to interactions and cooperation among students. The third principle relates to the expectations that are communicated in courses using LMS as perceived by both instructors and students. The fourth principle relates to ways that use of LMS tools structure and influence instructors' and students' time inside and outside of class.

This paper utilizes data from the online survey discussed in Paper 2 to investigate how the "blended" use of a learning management system (LMS) affects instructors' use of in-class time, comparing instructors and students at the residential and commuter campuses. We explore the issues survey respondents raise regarding how LMS influences Learner-Instructor (LI), Learner-Learner (LL), and Learner-Content (LC) interactions. The specific research questions that we address in this paper are: (1) In what ways does the use of LMS affect the way instructors use in-class time in the higher education classroom? (2) How does the use of LMS in these classrooms influence the Learner-Instructor and Learner-Content interactions? and (3) What are the effects of LMS on Learner-Learner interaction during class time?

Methods

We analyzed an open-ended survey item about the instructors' use of in-class time from the survey described in Paper 2. This item asks: "Do you think using the LMS has affected you/your instructors' use of in-class time? If so, how?" From the residential campus, 57.0% of students (n=1,101) and 55.3% of instructors (n=602) responded about the effects of LMS use on in-class time. From the commuter campus, we received a 63.6% student response rate (n=682) and a 72.4% instructor response rate (n=55).

To categorize the survey answers, we made note of common themes and issues encountered, and used these to collapse redundant categories. We arrived at a rubric with 12 codes for both the instructor and student responses, and used up to three codes to describe each response (see Table 1). The rubric accounted for both positive and negative responses concerning the affect of using LMS on instructors' in-class time. Inter-rater reliability produced kappa statistics between 0.8 and 0.93.

Results

The majority of responses by students and instructors indicated that the LMS positively influenced instructors' use of in-class time (see Table 1), where the most common responses were about facilitating logistics and providing access to materials (Learner-Content interactions). More residential students (21.7%) than commuter students (15.2%) mentioned improved efficiency and logistics. The differences between instructors were not as pronounced (19.4% residential; 21.8% commuter). Almost twice as many commuter instructors replied that the

LMS affected in-class time by providing access to materials compared to the other three populations. However, a significant portion of the sample indicated no change in their in-class time due to the LMS, slightly higher for the residential campus respondents than the commuter campus respondents.

Few respondents provided answers that suggested the LMS affected pedagogy or improved Learner-Learner or Learner-Instructor interaction. However, we did find that students at both campuses (7.3% residential; 11.6% commuter) perceived that instructors change the content or pace of instruction in classrooms due to the LMS. Few instructors responded that there was a change in content or pace (3.5% residential; 1.8% commuter). These data suggest that instructors and students at both campuses have different perceptions of how LMS use affects in-class time. Last, many instructors' negative responses reflected their criticism of students and technology while others mentioned a desire to improve the incorporation of LMS in their teaching. Students' negative responses also spoke to instructors' use of LMS and included somewhat sophisticated views of how technology could be better integrated into instructors' pedagogy.

Table 1: Frequency of Most Common Student & Instructor Responses to "In-Class" Qualitative Survey Item

Code	Residential Campus		Commuter Campus	
	Students	Instructors	Students	Instructors
Facilitates logistics	**21.7%**	**19.4%**	15.2%	21.8%
Provides access to materials	18.1%	16.8%	**15.8%**	**29.1%**
General positive response	8.5%	7.1%	12.2%	10.9%
Changes the content/pace of instruction	7.3%	3.5%	11.6%	1.8%
Facilitates discussion in class or online	2.1%	3.3%	3.1%	5.5%
Preparation for class – students	1.0%	1.7%	2.5%	1.8%
Limited / non-user	1.1%	1.3%	3.1%	0.0%
Does not change	34.0%	39.7%	27.1%	25.5%
Changes negatively	2.7%	1.8%	4.1%	1.8%

Discussion

Overall, the majority of respondents indicated that LMS had a positive effect on instructors' use of in-class time. Instructors and students generally gave similar reports about the nature of this change, although their perceptions differed regarding the degree to which LMS use facilitated logistics, provided access to materials, and changed the pace of instruction. There were far fewer negative responses but these were eye-opening. Some residential instructors suggested that the LMS was beneficial only for out-of-class time, but they also talked about their own lack of familiarity and how students were using LMS instead of coming to class. A few residential students and commuter students, to a lesser degree, complained that instructors were completing lessons too quickly or not covering material in sufficient depth in class because they posted materials online.

From these data we can conclude that changes in the use of class time are mostly due to the increases in Learner-Content (LC) interactions supported by the LMS. Log data from the LMS confirm that LC interaction is the primary use of LMS at the residential and commuter campuses (see Paper 2). We found few responses about changes in Learner-Instructor (LI) and Learner-Learner interactions as a result of LMS use. Also, there were higher percentages from commuter students than residential students mentioning LI and LL discussions. Perhaps the capacity of the LMS to support LL and LI interaction is not needed as deeply at a residential campus, where students and instructors may have more opportunities to interact face-to-face.

We also see evidence that LMS can support the four principles of best practices for higher education that we examined (Chickering & Gamson, 1987). First, the efficient availability of course material and announcements support LC interactions. Second, discussion boards within LMS support LL interaction. Third, course expectations are communicated through various resources, such as a syllabus, assignment instructions, grades, and other materials, although students disagree on the extent to which this occurs. Finally, we found that the LMS is particularly useful for structuring instructors' and students' time inside and outside of class through improved logistics and organization of course materials. Responses across campuses revealed an implicit assumption that students learn material independently outside of class when LMS is used, and the reaction to this assumption was mixed: Instructors thought this was a good thing and students did not. Therefore, we recommend that future studies explore students' ability for self-regulated learning. We also recommend further exploration for how LMS can better support LI and LL interaction more broadly across campus types.

Paper 4: The Gifts We Give Ourselves: Embedding Disciplinary Tools in LMS

Diana Perpich

Introduction

It would be pleasant to think of Learning Management Systems (LMS) as the perfect gift we gave ourselves to celebrate the coming of age of higher education in the 21st century. A *System* to manage *Learning,* packaging up the whole messy business of teaching and learning into a collection of neat, authenticated boxes wrapped in the school colors and tied with a bow. That's what we ordered, and that's what typical LMS have delivered onto our virtual doorstep, a stack of well-bundled packages. As we open up the boxes we are somewhat surprised, albeit pleasantly, to find simple gifts: the typical LMS includes functionality to manage materials, view and assess student work, and support communication. However, following the gift metaphor, faculty are left asking themselves, "Socks? Just socks?" Wanting more are the educators dedicated to exploring the seemingly infinite possibilities poised by new technologies. "These users are more interested in support for their need to experiment with new ideas in their teaching and learning environments and then evolve/improve those ideas as they go along" (Severance, Hardin, & Whyte, 2008). Educators, and the organizations that support them, can go shopping for themselves to seek out innovative, discipline-specific tools wherever they may be found.

In this paper, I present vignettes of three instructors at a large Midwestern university teaching in the Fall 2009 term who returned these gifts to themselves in concert with the local LMS. These instructors successfully leverage the basic functionality of the system to frame and to extend their coveted discipline-specific elements and to engage students in new ways with the course material, with the instructor, and with each other.

Vignette 1

The Community Health Nursing course provides an example of an instructor leveraging the local LMS to enhance students' interactions with course materials (LC). This theory and clinical course requires students to "think critically about the role and core competencies of community health nursing … within diverse population and ecological contexts" (quote from the online course description). In planning this course, the instructor sought out materials that not only presented data and policy about community health, but also presented the stories of those being served. Specifically, she integrated materials from "The Neighborhood," an innovative, virtual case-based learning strategy centered on interactions between the household and community agency characters developed by a professor at another university. The interrelated stories unfold in weekly installments and include photos, biographical information, medical records, and video clips.

Even though "The Neighborhood" represents innovative, well-conceived, discipline-specific content, it's not the whole course package. When the instructor presents the discipline-specific content of "The Neighborhood" within the structure of the university's LMS, she adds context by linking more traditional articles and local community stories, often drawing from the daily headlines. She also facilitates workflow by posting notifications and reminders within the LMS and she uses the LMS assessment tools to deliver rapid feedback on graded activities. She is not using the novel, discipline-specific course material in place of the standard LMS; she is using outside online materials in combination with the LMS.

Vignette 2

Jazz Arranging is a composition class where the instructor utilizes the LMS as a platform for students to share their original work with each other, as well as submit it for credit. Historically, students would compose and turn in their scores to the instructor for critique. Students could share their work with each other, but the arrangements needed to be heard to be properly evaluated. This practice posed significant challenges as students had to perform their compositions for each other in class or record them outside of class for sharing later.

The instructor experimented with and eventually adopted Sibelius, a leading musical notation software package. In Sibelius, compositions can be archived digitally and the files play themselves so the focus is squarely on the composition and not the performer. This instructor's integration of Sibelius with the LMS benefits not only himself, but also his students. Now students are required to arrange their scores in Sibelius, and the class meets in a computer lab where students can see and hear each other's arrangements by accessing them via the LMS. The instructor uses the Assignments tool to collect and grade privately (LI), and then he shares and discusses each student's work with the class. Facilitated by the LMS, each student-arranger has the entire class as audience (LL). The instructor also uses several other LMS tools to manage class logistics, freeing up class time to listen to students' music and to engage in discussion.

Vignette 3

In Principles of Engineering Materials, the instructor leverages the local LMS to enhance students' Learner-Instructor interactions (LI). This is an introductory Engineering course with both a weekly lecture presented by the faculty-instructor and a weekly discussion session led by a teaching assistant. Typically with this arrangement, student-instructor interaction is limited to well-timed nods and courtesy smiles passed back and

forth during the lecture. In this class, however, the instructor sought a way to engage students by directly exposing and sharing his approach to weekly problem-solving assignments.

In preparation for Fall 2009, the instructor purchased a LiveScribe system. He now records himself solving key homework problems by hand every week. He clicks Record on his smartpen and then he starts working through the solutions, talking through each step. Students access the resulting "pencasts" via the standard LMS. Because students hear his voice and watch his pen draw the diagrams and formulas; because they hear and see his scribbles and missteps; because they can start, stop, jump, and replay his recordings; *because these are personal recordings,* the students have more interaction with the instructor, albeit one-way interaction. The expectation is that this process provides not only a model of problem-solving but also a sense of familiarity with the instructor that pays forward to provide opportunities for richer engagement with the instructor during lectures and office hours.

What does the LMS offer this arrangement beyond a place to access the recordings? For one, the instructor encourages students to bring laptops to lecture (supplying them when appropriate) and encourages student use of the Chat tool during the lecture. The instructor can also use the Chat transcripts to assess student comprehension and follow up with a specific student when appropriate. The LMS is flexible enough for him to personalize the look, feel, and organization of his syllabus and schedule, drawing students into the LMS even though he has the technical skills and resources to work outside it. In this regard, he meets students on familiar ground, in the LMS, while in the same space offering them uncommon access to their professor and a window into his problem solving processes.

Discussion

These instructors accept the basic tools that the LMS offers and employ them as the functional foundation for students' interactions with the course materials, with each other, and with the instructor. It is worth noting that the innovative and independent elements portrayed in each vignette all engage students with multimedia artifacts via learner-driven navigation. The LMS supports these multimodal and personalized engagements by enveloping them, not only structurally but also programmatically into the domain content. The LMS can be the constant in the evolution of new learning models within and across specialized disciplines. To return to the metaphor of gifts, innovative instructors in higher education know what they need: bring on the socks but don't forget to tuck a gift certificate in with them. Some things, you just have to pick out for yourself.

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