Work in Progress - Using Screencasts to Enhance Student Learning in a Large Lecture Material Science and Engineering Course

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Abstract - University lecturing is changing as a result of increasing student populations, increasing student diversity, and transformative technologies. One of the newest technological developments is the availability of screencasts, recordings that capture audio narration along with computer screen images. This study documents the strategic use of screencasts in a Material Science and Engineering (MSE) course, and examines their impact on student learning and satisfaction in the large lecture environment. Screencasts posted to the course management site included solutions to homework and quizzes and mini-lectures that explain topics identified by students as unclear. Survey results indicate that the majority of students responding found all of the screencasts helpful regardless of whether they found a concept difficult or not. But other data suggest that the impact on student learning could be even greater, as both faculty and students learn to utilize this new resource. Future course iterations will refine the uses of screencasts and continue analyzing their impact.

Index Terms – Instructional Technology, Material Science and Engineering, Screencasts, Student Learning.

INTRODUCTION

One method to expand the lecture class in space and time is through the use of screencasts, videos that capture the activity on a computer screen with real time audio commentary [1]. In higher education, screencasts can provide the rich, multimedia structure of a classroom lecture that engages students’ different learning styles. Like traditional texts, they can be studied at each student’s individual pace, or studied selectively. They are available “on demand” and accessible to students at any time of day (in contrast to office hours, live chats, etc). Rather than putting students in a passive role, screencasts can enhance active study and learning.

This study investigates student use of screencasts in a lecture course MSE220, Introduction to Materials and Manufacturing. MSE220 is a large survey course that, on average, has 150 students per semester. The student population in the course is evenly distributed between sophomores, juniors, and seniors. This course is one of two gateway courses into the Material Science and Engineering department at the University of Michigan; but the majority of the enrolled students come from several other departments (Aerospace, Chemical, and Industrial and Operations Engineering) that have designated this course as a technical elective. Thus, one challenge of teaching this course is that the background and motivation of the students are quite diverse. Another challenge is that the course content spans the entire range of a very multidisciplinary field. As a way to address these challenges, the professor – co-author Millunchick– developed screencasts to supplement typical course resources such as the lecture, text, and homework materials, and she worked with co-authors Pinder-Grover and Bierwert to research the impact on her students.

EXPECTED OUTCOMES

The research design explores the efficacy of screencasts in student learning. We have data on student use, student survey results, and course performance. The key questions in our study are these:
• How do students use varying kinds of screencasts?
• Can screencasts be used strategically to clarify topics that students identify as being difficult or unclear?
• Does student use of screencast affect learning, in terms of self-report and/or in terms of exam performance?

CURRENT PROJECT STATUS

Before this study, Millunchick was already using recorded lecture materials as resources posted to her course management site for student reference. She recorded her in-class lectures, using a lecture capture system that combines a video recording in synch with her slides. She also created screencasts, using software that combines an audio recording with her use of a tablet PC, to provide thorough explanations of the homework, quiz, and exam solutions. This study was prompted by her desire to assess the effectiveness of these resources – and to assess another resource, one inspired by a classroom assessment technique advocated in faculty development literature, “The Muddiest Point” assessment [2]. At the end of each unit, Millunchick gave students blank index cards and asked them to identify concepts or topics that they did not fully understand for that unit, and concepts or topics that they did understand. No more than 15% of the students identified any one problematic topic in any unit, but those identified were concepts that students have historically found difficult in this course (i.e. basis, true stress, error function, slip, lever rule, and polymer
structures). For the most frequently named concepts, Millunchick created a screencast that provided additional explanations and worked out problems or examples as appropriate. By the end of the course, after 16 units, Millunchick had made 6 screencasts.

**EVALUATION PLAN**

While midterm student feedback and end of term course evaluations were used to assess the overall course, the authors created an end-of-term online survey to evaluate all the screencasts. The survey asked students about the difficulty of concepts selected from the “muddiest points” on which the professor had made supplemental screencasts, how they used the screencasts, whether the resource was helpful, and whether they had any difficulty getting access to the screencasts. The authors will also research the correlation between logged student use and student performance on exams.

**PRELIMINARY RESULTS**

Out of the 144 students enrolled in the class, 72 students responded to the end of term survey (with between 52-57 students responding to most questions). The responses show that students believe the “muddiest point” screencasts are helpful (Figure 1), and between 13% and 16% of the students found them “extremely helpful.” Students identified the following uses: to clarify misunderstandings, to supplement the lecture material, and to review for exams.

![How helpful was the screen cast?](image)

**FIGURE 1**

*NUMBER OF RESPONDENTS THAT FOUND SCREENCASTS HELPFUL.*

Although the majority of the respondents (>60%, N ≥35/53) found only two of the six topics covered in the screencasts to be difficult (i.e. basis and polymer structures), they still viewed the screencasts for almost all topics and found them to be helpful. One student commented, “Screen casts are great because it shows topics that the Professor finds important and is a great resource to use to study for the exam. Also, even if I understand the concept, hearing important material one more time in a new way is always extremely helpful.” Most respondents also found the homework solution screencasts and the exam solution screencasts helpful for all six topics (>66%, N ≥35/53 and >50%, N ≥26/52, respectively). In general, students did quite well on the exam questions that were associated with screencasts, having an average grade of 80% which is comparable to, the average score for most questions. The small number of students identifying screencasts as being “extremely helpful” may be the minority who had difficulty with those concepts, but further research is needed to identify this. The distribution of this minority almost certainly shifts during the course, reflecting the different academic backgrounds of students. Other studies have determined that lecture recordings are valued by a subset of students, as indicated by differential patterns of student use (e.g., [3], [4]). More refined analysis of student use and performance is needed to determine whether the students who really need the resources are using them.

**PROJECTED STATUS BY THE CONFERENCE DATE**

This study suggests educational promise in the use of screencasts to supplement lecture material in large courses. Our next step is to see whether screencast use correlates with student learning outcomes as measured by performance on quizzes and exams. The study will continue in the next iteration of the course. By the conference date, students in the Fall 2008 offering of the course would have completed one exam and have had the chance to review at least two screencasts, and we will have more analysis of the impact.

**REFERENCE**


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