

# **LECTURE CAPTURE TECHNOLOGY: DOES IT HELP IN STUDENT PERFORMANCE?**

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## **ABSTRACT**

A variety of technology advances have made it easier to deliver course content to students both in-person and in archived formats. Lecture capture technology (LCT) such as Echo360 enables instructors to capture and post class materials with very little effort. And most students strongly favor the use of podcasts or other LCT (Bongey et al., 2006; Fernandez et al., 2009). These facts help explain why the use of LCT has increased dramatically in recent years (Zhu & Bergom, 2010). This research reports the results of a study to try and identify the impact of this technology on student performance.

## **BACKGROUND**

Despite the fact that students favor the concept, anecdotal evidence in our classes suggests that relatively few students actually review lectures after they are given. Upon closer examination of published studies, we find that most statistics regarding LCT are based on students self reporting — that is, the students' perceptions of the technology rather than the actual impact (e.g., Veeramani & Bradley, 2008).

Given the apparent gap between the availability of LCT and the actual use of captured lectures, we created a small research project that sought to achieve the following objectives:

1. Perform a systematic analysis of if and when students access the captured lectures.
2. Explore methods to increase student use of captured lectures.
3. Evaluate the impact of LCT on student performance.

In brief, the objectives were accomplished as follows. We monitored the access to course capture through Blackboard, a web-based learning management system. We then promoted access to the captured lectures to one group of students and did not promote the lectures to a control group. We then assessed the impact of the LCT through before and after surveys, as well as student performance on extra credit quizzes given to the students. Further details of our methods are discussed below.

## THE STUDY

Each of the co-authors taught two sections of the same class in the fall 2011 term. The courses are required for all students in the Bachelor of Science in Business Administration degree program.

The lecture capture technology used at UMass Lowell is Echo360. Classrooms are equipped with cameras and microphones that record video and sound of instructor lectures. In addition, any material that is projected onto the classroom screen — such as PowerPoint slides displayed using the computer or papers projected using the document camera — is also captured. The captured lectures are automatically uploaded to a web site, and a unique link is created for each class. Instructors can choose to release individual lectures or give blanket access to all of the lectures for a class. Students can view the lectures through any web-enabled device, such as a computer, tablet, or phone. After logging in to the Echo360 portal, users can fast forward, rewind, or jump to any section of the recorded class.

Our first objective was to systematically observe when/if students access the course captures. One study found that students tend to access the material right after the lecture and just before exams (Copley, 2007). Do these results hold for UMass Lowell students? These data were collected by placing links to course capture materials in specific areas of our Blackboard course sites. Blackboard has extensive tracking functionality, enabling us to monitor precisely what is being accessed, by whom, and when.

The second objective of the project was to study ways to promote student use of captured lectures. To accomplish this objective, each instructor developed ongoing quizzes for their classes. We administered short, three-question quizzes on course material throughout the semester. Answers to the quiz questions were easily answered by reviewing clues revealed in the captured lectures; however, the answers may not be as obvious to those who have not reviewed the lecture. The quizzes counted for extra credit in all of our classes. Second, we continued to promote the use of Echo360 by providing weekly reminders to the students and offering multiple demonstrations of the technology in one section. The other section (one for each instructor) was given access to the same quizzes but not the same amount of reinforcement and thus served as a control group.

The third objective of this project is to evaluate the impact of LCT. This objective was achieved by comparing the exam performance of students in the “active promotion” sections versus the “passive information” sections. While it is not feasible to control for all variables in this situation, this experimental design enabled us account to some extent for instructor ability/style and class day/time. We hope to confirm the recent (and ongoing) work of Cyr (2011).

### **Hypotheses**

Our hypotheses for the study are as follows:

H1: *Given extra motivation, students are more likely to use lecture capture technology.* To test this hypothesis we measured average number of accesses [“hits”] per week prior to the extra credit quizzes being offered vs. the average number of “hits” per week once the

quizzes were offered. This was independent of whether students took or how well they performed on the quizzes.

H2: *Students will use accessible technology if it is made available.* We did not collect any hard data to test this hypothesis, but instead relied on anecdotal conversations with students.

H3: *Students performance will be enhanced by using lecture capture technology.* To test this hypothesis we measured the average quiz performance of those who used made at least once access to the technology vs. those who did not use the technology, only evaluating those who attempted the quizzes. We had originally planned on comparing the performance of two sections from each instructor, but this turned out not to work for two major reasons. First, classes were offered back to back, and the student grapevine seemed to nullify these differences. For one instructor prior to at least two of the quizzes, students from the “passive information” section, asked about the quiz/Echo 360 reminder given to the first class. Second, the same instructor forgot to give specific reinforcement prior to two of the quizzes.

### DATA ANALYSIS

In one professor’s case, five quizzes were given for extra credit. Students were given 24 hours to review the Echo360 recordings prior to the quizzes being made available. Students had to anonymously agree that the outcomes of the assessments was completely voluntary to comply with Institutional Research Board (IRB) rules. Interestingly, 70% of the students agreed that they would participate, even though it simply required a check off box to be involved. Of the sixty-six (66) students who agreed to take the extra credit quizzes, on average a little over 40% took the first four quizzes during the allotted time frame. About half that number (20%) took the final quiz, a drop-off probably due to exam fatigue and the fact that the quiz was offered the day before a holiday, Thanksgiving.

Some other interesting data can be generated by viewing participation. This is summarized below:

Quizzes taken	Responses [percent]
0	18 [27%]
1	11 [17%]
2	12 [19%]
3	12 [19%]
4	8 [12%]
5	5 [8%]

These data suggest that the perceived reward [a maximum of 15 points out of 500 or 3% of a student’s grade, was not enough of a motivating factor to even participate in the study. Overall, only 27% [25 of 95] of students even bothered to take more than 2 of the 5 extra credit quizzes, lowering the probable sample of students who potentially would watch the

Echo360 recordings to a relatively small sample size. In the spring term, the instructors will have to rethink the “carrot” to the students, that is how will they entice them to view the recordings. In retrospect, the instructor did not reiterate when the quizzes would be available, just indicating at the beginning of one of the two classes, that watching Echo360 may be helpful in responding to the quizzes.

Next we looked at the actual viewing of the Echo360 recordings. The following data is overall. To get a feeling of how many reviewed the video capturing of the lectures, the Blackboard system allows you to identify the tool usage over specific periods of time. The instructor taught on Tuesdays and Thursdays from 12:30 to 3:15PM. Quizzes were made available from 6:00 to 11:00PM on the day after a chapter was completed. Thus, we recorded the access to the recordings from noon the day the lecture was completed to 11:00PM on the day the quizzes were due. The actual views are listed below:

Prior to Quiz 1: 43 views, Quiz 2: 44 view; Quiz 3: 9 views; Quiz 4: 5 views; Quiz 5: 1 view.

Obviously, for the first couple of weeks after the extra credit assignment was given, there was some enthusiasm for the project. There was a precipitous drop off in viewing the recordings after this time. This pattern could be because students did not have time or did not see the reward for viewing the recordings, although we do not have data to support this conjecture.

Quizzes were given over material from the second half of the course. A comparison was made to the views over the same time frames earlier in the class, between the finishing of a chapter and midnight the following days. Over similar time frames, there was a total of 3 views over the entire class. This indicates that at least for this professor, who includes attendance as part of his grade, that either his lectures are so clear that review is not necessary (one which the instructor does not profess), that students do not have the time to review immediately after classes, or that the instructor is unclear, making viewing of the lectures a waste of time. These data could be obtained using an anonymous survey in the future.

At the very least, it seems that to view the videos, students need some additional motivation or carrot to do so.

### **Support for Hypotheses**

#### **H1 (Motivation)**

The discussion above indicates that students do not readily see the value of this technology on a regular basis. It may be that reinforcement of the key concepts has to be made clearer. It could be that students who are required to come to class do not see the value of revisiting or reviewing the same material is helpful. Or, it may be that the professor is ineffective in person, thus reviewing this ineffectiveness is not seen useful. We will have to revisit how to make the technology effective.

#### **H2 (Use of technology)**

Anecdotally, based on the conversations after class with some of the better students who the instructor felt comfortable with, students liked the technology for quick reviews. This instructor spent the first couple of minutes each class reviewing what was expected during that period and the following week. A couple of students found this useful, but re-listening to the lecture not as useful. In addition, this class was fact based, not problem solving. Students indicated that they found the technology to be more useful when reviewing concepts which they were having trouble with, rather than reviewing a general discussion as was the case in this class which was pretty conceptual in nature. The authors did not control for differences in teaching style which may be the most important differentiator.

### H3 (Student performance)

The third hypothesis tests the value of the video capture technology. We can get a potential impact by looking at the scores of the students who participated. First, we look at the overall mean score on each of the quizzes, for all students who participated. Note a score of 3 means students got all 3 questions correct, 0 none correct. Overall means for the 5 quizzes are given below:

Quiz 1: 2.4 [n=28]

Quiz 2: 1.8 [n=31]

Quiz 3: 2.0 [n=24]

Quiz 4: 2.6 [n=29]

Quiz 5: 2.0 [n=14]

Certainly, these five quizzes were not of uniform difficulty. From above, we see that the number of views of the video capture technology dropped off sharply after the first two quizzes, we will compare the scores of those who viewed to those who did not for these two quizzes. Given how the data are captured through Blackboard, this turned out to be a time intensive procedure, as each individual had to be examined as to whether they viewed the Echo360 recordings during the predetermined time intervals.

The results follow:

Quiz 1: 2.5 viewed; 2.3 did not view

Quiz 2: 1.85 viewed; 1.70 did not view

Initial findings show a slight benefit from watching the video, but not a significant difference.

## **CONCLUSIONS AND FUTURE WORK**

The authors received a small research grant whose goal was to identify unique ways to try and improve the usage of video capture technology. Our previous experience as evidenced

by views as recorded through Blackboard summary data was that students have not used the technology in the past.

The authors decided on using a rewards based approach. That is, if students viewed the video capture recordings, they would get a reward. In this case the reward was extra credit as measured through online quizzes. To access the quizzes, the students had to go through a two step process, first they had to consent to being part of a research project, a step which simply required checking a box. Second, they had to access a three question quiz, which they could access over a 5 hour, later extended over a 6 hour time frame. They were given 5 minutes to complete the quiz.

The authors spent a significant amount of time setting up the exercise, starting with compliance with the IRB, setting up the rules for access within Blackboard, creating the quizzes, and then adding the appropriate constraints on the quiz access, including availability (allowing sufficient time to process and post the recordings), but soon enough after the class so that there was a direct relationship between the actual class delivery and availability of the recordings and the delivery of the quizzes. Initially we had intended to have a control group, that is one where students were reminded of the quiz availability the other not, but this was not effective because of interclass student communication and the instructors forgetting to remind the active class.

In addition, the instructor made a conscious decision not to remind students beyond an introductory discussion and email of the upcoming quiz dates. This decision may have been to the detriment of the study as there was a sharp drop-off in participation between the second and final 3 quizzes.

These outcomes have led the authors to adjust their thinking for the following term. The following changes will be made.

- Students will be reminded a day in advance of when the quizzes are to be offered.
- Quiz questions will be reviewed by the instructors prior to their lectures. Instructors will make a conscious decision to directly answer the quiz questions during the lectures, with at least one answer being in the first 5 minutes of the lecture, and at least one answer being given in the last 5 minutes of the lecture.
- Quizzes will be lengthened to 5 questions. Three did not seem to be enough of a carrot to get students to participate.
- The first quiz will be easier. This is will be used as a hook to get the students enthused about the benefit of taking the quizzes and watching the lecture capture technology.
- A short survey will be given anonymously to students where we will solicit their opinions on the value of the technology

We feel that LCT has the potential to be helpful to students in the long term. The question remains as to how effectively to get them engaged. One extreme is to pre-record all the classes,

so that students do not have to come to class. Another issue is to determine which types of material are best suited for this capture. We will continue to experiment to see where it may be used to add value to the students while still maintaining the value of the traditional face-to-face instructional methodology.

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