Work In Progress – Student Learning as a Function of Attendance in Large Engineering Classes

Michael Elmore and Koenraad Gieskes
Binghamton University, State University of New York, Binghamton, NY USA 13902-6000
melmore@binghamton.edu and gieskes@binghamton.edu

***Abstract* - This study documents an alternative for freshman engineering students to attending a large lecture in their introductory engineering course. In the fall semester students are required to be physically present in lecture. In the spring semester students are given the option of either being physically present, when the lecture is given, or viewing the recorded lecture. Attendance is recorded in the lecture with an *iClicker*™. Students, who choose to not attend lecture can access the recording on *Blackboard*™ during the same week the lecture is given. The study compares student performance on first semester midterm exam grades with student performance on second semester midterm exam grades. It is seen that students, as a group, tend to achieve the same midterm grade whether they attend the lecture, when it is given, or not. Lecture assignment completion rates are also compared to lecture attendance. Suggestions for further study are given.**

Index Terms – Large engineering classes, student learning, student engagement, student attendance.

INTRODUCTION

Student learning and engagement in large engineering classes is highly dependent on individual learning styles [1]. The traditional lecture format in which instructors transmit information to receptive students is not effective for all students. A dynamic and energetic lecturer, who utilizes the latest technology (clickers, screencasts, smartphones, tablet PCs, etc.) and crafts a thoughtful presentation, can significantly improve student learning and engagement. Even so some students will still remain unengaged, whether due to lack of sleep or the distractions inherent in a large lecture hall. In an attempt to keep the students current on the information covered in class, attendance is required in many lecture classes. For many first-year courses, this provides additional structure that aids the students in their transition from high school to college.

It is thought that if students are given the option of not attending class, then some might misuse that freedom and fall behind in their studies. The consequences of not attending lectures have been extensively studied [2-5]. One concern is that some students may wait until the last minute before studying the material and in doing so will not gain the same level of long-term memory retention as repeated exposure to the material would have provided.

This study documents an alternative for freshmen engineering students to attending a large lecture. At the Watson School of Engineering and Applied Science at Binghamton University the first-year engineering program is comprised of two linked courses each semester: Exploring Engineering and Engineering Communications. Exploring Engineering I & II, each have two components: (1) a one-hour lecture section that meets twice a week, and (2) a one and one-half hour laboratory section that meets once a week. The lecture section is one for which all the students are registered while the laboratory component is split into classes of twenty-five students or fewer. In Exploring Engineering I, the fall semester iteration of this course, attendance is mandatory. However, in Exploring Engineering II students have been given the option of viewing the recorded lecture, rather than being physically present when the lecture is given. Attendance is taken in the lecture with an *iClicker*™. Students, who choose not to attend the lecture, access the recording on *Blackboard*™. Student access to the recording is tracked and serves as 'attendance' at the lecture. Lecture notes are available to both student groups on *Blackboard*™.

Pinder-Grover [6] has investigated the use of Screencasts to supplement lectures, but without the option to attend lecture or not. Ho [7] gave students the option of completing web based training (WBT) or attending traditional lectures. It was reported that the students who attended class had higher grades on assignments and the exam, but numerical results were not presented. Grabe [8] gave students the option of using lecture notes rather than attending the lectures and reported no significant difference in performance.

This study compares the performance of students who attend the lectures with students who choose not to attend and view the recorded lectures instead. Performance on lecture assignments and a midterm exam are compared. Of interest here, is whether student performance varies, when accommodations of this type are made for differences in student learning styles.

COURSE ATTENDANCE

ECHO360™ is the lecture capture system used at Binghamton University. A link for each lecture recording is put on *Blackboard*™ shortly after a lecture is given. Students are given until midnight Sunday the week the lecture is given to view the recording. The recording is only

available and viewable during the week of the lecture, so that students are not enabled to procrastinate until just before an exam. However, the other lecture material, *PowerPoint*™ presentations and other printable material, is made available until the end of the course. *Blackboard*™ uses a *tracking* tool to record the number of times a folder, document, or other object is opened. A course instructor can run a report that provides statistics for the number of times a student in the course opens an object. This tracking tool can be used to record 'attendance' in viewing a lecture recording that has been posted in *Blackboard*™.

When the study was initiated, 'attendance' for viewing the lecture recording was to be tracked. In the fall semester of the course, attendance is part of the final grade. It is believed that freshman students need to be encouraged to attend class to aid in their transition from high school to college. It was intended to continue this policy in the spring semester, while giving students the option of either attending the lecture when it is given or viewing the recording. It was discovered several weeks into the spring semester that the *Blackboard*™ *tracking* tool was not consistently recording when students opened the recording for viewing. After contacting Blackboard, Inc. it was confirmed that there is a problem with the *tracking* tool, which would not be fixed until the next release of *Blackboard*™ [9]. Consequently, it was decided that attendance would only be taken in class with the *iClicker*™ and student attendance would not be considered for grading purposes in the spring semester.

RESULTS

Figure 1 shows a comparison between the fall 2010 semester and spring 2011 semester midterm exam grades. Each exam consisted of 70 multiple choice and true/false questions. The spring 2011 results in isolation appear to suggest that students who did not choose to attend lecture, did more poorly on the exam, even though they had the option of viewing the recording. However, when the fall 2010 grades for same student groups are compared to the spring 2011 grades the same trend emerges. In other words the same students, who chose not to attend lecture in the spring, tended to receive lower scores in the fall too, even though they were present when the lecture was given. The same students, who chose to attend all lectures in the spring, tended to receive higher scores in the fall as well. The spring midterm grades overall are generally lower than the fall midterm grades, presumably because the spring exam was more difficult. The standard deviation of exam grades was 9.6 in the fall of 2010 and 9.2 in the spring of 2011.

Three assignments were given in the spring, which were based on material presented in lecture. While the assignments mostly covered material that was available to students on *Blackboard*™ in the form of *PowerPoint*™ presentations and other printable material, students were told that material that was introduced only during lecture might also be covered on assignments and exams. The trend in the percentage of completed assignments closely parallels that of lecture attendance.

It is worth noting that students, who choose to attend the lectures report that they like the smaller class, whereas students whose choose to only view the recording like the flexibility it affords them with their schedules. Students generally, but not always, chose the same option each week.

CONCLUSION AND FUTURE PLANS

It is the conclusion of this study that attendance at the time the spring 2011 Exploring Engineering II lecture is given did not significantly affect student performance as measured on a midterm exam. A comparison of grades on the fall 2010 Exploring Engineering I lecture with grades on the spring 2010 midterm suggests that student performance is more likely affected by study habits, unrelated to lecture attendance. This preliminary conclusion is supported by the completion percentage of the spring 2011 lecture assignments.

Next academic year this study will be repeated. If the *Blackboard*™ tracking feature is fixed, then the study can investigate if student performance is further affected by both attending lecture and viewing the recorded lecture. Lecture assignments will be given in the fall semester and the percentage completion will be compared to the spring 2012 lecture assignment completion.

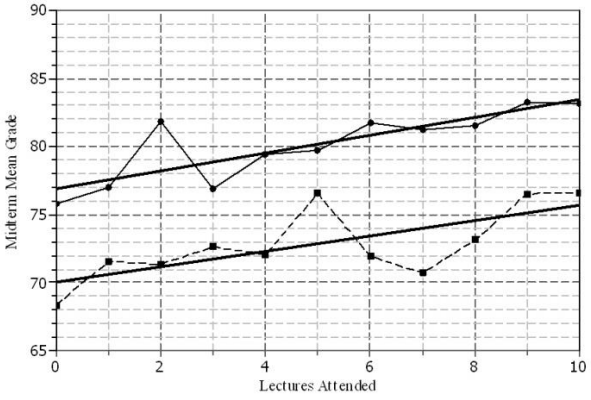

FIGURE 1
MEAN MIDTERM GRADE COMPARISON

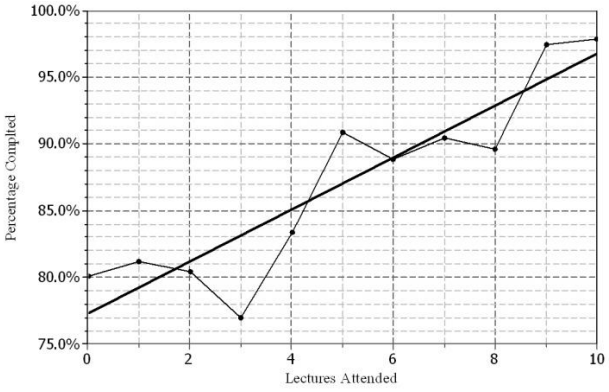

FIGURE 2
LECTURE ASSIGNMENTS COMPLETED

REFERENCES

[1] Felder, Richard M. and Linda K. Silverman. 1988. "Learning and Teaching Styles in Engineering Education". *Engineering Education*. Vol. 78(7), pp. 674-681.

[2] Massingham, Peter. 2006. "Does Attendance Matter? An Examination of Student Attitudes, Participation, Performance and Attendance". *Journal of University Teaching and Learning Practice*. Vol. 3/2. pp. 82-103.

[3] Purcell, Patrick. "Engineering Student Attendance at Lectures: Effect on Examination Performance". September 3-7, 2003. In International Conference on Engineering Education. *Proceedings of the International Conference on Engineering Education*. Coimbra, Portugal.

[4] Lockwood, Peter, Chris Guppy, and Robyn Smyth. "Should lectures be compulsory?". In UniServe Science Assessment Symposium. 2006. *UniServe Science Assessment Symposium Proceedings*. pp. 178-183.

[5] Office of Technology for Education. Carnegie Mellon. "Lecture Webcasting: A Teaching with Technology White Paper". In *Teaching with Technology*. January 2007

[6] Pinder-Grover, Tershia, Joanna Mirecki Millunchick, and Crisca Bierwert. "Work in Progress – Using Screencasts to Enhance Student Learning in a Large Lecture Material Science and Engineering Course". In Frontiers in Education Conference. October 22-25, 2008. *Proceedings of the 38th ASEE/IEEE Frontiers in Education Conference*. Saratoga Springs, New York. pp. F1A-13 to F1A-14.

[7] Ho, Wenyi, Hogan, Doug, Wise, John and Thomas Litzinger. "Work in Progress – From 'Live' to 'Online: A Feasibility Study". In Frontiers in Education Conference. October 20-23, 2004. *Proceedings of the 34th ASEE/IEEE Frontiers in Education Conference*. Savannah, Georgia. pp. S1F-22 to FC3-23.

[8] Grabe, Mark. 2004. "Voluntary use of online lecture notes: correlates of note use and note use as an alternative to class attendance". *Computers & Education*. Vol. 44, pp. 409-421.

[9] Bell, Carol. Assistant Director. University Center for Training & Development. Binghamton University. February 24, 2011. Email to author.

AUTHOR INFORMATION

Michael Elmore, Director and Visiting Associate Professor, Engineering Design Division, Thomas J. Watson School of Engineering and Applied Science, Binghamton University, State University of New York, melmore@binghamton.edu

Koenraad Gieskes, Lecturer, Engineering Design Division, Thomas J. Watson School of Engineering and Applied Science, Binghamton University, State University of New York, gieskes@binghamton.edu