

## **AC 2007-350: THE USE OF ELLUMINATE DISTANCE-LEARNING SOFTWARE IN ENGINEERING EDUCATION**

### **John Crofton, Murray State University**

Dr. Crofton earned his B.S., M.S., and Ph.D. in Physics and his B.E.E. in Electrical Engineering from Auburn University. Before coming to Murray State University in 1994, Dr. Crofton was a Senior Engineer at the Westinghouse Science and Technology Center in Pittsburgh. Dr. Crofton's research work has focused on ohmic and Schottky contacts to compound semiconductors such as SiC and GaN. Additionally, Dr. Crofton is interested in applications of solid state UV sources for water purification.

### **James Rogers, Murray State University**

Jamie Rogers is an assistant professor in the Department of Engineering and Physics at Murray State University. He is also director of the West Kentucky Regional Moonbuggy Competition. He received his Ph.D. in mechanical engineering from the University of Illinois, Urbana-Champaign in 2002. His engineering education research includes the use of emerging technology to enhance instruction, K-12 outreach, and engineering activities for freshman.

### **Caitlin Pugh, University of Kentucky**

Caitlin Pugh is a junior mechanical engineering student at the University of Kentucky - Paducah Extended Campus. she is a traditional student whose primary focus is on school.

### **Kenny Evans, University of Kentucky**

Kenny Evans is a junior mechanical engineering student at the University of Kentucky - Paducah Extended Campus. Kenny would be considered a non-traditional student as he has returned to school after several years in industry. He also works full time.

# **The Use of Elluminate LIVE!® Distance Learning Software in Engineering Education**

## **Abstract**

More and more, people working or wanting to work in engineering and other technical fields who reside in geographically distant locations from a traditional university are demanding that Colleges of Engineering meet their needs through the establishment of remote campuses and through other distance learning alternatives to a traditional engineering education. In meeting this challenge, a variety of delivery methods have been employed including synchronous and asynchronous online delivery in both fully online and hybrid (online and face-to-face) course structures.

This paper describes the details of delivering a hybrid course using a tablet PC with Elluminate LIVE!® (Elluminate), which is a synchronous, online virtual classroom tool. Classes in mechanical and electrical engineering were offered using a hybrid method of instruction where approximately 50% of lectures are face-to-face and 50% are online. Elluminate was also used to supplement lecture material through online help sessions and exam reviews. For both face-to-face and online lectures, all notes were archived for continual student access.

Specifics on the technology required for both delivery and reception of the lectures is given along with the strategies employed to ensure optimal interaction between the instructor and students. The views of the two faculty who taught the aforementioned courses show that using a web-based, real-time virtual classroom software is an effective and efficient method of instruction but does have some disadvantages including feeling disconnected from the students during online lectures. Lessons learned include the ineffectiveness of trying to apply traditional approaches of lecture in online delivery.

Views from two students, a non-traditional student who attended lectures primarily from work or home and a traditional student who attended lectures on campus, include mixed reviews on web-based lectures. However, both felt that Elluminate was effective in delivering material but the traditional student preferred face-to-face interaction which was an expected outcome. Challenges of the online approach discussed by the students include difficulty in concentrating and limited interaction during online lectures. The students also suggest that as a supplement to lecture, Elluminate is an extremely effective resource.

## **Introduction**

The need for an increase in the number of engineers in the U.S. has prompted colleges and universities to establish non-traditional Colleges of Engineering in an attempt to make engineering education opportunities available to students that may not otherwise consider a career in engineering. One such program is the University of Kentucky-Paducah Extended Campus Engineering Program that is located in Paducah, Kentucky on the campus of a regional community college. This is a joint engineering program between the University of Kentucky and Murray State University with approximately one-third of the faculty residing in Murray,

Kentucky, 50 miles from Paducah. As an alternative to commuting to Paducah for their two-day-per-week course, faculty recently experimented with using Elluminate, a web-based, real-time virtual classroom software, to deliver a portion of the lectures.

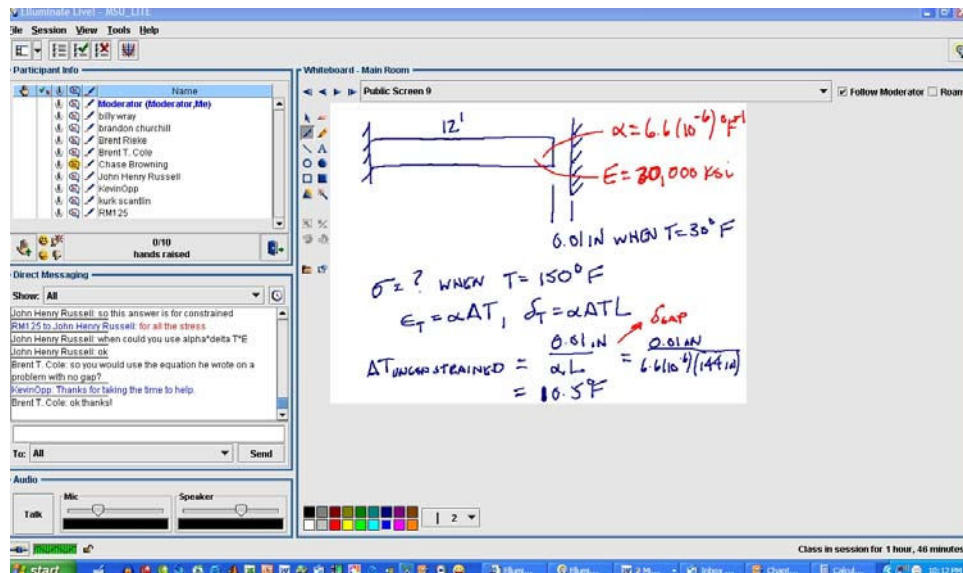
This paper describes the details of delivering a hybrid course using Elluminate. We begin by describing the features and mechanics of Elluminate including examples of lecture notes and class discussion. We then describe how the course was structured in order to provide the most faculty-student interaction within the hybrid learning environment. The faculty then present their opinions on the advantages and disadvantages of using a web-based virtual classroom software. Specifically, we discuss the feasibility of using the software as a *substitute* for face-to-face instruction and as a *supplement* to face-to-face instruction. The faculty opinions are contrasted with the views of two students: a non-traditional student who attended most online lectures from work or home and a traditional student who attended online lectures on campus. Finally, we summarize these findings and discuss how the success or failure of the delivery method is directly related to student motivation.

### **Description of Elluminate LIVE!®**

Elluminate LIVE®<sup>1</sup> is an award-winning, web-based collaboration software that allows the instructor to duplicate much of the benefits of a face-to-face lecture in an online environment. Features include real-time, online collaboration where both the instructor and students can interact via an interactive whiteboard and/or through application sharing. Audio interaction, including simultaneous talking from multiple participants, is provided through full-duplex voice-over-IP. Communicating through text messaging is also available and is the most often used form of communication by the students. A unique feature of the text messaging is the ability of students to send private messages to the instructor which helps when the student thinks they might be asking a “stupid” question. The live polling feature is a useful tool in assisting the instructor in judging student understanding and/or interest in a topic. Other features include live webcam video, multimedia delivery, synchronized web tours, file transfer, breakout rooms and recording and playback capabilities. As one can see, there is very little technology-wise one cannot do with this software that they can do in a face-to-face lecture.

For lectures and help sessions, we predominantly used the interactive whiteboard, application sharing, text messaging, and VoIP capabilities of Elluminate. Figure 1 is a screenshot from a help session using the interactive whiteboard. PowerPoint slides can be easily imported into this whiteboard as can image files. With a tablet PC, the instructor is able to annotate directly on the whiteboard using a variety of colors and can even highlight. Students can also write and draw on the whiteboard although this was used sparingly since the students did not have tablet PCs. After lecture, the annotated whiteboard slides can be exported as PDF files and archived for continuous student access.

The archiving of annotated notes presented an unexpected problem in the mechanical engineering class since the instructor annotated on prepared PowerPoint slides. Therefore, since two different software packages were used for annotation, the annotated notes had to be combined by converting both sets of notes to PDF and combining files in Adobe Acrobat. While not a large issue, it was somewhat tedious. A simple solution was to application share Windows



**Figure 1: Screenshot of an Elluminate session using the interactive whiteboard. The whiteboard allows both the instructor and students to write on the whiteboard in order to work through a problem or concept together.**

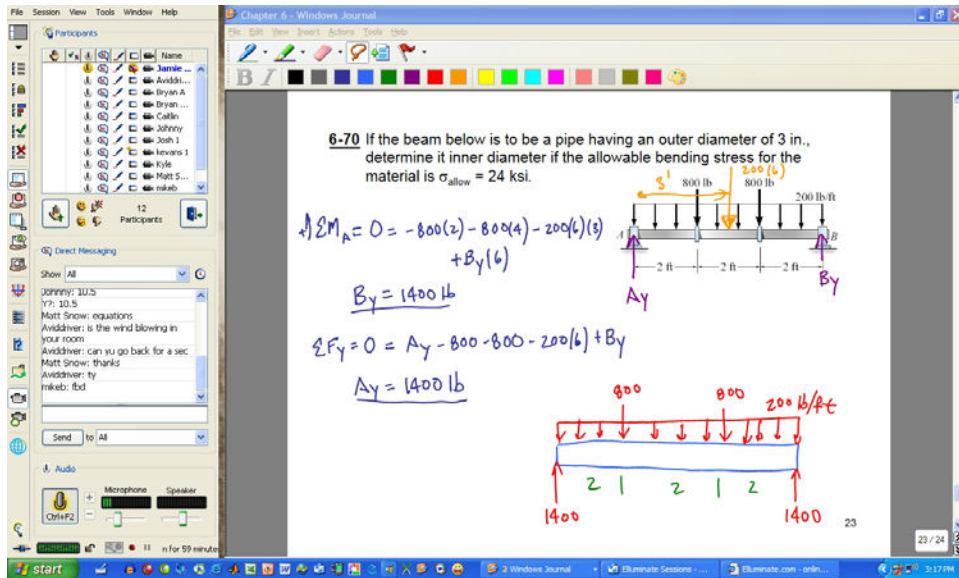
Journal as shown in Fig. 2 which allowed the instructor to annotate within the same file whether teaching face-to-face or online. Students could still annotate on these notes as the instructor could give them control of the shared application.

## Hybrid Course Structure

From the beginning of the joint engineering program with the University of Kentucky – Paducah Extended Campus, faculty from Murray State have always commuted twice a week in order to deliver classes in a face-to-face format. In experimenting with alternative approaches, two faculty decided to try a hybrid course structure by delivering one lecture per week face-to-face and the other lecture using Elluminate. The only exceptions were exam weeks in which the faculty traveled both days in order to provide the necessary interaction and support required as the students prepared for the exam. The faculty also supplemented lectures through scheduled virtual office hours and exam reviews using Elluminate.

Face-to-face lectures were held in a typical engineering classroom using a tablet PC and data projector. Notes were generated on the tablet PC using Windows Journal, as shown in Fig. 3, which allowed them to be archived for continuous student access. Weekly homework assignments were assigned during face-to-face lectures and were also turned in during face-to-face lectures. Any group assignments were included in face-to-face interactions as well.

For the online lectures, the students were encouraged to attend from any convenient location including home, work, or on campus, and at least one student did attend from each of these locations. Unfortunately, the technology and environment provided for those students who chose to attend on campus was disappointing. It was a case of applying traditional classroom ideals to a non-traditional format. The computers that students were provided with on campus were located in an “old-style” computer classroom with CRT monitors mounted in the desks. Further,



**Figure 2: Screenshot from an Elluminate lecture. Structured PowerPoint notes have been imported and annotated on. Note the text messaging and instructors view of participants on the left.**

instead of each student being able to use a headset with earphones and a microphone, one computer was connected to speakers which broadcasted sound to the entire room. Each computer however did have a microphone for the students to use in order to ask questions. As will be discussed later, providing a traditional style classroom for an online lecture is a recipe for disaster. Unfortunately, this classroom setup was beyond our control so the students were simply encouraged to log on elsewhere if possible.

The fact that the distance learning faculty are only on campus twice a week has always been an issue when it comes to student interaction outside of class. Over the past few years, faculty have tried several different approaches in order to increase interaction including using Interactive TV, which is a state-wide video conferencing system, text messaging, and virtual office hours using the Virtual Classroom feature of Blackboard. With the added features of Elluminate as described previously, it was chosen for virtual office hours and for exam reviews.

It was during virtual office hours, that the true interactive capabilities of Elluminate were apparent as students asked questions via text message and audio. In some cases, those questions were conceptual and the instructor was able to give a satisfactory answer audibly. However, in most cases, the instructor and students used the interactive whiteboard to draw diagrams and work through problem solutions. In one exam review, a student prepared a figure in PowerPoint and saved it as an image file and then imported it into the whiteboard. The students and instructor were then able to draw on that image and work through a solution.

## Faculty Opinions

### *Elluminate as a Substitute for Face-to-Face Lectures*

As mentioned previously, the capabilities of Elluminate are so various that there was nothing that could not be done in Elluminate that could be done face-to-face with maybe the exception of

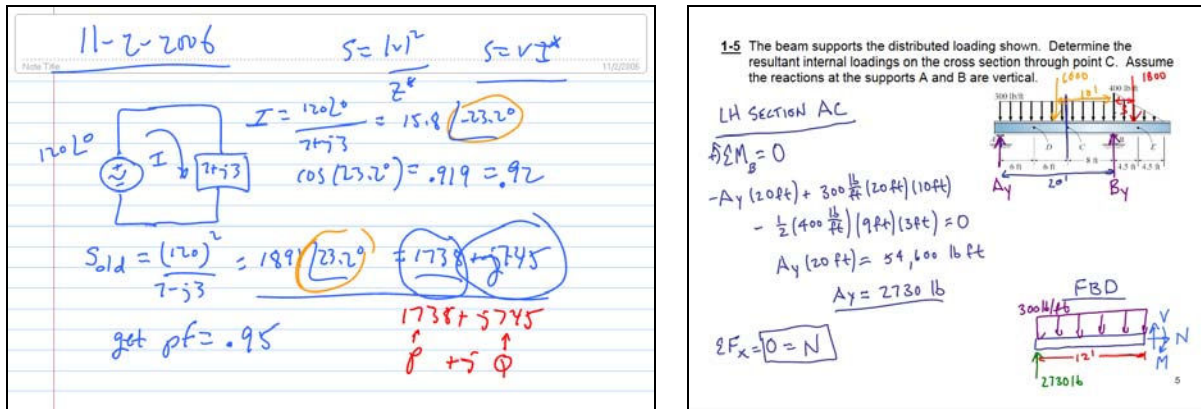


Figure 3: Examples of notes generated in Windows Journal. An easy-to-use import feature allows the instructor to use structured PowerPoint notes within Windows Journal.

proctoring exams. Further, the beauty of the hybrid structure of delivery was that if we felt limited by the online tool, we could postpone that activity until the next face-to-face interaction. While we both prefer face-to-face interaction with students since it really is impossible to duplicate the dynamics of such a classroom online, we feel that Elluminate is a useful and effective tool for delivering lectures in a hybrid or fully online course.

By using Elluminate to deliver one lecture per week from the comfort of our office as shown in Fig. 4, we were able to free up two or more hours in our work week that would normally be spent on the road. Having become accustomed to not having those two extra hours, it was amazing how productive they were. Cutting out one travel day also relieved some of the fatigue that accompanies traveling back-and-forth between campuses. Knowing that we would only have to travel once-per-week, also allowed us flexibility in scheduling our classes at an early morning hour (8:00 am) that we would normally avoid.

The primary drawback from a faculty perspective to using Elluminate is the lack of face-to-face interaction with the students during lecture. This makes asking and answering questions more difficult, though not impossible, and also eliminates the instant feedback given by the facial expressions that indicate comprehension of the presented material. The importance of this can only be determined by each individual faculty member along with the students in the class.

No matter how good it is, no technology can ever replace the classroom dynamics and faculty-student interaction afforded in a face-to-face lecture. However, when meeting face-to-face is not optimal for either the faculty or students, Elluminate is an excellent tool for providing course content while still allowing for interaction with students.

### *Elluminate as a Supplement to Lecture*

As a supplement to lecture, through weekly office hours or review sessions the evening before exams, Elluminate is a wonderful tool. Interestingly enough, when the students motivation was at its peak, like the night before an exam, the faculty-student interaction on Elluminate was astonishing. Students were more likely to use audio to ask a question and were much more likely to collaborate with the instructor on the whiteboard.



**Figure 4: Ability to use Elluminate to deliver lectures from the comfort of your office provides time-savings and flexibility in scheduling.**

The flexibility of holding office hours and review sessions at any hour allowed us to schedule around the busy schedules of some of our students while balancing our own responsibilities at home. The fact that we could log on and hold the session from any computer with internet access meant that just five minutes after putting our kids to bed, we could be online interacting with our students.

Given the various capabilities of Elluminate and the increased student motivation, some of the best interactions we had with students, including face-to-face lectures, were during Elluminate review sessions. Even if we never used Elluminate as a substitute for a face-to-face lecture again, the convenience for both the faculty and students makes Elluminate worth every penny as a supplement to lecture alone.

### **Student Opinions**

In order to provide insights from students, two students: a traditional student who focuses primarily on her courses and a non-traditional student who has to balance coursework with his family and work, agreed to coauthor this paper with us. To stimulate their feedback, we simply asked them to first comment on Elluminate as a substitute for lecture and then to comment on it as a supplement to lecture.

#### *Comments from a Non-traditional Student*

Elluminate is a very effective substitute for in-class lecture for students who need an alternative to traditional classes. As a non-traditional student with a full time job, time constraints are the biggest challenge I face in my effort to advance my education. The use of Elluminate technology helped alleviate some of the burden of trying to reschedule work hours to allow for campus time needed for classes. The class time combined with travel time to and from campus required up to three hours of work to be rescheduled for one class. The ability to log on to the

Elluminate site and hear the lecture from work or home eliminated a lot of the stress I normally experience trying to juggle time for work, school and family. The whiteboard and application sharing of the Journal notes allowed me to see the class notes as the lecture was taking place, and even gave me the means to write or draw on the board if I had a question that needed visual reference. The audio feature allowed me to hear the professor in real time and likewise ask questions. The visual and audio sometimes lagged behind because of the ISP connection at my home, but this was a minor aggravation and caused no real problem in my ability to receive and understand the lecture. In my opinion, there is no substitute for face-to-face delivery of a lecture, but for students who are limited on the amount of time available or the amount of traveling they are capable of, Elluminate is a very valuable tool for educational purposes.

Elluminate is an extremely beneficial supplement to face-to-face lectures. Being able to schedule online review sessions before tests was extremely helpful particularly for those last minute questions that manage to surface just prior to test time. Rather than trying to catch the professor in his office or waiting until test time to ask those last minute questions, these review sessions allowed me to clarify the questions and resume studying without any confusion. The ability to log on from any computer with an internet connection made it possible to review from home instead of having to be on campus. The interactive feature of the whiteboard made it possible for me to write out questions or draw examples of problems I needed clarification on, in addition to asking questions verbally. As a supplement to face-to-face lecture, I found Elluminate to be an invaluable tool.

#### *Comments from a Traditional Student*

In both classes I have taken in which Elluminate was used, half of our lectures were delivered face-to-face and half were given using Elluminate. This gave a great opportunity to compare Elluminate to conventional lecturing. In my experience, the face-to-face lectures are more successful in conveying the lecture material to the students; however, Elluminate was not completely unsuccessful. The program is easy to use. A student can electronically raise his or her hand and ask a question through either a microphone or a text message. The students can also use the whiteboard to help better demonstrate a question. The ability to access archived notes is very convenient for students.

I found that it was harder to concentrate on the class material when the lecture was delivered via Elluminate. It is much easier to concentrate when the professor is in front of you as opposed to staring at a computer monitor. For many students, being on the internet only brings added distractions. Consequently, attending online sessions in the same room with other students made it more difficult to concentrate as it only took one distracted student to negatively affect the environment for all in the room. I would have preferred the ability to log on from a quiet location using a wireless notebook computer. When using Elluminate, the audio would lag occasionally which was also a distraction. With all of this in mind, I do not believe Elluminate is a good substitute for face-to-face lecture.

As a side note, I also found that the online lectures given using Elluminate were more successful when the professor had slides of notes prepared in advance to import into the whiteboard or



application share using Windows Journal. This provided a good template and saved time by having examples set up ahead of time.

When Elluminate was used as a supplement for lecture, I believe it is a very useful asset. We used it for online office hours and test reviews. Elluminate was great for test reviews because the sessions could be scheduled at a time of most convenience and everyone could participate from a location of greatest convenience. Scheduling Elluminate for office hours was also very helpful since the professors were not on the same campus and therefore not available for office visits. This gave students a mode of asking questions that is better than using email, phone, or other means. Elluminate is definitely a good supplement to face-to-face delivery of lecture.

## **Conclusions**

While no online delivery tool can truly reproduce the dynamics of a face-to-face lecture, the capabilities of Elluminate LIVE!® make it an excellent tool when face-to-face interaction is not practical for students or faculty. From a faculty perspective, the opportunity to eliminate the two-hour travel time to and from campus and the fatigue that accompanied that travel made Elluminate a wonderful method to deliver lectures in a hybrid course structure. While the faculty did notice a decrease in interaction during online lectures and students report some difficulty in concentrating during online lectures, we all believe that this is due, in part, to a decrease in motivation in the students. Since faculty have always delivered face-to-face lectures in this joint engineering program, face-to-face delivery has become the student expectation. Therefore, when the traditional students felt we were using Elluminate as a convenience for us, which was the case for lecture, they were less motivated and the tool was less effective. However, when the students felt the use of Elluminate was convenient for them, which includes lectures for non-traditional students and review sessions for all students, their motivation increased greatly as did the effectiveness of Elluminate as a delivery method.

## **Bibliography**

1. Elluminate LIVE!®. [www.illuminate.com](http://www.illuminate.com)