An Engineering School's COVID 19 Response to Fall Instruction (or how I spent my 2020 summer)

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Abstract

In March 2020, due to the COVID-19 pandemic, universities across the US closed to in-person instruction and moved their classes online. Uncertainty prevailed during the summer regarding how to safely reopen schools for the Fall 2020 semester. This paper explains how the Mercer University School of Engineering developed plans and procedures for offering in-person instruction while also accommodating students who were unable to return safely to the classroom. Through the Fall 2020 semester, Mercer University was one of the few universities in the country to successfully remain fully open with faculty simultaneously serving in-person instruction and on-line students when necessary.

Keywords

Instructional equipment, training, COVID-19 response

Introduction

On March 14th, 2020, like many institutions across the US, Mercer University sent students home because of the COVID-19 pandemic. Classroom instructors were given a week to move their classes online for the remaining 6 weeks of the Spring semester. Instructors rose to the occasion and generally finished the online semester without major incidence. Instructors' approaches to online instruction varied, including synchronous Zoom™ sessions; asynchronous videos captured by phones, document cameras and web cameras; or simply emailing instructor's notes; however, the effectiveness of these methods can vary[1].

Sensing that Fall 2020 would be different from previous Fall semesters, the Mercer University School of Engineering (MUSE) administration considered what instruction might look like. Some primary considerations included: additional sections of classes; face to face or online instruction; or a hyflex combination of both face to face and online. There were really no answers at the beginning of the summer in order to plan. With a national shortage of web cameras when most institutions across the US moved to online instruction in the Spring, MUSE realized the need to immediately plan and implement multiple solutions.

Early on, because of the uncertainty, we informed our faculty that they should plan on teaching face-to-face and to record their lessons. They could record lessons separate from face-to-face delivery, or record their face-to-face lesson.

So, the primary objective was to come up with a way to minimize the workload on faculty while meeting an unknown set of instructional requirements for the Fall. We had 3 months. What follows is an explanation of how we addressed primary components of instruction including

classroom instructional equipment, recording software, training, social distancing constraints, and schedule changes.

Classroom Instructional Equipment Enhancements

For Fall 2020, faculty were required to record their lessons and make them available for students unable to attend class. Instructors were given the option to record lessons separately from their classroom delivery or record their live classroom sessions. A first guiding principal for classroom instructional equipment was to provide faculty with the ability to capture and record their classroom instruction. A second guiding principal was to standardize, as much as possible, the computing and audio-visual equipment in each classroom because instructors move between classrooms.

At the turn of this century, only one MUSE lecture room was equipped with a computer and overhead projector. By the late 2000s however, MUSE had installed computers and overhead projectors in most of their 20 lecture rooms. The computers were mostly older models, often repurposed when a faculty received a new computer for their office. MUSE was also responsible for maintaining this equipment. Then in the early to mid-2010s, Mercer University formed an Audio-Visual department to centrally manage and maintain AV equipment and standards. In 2015, the AV department began upgrading a few MUSE classrooms each year with a Mercer University standard teaching platform. By January 2020, 14 of the 20 MUSE classrooms were equipped with the new AV standard.

Given the state of MUSE's classroom computing and AV capability, three immediate steps were taken during the summer of 2020 to prepare for recording lessons:

1. Upgrade computers and monitors - The first action MUSE took in the summer was to immediately place orders to upgrade the computers and monitors for the 6 rooms containing old systems. These computers were received and upgraded by the IT department by July.
2. Wall-mounted cameras and document cameras – All but 7 of the classrooms contained desktop document cameras. We immediately purchased document cameras which arrived and were installed throughout the summer. The AV department, in conjunction with Mercer's Center for Teaching and Learning, settled on wall-mounted cameras that could capture classroom instruction, including clear images of anything instructors wrote on whiteboards. Wall-mounted AverCam™ video cameras with panning and zooming capabilities were installed in all 20 MUSE classrooms by the end of July.
3. Classroom Audio – To capture the instructors' voice and classroom conversation, the AV department installed Jabra™ echo canceling microphones. MUSE also purchased a few voice amplification devices to help soft-spoken faculty project their voices while wearing masks.

With plans in place for hardware and orders being received and installed, our focus shifted to software.

Recording Software

In 2012, Mercer University implemented the Echo360™ video capture system and software in two of their professional schools — the College of Pharmacy and the School of Medicine. The Echo360 environment was limited to a handful of classrooms equipped with cameras and microphones embedded in the ceiling, along with microphones at student seats. The Echo360 DVR appliances complemented a connectivity infrastructure that also provides a live video link between campuses in these equipped rooms. Management of Echo360 up until August of 2020 was maintained within these two schools. Faculty members were largely unaware of Echo360 and simply consented to have their classes recorded. No live broadcasts were conducted using Echo360.

In June of 2020 following the nationwide quarantine due to Covid-19, Mercer widened the scope of their contract with Echo360 to include use of its Universal Capture software for all faculty members across all 12 colleges and schools (approximately 1,000 professors plus an indefinite number of adjuncts). This contract extension included unlimited downloads of the personal version of Universal Capture available for faculty and students and implementation of the classroom version for all classrooms. Mercer IT integrated Echo360 and Zoom fully within Canvas™, Mercer's chosen learning management system.

Training

Each college and school deans' offices developed guidance for faculty on when to record classroom sessions or when to broadcast live (which also captures a recording). The school of engineering decided that all classroom sessions would be recorded, regardless if students were missing due to COVID or not. Faculty could choose to record their face to face lesson in the classroom, or could record their lesson separate from their classroom instruction.

For training on the Echo360 platform, MUSE turned to Mercer's Center for Teaching and Learning. During June 2020, Echo360 beginner sessions were offered to faculty members, followed by advanced sessions in July. The Center for Teaching and Learning also created an Echo360 Instructor Course in Canvas as a repository of recordings from training sessions and other support information. Mercer AV and the Center for Teaching and Learning held live demonstrations in classrooms across the University, posted job aids in every classroom, and sent multiple how-to emails to faculty along with supporting documentation online. Additional training was provided on Canvas, particularly for course organization, with the expectation that students need to rely more on an expanded use of our learning management system.

Social Distancing in Classroom

Prior to 2020, the term "social distancing" was not part our lexicon. Now "social distancing" needs no explanation. Our rising sophomores, juniors and seniors had already registered for Fall classes. Thus, one of our greatest fears at the beginning of the summer was how COVID social distancing guidelines would impact our class registration. Would we be required to cut our classroom enrollment capacities in half? Would we have to offer additional class sections? Would we require our faculty to teach a larger load, and who would ask them?

Initially we began analyzing the impact of cutting our class capacities in half. Under this scenario, all the above fears were realized. Fortunately, the Provost's Office worked with an infectious disease physician to develop guidelines, and subsequently measured and spaced our classrooms and set new COVID classroom capacities. In general, these capacities were about 75% of pre-COVID capacities.

To execute these new COVID classroom capacities, we removed chairs and arranged the seats in a checkerboard pattern to minimize potential aerosol transmissions. We also set classroom capacities in our registration system and adjusted class rolls to fit the new standards. We were spared from significant impact since our Junior and Senior level courses are generally smaller than room capacity. We also have several "large" classrooms. Also, we had not registered freshmen, so we were able to set the capacities of freshmen courses to the revised COVID capacities. That left sophomore classes to resize. We moved several of the larger registrations to the larger classrooms and moved some students between sections. Fortunately, we could identify when a student registered and moved only those who were last to register.

Schedule Change (increased time between classes)

The Provost's Office also increased class transition time from 10 minutes to 20 minutes. The longer times between classes would allow for temperature scanning upon classroom entry and / or use of disinfectant to clean surface areas and time to setup Echo360 or Zoom recordings.

The impact of this increase was to spread the schedule later in the day. For example, graduate courses that normally met from 6-9pm were moved to 7:20-10:20pm. Needless to say, this caused numerous concern among those teaching late courses.

To address these concerns, the only approach we could devise was a brute force method. We first let the schedule spread out. Then we looked at the schedules of all the students enrolled in these "late" classes to determine if we could move the class to an earlier time. Ultimately we were able to move all but 3 graduate courses to the earlier time slot.

Results

By the first day of the fall 2020 semester on August 17, nearly 200 classrooms across Mercer were equipped to broadcast instruction live by Echo360 or to record instruction. From August 17-31, 2020, Mercer University produced 15,500 hours of instruction video using Echo360, 11,300 of which were live broadcast hours to students outside the classroom. Since some professors use Zoom in the classroom instead of Echo360, which is an acceptable delivery solution with our technology configuration, these numbers are lower than the actual amount of instruction captured via video transmission. Total Echo360 capture hours are illustrated in Figure 1, below, which shows prior use of Echo360 from October 2019-July 2020 in just two of our schools (Medicine and Pharmacy) and university-wide adoption in August 2020.

Although we expected to use Echo360 and Zoom primarily to push instruction to absent students, an unexpected benefit has been that students often revisit recordings of class sessions to supplement their understanding. A study by Rahman, Rahman Shah, and Chowdhury in Computer Applications in Engineering Education[2] explores the idea that student attention and concentration often lags during class and that students often review recordings, fast-forwarding

to parts of the class session that they did not understand well. They note this is especially true for non-native English speakers, who often listen to parts of recordings multiple times. These authors also note that students' overall stress level about missing class is lower because they can rely on the lecture video capture to keep up; they report also that 70% of students surveyed believed lecture capture helps raise their grades. While we were aware of this phenomenon among students in our Medicine and Pharmacy schools, we have seen similar encouraging signs in our undergraduate and graduate students in our other colleges and schools.

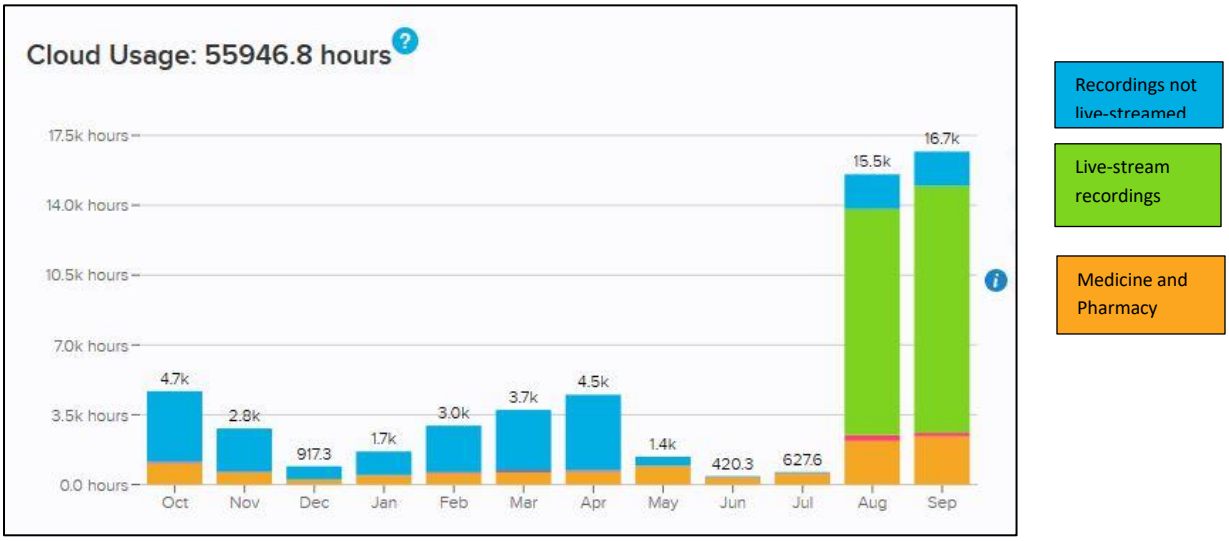

Figure 1: Echo360 video hours captured October 2019-September 2020

Summary

After learning from the spring semester of 2020, Mercer University instituted a plan that allowed classes to be both in person and online. New software and equipment were purchased and the faculty trained to use the equipment well in advance of the upcoming fall semester. Social distancing was optimized in all spaces and additional time provided between classes to allow students and faculty to clean and to allow spaces to be completely empty before the next set of classes began. All of these have allowed the university to continue in a business as usual fashion and for the most part have produced positive responses from students and faculty.

References

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Biographies

Susan Codone is a Professor of Technical Communication and the Director of the Center for Teaching and Learning. She has been at Mercer for 19 years and holds a Ph.D. in Instructional Design from the University of South Alabama. She is a Fulbright Specialist and a Georgia Governor's Teaching Fellow.

Stephen Hill earned his Ph.D. from Georgia Institute of Technology. He is currently an associate dean and associate professor at Mercer University School of Engineering. He worked for Schlumberger Oilfield Services for 14 years before returning to academia in 2013 to pursue his goal of educating the next wave of engineers entering the work force. His experience in the work force was in product development of downhole tools related to the extraction of oil and natural gas from various reservoirs. His current research interests include impact erosion, wear, two phase flow phenomena, solid/liquid phase change, desalination, and highly ionized plasma.

Laura W. Lackey joined the faculty at Mercer in 1998; she currently serves as Dean, Kaolin Industry Chair, and professor of environmental engineering. She has taught more than 20 different courses that ranged from Introduction to Design to a variety of senior- and graduate-level courses. Dr. Lackey received the School of Engineering Teacher of the Year Award in 2001, 2007, and 2015. She was named to the All-SoCon Faculty Team in 2016, and in 2020 was chosen as one of the top 100 women in Georgia Engineering by the Engineering Georgia magazine. Before coming to Mercer University, Dr. Lackey worked for six years as a chemical engineer for the Tennessee Valley Authority. She earned a Ph.D. in chemical engineering from the University of Tennessee in 1992, and she is a registered professional engineer and a Board Certified Environmental Engineer.

Scott R. Schultz is the senior associate dean and professor of industrial and systems engineering at Mercer University in Macon, Georgia. He has been at Mercer University for 19 years. He also consults at the Mercer Engineering Research Center in Warner Robins, Georgia. He comes from an industrial background with thirteen years of experience with Ford Motor Co. in Dearborn, MI and Windsor, Ontario and two years of experience at the North Carolina State University Furniture Manufacturing and Management Center. His primary research and teaching interests are in scheduling, heuristics and process modeling. He is a past president of the ASEE-SE section.