SYMPOSIUM ARTICLES

Sparking curiosity and engagement through online curriculum

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ABSTRACT In 2020, classrooms across the country abruptly transitioned to emergency remote learning in response to COVID-19. Instructors quickly searched for guidance on ways to present course material in an online format that would still allow for course learning outcomes to be met. Perhaps the greatest challenge cited by instructors was engaging students when face-to-face meetings were not an option. This becomes an even greater challenge in poultry and animal science curricula that encourage hands-on learning. Most first year students are unaware of the opportunities in the animal agricultural industries and engagement in the classroom is one way to spark curiosity and interest in the subject matter. The abrupt change to online teaching challenged many instructors to rethink their teaching strategies and explore teaching pedagogies to engage students in an online student-centered learning environment. An outcome from this challenge was an increased comfort and efficacy, for both students and instructors, of applying pedagogical approaches to enhance online learning. A symposium at the 2021 Poultry Science Association brought together instructors of poultry and animal science courses from across the country to discuss the challenges and successes of implementing on-line instruction and engagement in response to COVID-19. A consistent commentary among the participants of the symposium concerned an increased desire for collaboration and dialog concerning effective pedagogical approaches among instructors of poultry and animal science courses. Thus, a summary of the symposium's presentations, as well as thoughts from a student panel, concerning effective online teaching and learning is presented.

Key words: remote learning, undergraduates, student engagement

SECTION 1: DEVELOPING AND MAINTAINING INTEREST IN A GLOBAL PANDEMIC

Elizabeth L. Karcher

COVID-19 Challenges

In March 2020, students and instructors from around the world were faced with an abrupt transition to remote emergency learning. This rapid change challenged many instructors to rethink their teaching strategies and explore teaching pedagogies to engage students in an online student-centered learning environment. Traditionally, faculty in Agriculture has been resistant to distance education (Boland, 2017). The lack of familiarity with teaching online and other perceived technology issues were cited by many as a key challenge in 2020. As instructors scrambled, there was also frustration over lack of student communication during this time period. Complicating the matter was the variation in instructor support and trainings offered by institutions. This support was necessary to promote self-efficacy amongst instructors hesitant to teach in the online learning environment.

At the same time, students also felt their own unique challenges. Students reported a negative impact on their physical and mental health (Yang et al., 2021). This came primarily in the form of perceived stress. Many students felt an increase separation from school, suffered from feelings of anxiety related to the COVID-19 pandemic and experienced perceptions of increased workloads. Students also expressed feelings of lack of engagement with their peers and with their instructors (Walker and Koralesky, 2021).

COVID-19 Opportunities

Despite the many challenges associated with emergency remote learning, there were several positive opportunities that arose. There was a sense of resiliency as instructors engaged with peers from across their university, country, and even the world. These discussions on best practices in online teaching and assessment provided opportunities for instructors to further develop their teaching skills. Perhaps even more important, discussions allowed time for instructors to critically reflect on the impact of changing teaching strategies on student learning. For many, the adopted teaching pedagogies in 2020 will carry over into their classroom as we return to face-to-face instruction. Online learning also provided a space to break down the physical walls of a classroom. In the virtual format, instructors could now have students engage with guest speakers and content experts from around the world.

Promoting Student Engagement

Year 2020 highlighted questions related to best practices in engaging students in online learning environments. Both students and instructors reported feeling disengaged with courses. Student engagement in a course is critical to student performance and persistence. Engagement is described by Schindler et al. (2017) as having 3 integrated components: behavioral, cognitive, and emotional. Each of these unique components is necessary to engage students and promote success. Fortunately, there is recent evidence that suggest which online teaching strategies are least effective at creating student engagement. These include lecture-based instruction (Erickson et al., 2020) and asynchronous learning (Walker and Koralesky, 2021).

Walker and Koralesky (2021) surveyed 140 students at the University of British Columbia and had students self-report which synchronous teaching strategies were most engaging. Of students surveyed, 73.0% (n = 111) found answering instructor-led polls to be most engaging, followed by instructor interaction with the chat function during class (70.6%; n = 109). The majority of students also noted increased engagement when seeing a hands-on demonstration of an activity "live" through virtual technology.

During Spring of 2021, researchers at the University of Wisconsin collected data from 10 instructors and 261 students in the Animal and Dairy Science Department (Erickson and Wattiaux, 2021). Overwhelmingly, instructors (70%) reported having little to no experience with online teaching prior to the transition to emergency remote learning. Interestingly, the majority of students (72.5%) had little to no experience taking courses primarily online and more than half (52.1%) indicated a negative impact of online learning on their engagement. Social presence was included as a factor that predicted student satisfaction and engagement outcomes. In teaching, social presence can be defined as the ability of students within the class to project themselves, socially and emotionally, through a variety of communication methods (Garrison and Anderson, 2003). Increasing social presence in a classroom can lead to increases in student motivation that can have positive impacts on student performance. Instructors may consider adopting the following strategies to increase social presence in the classroom: 1) including both instructor and student introductory videos; 2) utilizing polls and word clouds; 3) creating online collaborative team projects; 4) offering convenient online office hours; and 5) engaging students with technologies such as Kahoot and Google Jamboard.

Additionally, preliminary data presented at the North American Colleges and Teachers of Agricultural Annual Meeting in June 2021, indicated that students enrolled in an Introduction to Animal Agricultural Course (n = 161; Purdue University) in Fall 2020, preferred synchronous online delivery compared with asynchronous methods (Simmermeyer et al., 2021). Using the Situational Interest Scale (Chen et al., 1999), synchronous lectures increased student attention demand and instant enjoyment compared with asynchronous online learning modules. Overall, synchronous remote formats were associated with greater student situational interest. This is important because situational interest can lead to a more sustained personal interest that may influence student engagement, performance, and career decisions.

In conclusion, the transition to emergency remote learning in March 2020 was chaotic for both instructors and students. However, with support, instructors adopted learning strategies to engage students despite the lack of face-to-face instruction. Much of what was learned in the last 18 mo can continue to be incorporated into the learning environment as we transition back into the campus classroom.

SECTION 2: A DEPARTMENT'S RESPONSE TO THE COVID-19 CHALLENGE: EFFECTIVE STRATEGIES FOR ONLINE ENGAGEMENT AT IOWA STATE UNIVERSITY

Dawn Koltes

In a world prior to March 2020, Iowa State University, like other universities, was going about normal activities that included large and small lecture classes, field days held on-site, experiential learning through hands-on laboratories and activities to reiterate lessons learned in the classroom. Student-led organizations met per usual allowing club members the opportunity for networking, applying knowledge learned in the classroom and the ability to gain new skills. Then, as spring break approached in the middle of March 2020, the discussions of a virus sweeping the globe causing illness led to increasing uncertainty among faculty, staff, and students. At Iowa State University, an announcement was made prior to the start of spring break informing faculty that they would be providing 2 wk of instruction online. Soon, practical questions regarding how to convert face-to-face instruction into an online platform were

discussed. Other external factors were also considered such as one's home environment and current resources available or a lack thereof.

To start addressing these challenges, a group of faculty members began to meet virtually, bi-weekly, to discuss matters centered on converting to virtual learning, including student motivation during the pandemic, and how to effectively engage students in this new, virtual, environment. Despite the differences noted in class format, class size, and instructor pedagogy, these faculty members found comfort knowing their colleagues were struggling to sort through similar issues and concerns. These 3 areas were 1) the engagement strategy or tool to be used in a virtual setting and whether it would meet our learning objective, 2) proper implementation of the engagement strategy or tool being used in the course, and 3) identification of community resources to meet these needs, particularly in a time when the generation of these particular resources was difficult and time consuming.

Engagement Strategies

The first engagement strategy or tool mentioned for virtual learning was to replicate instructor lectures by generating voice over PowerPoint presentations. However, it was quickly realized that students, and even ourselves, had poor or inconsistent internet connectivity to view or capture videos, capturing audience attention was challenging, and quick evaluation of understanding was more difficult. "Chunking" videos into five-to-ten-minute segments, generating Khan Academy style videos, imbedding quiz questions or discussion topics pertaining to material discussed in lecture videos, and providing self-guided worksheets for videos were tools frequently used to increase attentiveness and to make students aware of the main objectives of the course material.

Student engagement with course content is critical for learning, but it is not the only interaction students need to fully comprehend and apply concepts. Student involvement with fellow peers in the class was often missing in the new online format. To address this loss of sharing among peers, several faculty members within our species-specific courses chose to have students' record career presentations that were then shared with classmates. While this alone was a solitary activity, students were required to provide feedback to 3 assigned peers. Feedback was provided on presentation style as well as on content. Other instructors used various discussion boards either within the learning management software, known as Canvas, or through fee-for-service type software that curate the discussion, such as Packback.

Implementation of Engagement Strategies

Several options should be weighed to ensure that implementation of the strategy not only addresses the course objective but is also equitable across for all students. First and foremost, before implementation of a strategy, engagement strategies should address a specific learning objective within the course; otherwise students may perceive the engagement strategy as busy work. Second, addressing how the engagement strategy will be delivered and graded is critical to reducing student anxiety and for generating equality in grading, particularly when working with students who may have internet connectivity issues, limited time, or are in different time zones. When assignments are using new platforms or are high point/risk assignments, having a sample assignment to introduce the platform can be helpful in reducing emergent issues as students complete assignments outside of normal business hours. Lastly, when planning to implement any strategy, it is important for the instructor to consider how this will affect the instructor's/grader's use of time long-term. For example, generating a single use assignment that takes hours to generate, yet only minutes to complete and hours to grade, may not be the most effective use of the instructor's/grader's time. However, generation of a multiple semester/year assignment that takes an hour to generate, only minutes to alter between terms, and limited time to evaluate and grade, could be an important addition to the course.

Community Resources

Along these lines, as poultry and animal science courses across the globe struggled during the pandemic to generate content for online learning, many were forced to scour Google, YouTube, and a dozen other free and paid video repositories for just the right video or resource to fit their learning objective. Unfortunately, limited professional videos were available for some of the course concepts, such as the proper handling of livestock and poultry. Therefore, going forward, we should consider the creation of a database that will allow for the storage of created resources and tools that could be shared among institutions of higher education.

It is important to remember that student engagement occurs at several levels, including with the course material and with peers. Thus, instructors need to purposely plan activities and learning opportunities that play off these interactions to maximize learning in the virtual environment. Additionally, these engagements do not have to be elaborate or take significant time to design and grade, but rather, need to be directed and purposeful. As an example, sometimes a simple assignment that does not require students to learn new software and fits a specific learning objective may have more impact than adopting the latest tool in the learning management software. And finally, we need to identify ways to collaborate across species, disciplines, colleges, and universities to provide impactful virtual resources

that can be used by all in higher education who do not have the necessary resources.

SECTION 3: HANDS-ON LEARNING FROM A DISTANCE: HYBRID AND VIRTUAL LAB EXPERIENCES AT THE OHIO STATE UNIVERSITY

Benjamin Wenner

Background

In the Animal Science Department at The Ohio State University (**OSU**), the number of incoming students with minimal practical experience in food animal production continues to grow and many first-year students arrive on campus with limited awareness of career opportunities within animal sciences. The animal science courses at OSU provide students opportunities to grow their curiosity in animal production in their undergraduate program, but hands-on labs provide the foundational skillsets for a future in the workforce and reinforce core concepts within a varied curriculum. The onset of the pandemic in 2020 created additional layers of difficulty with induced distance learning, including in our traditionally hands-on and practical laboratory experiences. Student feedback and performance should be used to shape instructional approaches and bolster the efficacy of virtual laboratory experiences.

Using Technology to Open the Classroom

Prepandemic, the Animal Science Department at OSU had the advantage of already incorporating some digital technology into labs — especially within an applied biosciences lab taught to graduating students. Students in this course work in pairs to necropsy animals and diagnose disease, but despite written or pictorial instructions for the lab, students were frequently unprepared for how a dissection or microbiology activity would look and feel in reality. In addition, addressing one student's need at a microscope or lab bench left the remaining student pairs stranded without guidance or oversight which undermined the overall class experience. Investment from the department and our Office of Distance Education and e-Learning modernized the classroom with a digital microscope that connected to wall-mounted Apple TVs with the capability for students to display their own iPads to the main screen as well. Using a donated Padcaster, which holds iPads on a tripod for video recording, short videos were taken to demonstrate lab techniques and activities in an informal, step-by-step process. The short video clips aided in student preparation and allowed students to review until they were comfortable with the upcoming activities. Combined with digital assignments to help students self-pace their workload through the week, the

gap between student comfort and performance in the lab course was narrowed.

Distance Learning Laboratories

To successfully adapt the lab experience for distance learning during the pandemic, the purpose and outcomes of lab exercises in undergraduate education need to be scrutinized. Introductory courses lay the groundwork for the core knowledge expected of our animal sciences students. But hands-on or active learning approaches enhance student learning beyond the traditional lecture hall (Wells et al., 2019) and build the requisite skillsets for workforce readiness. It seemed inherent in the COVID-19 induced virtual learning environment that the hands-on experience would be beyond the reach of the average course instructor with limited resources. However, a variety of ideas are listed below that helped kickstart creative adaptation among our profession.

Virtual tours with handheld recordings or more advanced equipment quickly became a default option for instructors adapting to cancel field trips. Audio quality was often more problematic than the video quality. Background noise overrode many clips, speakers demonstrating a technique could be nearly inaudible at times, and these issues were amplified by poor internet connectivity. Bluetooth or headphone jack lapel microphones make for a quick fix to capture audio from a couple of tour guides at limited cost and can even be combined with many cell phones. Unless the local wireless speed is reliably fast (unlikely in many agricultural settings because of interference or bandwidth), it is advisable to scout a future site before visiting and if connectivity might be an issue, then plan for a recorded tour rather than having a class struggle through connectivity together.

Without traditional hands-on activities, hand-drawn assignments are an alternative to help reinforce concepts beyond traditional readings or lectures. Although some students would rather write down their lab results or methods, forcing some assignments in a virtual lab setting to require drawings can connect their brain in unique ways that enhance memory (Fernandes et al., 2018). With physiological renderings or lab methods, grading rubrics can be applied to consider the location, labeling, and relevant scaling of key features. The drawing assignments have been successful in documenting observations at both the cellular and macroscopic levels and drawing assignments are especially valuable to reinforce content from virtual guest demonstrations. A couple of drawing samples are included; a feed subsampling method (Figure 1) and a proper lambing birthing position (Figure 2).

Take-home kits are an alternative that brings the lab experience into the student's home. Personal examples of this technique in the past year include bagging wool samples to teach wool judging and boxing feed samples with instructions for hand-mixing animal feed blends using common kitchen supplies. In both cases, simple
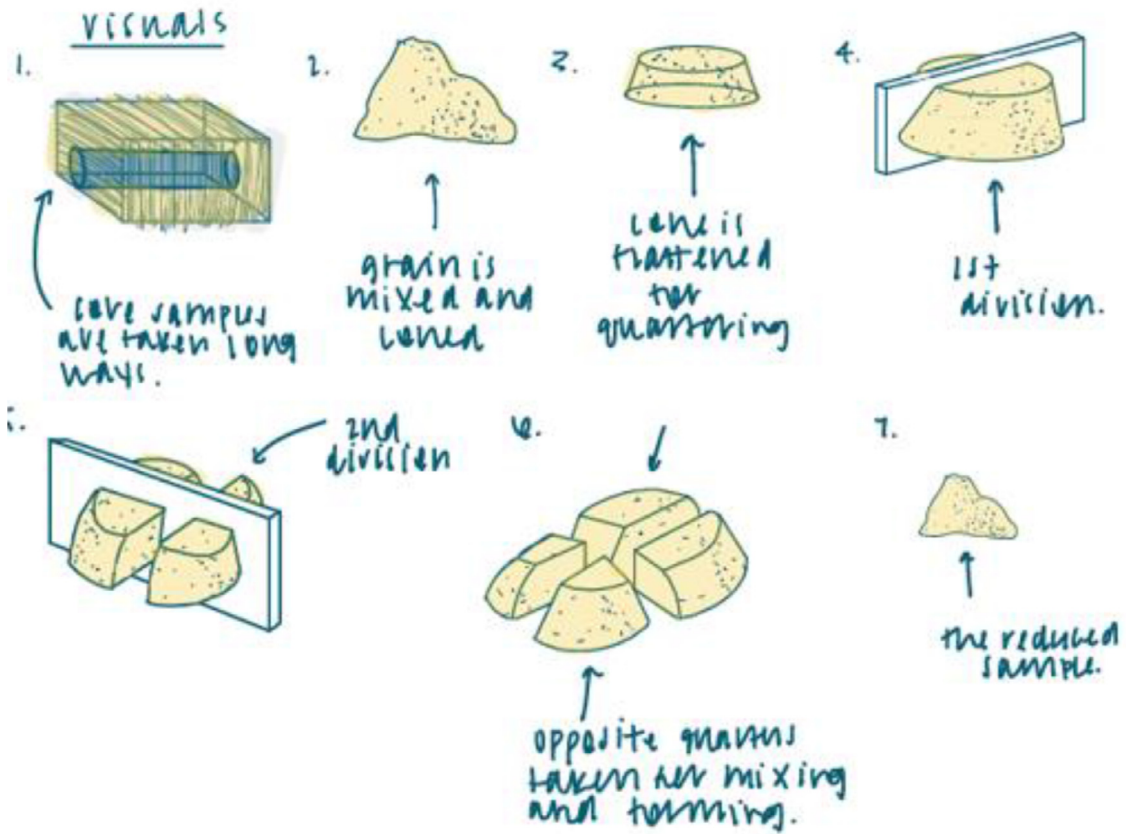
Figure 1. Example drawing of a feed subsampling method. Drawing created by Chloe Englehart (Student at The Ohio State University).

tricks such as *intentionally* leaving all samples unlabeled both sparked curiosity in students and forced them to guess at identification, which led to immediate discussions benefiting the entire classroom. Of course, some students will need to be convinced that the unlabeled ingredients are neither a conspiracy nor an instructor shortcoming but rather bear educational intentions. Preparation of kits requires detailed knowledge of the
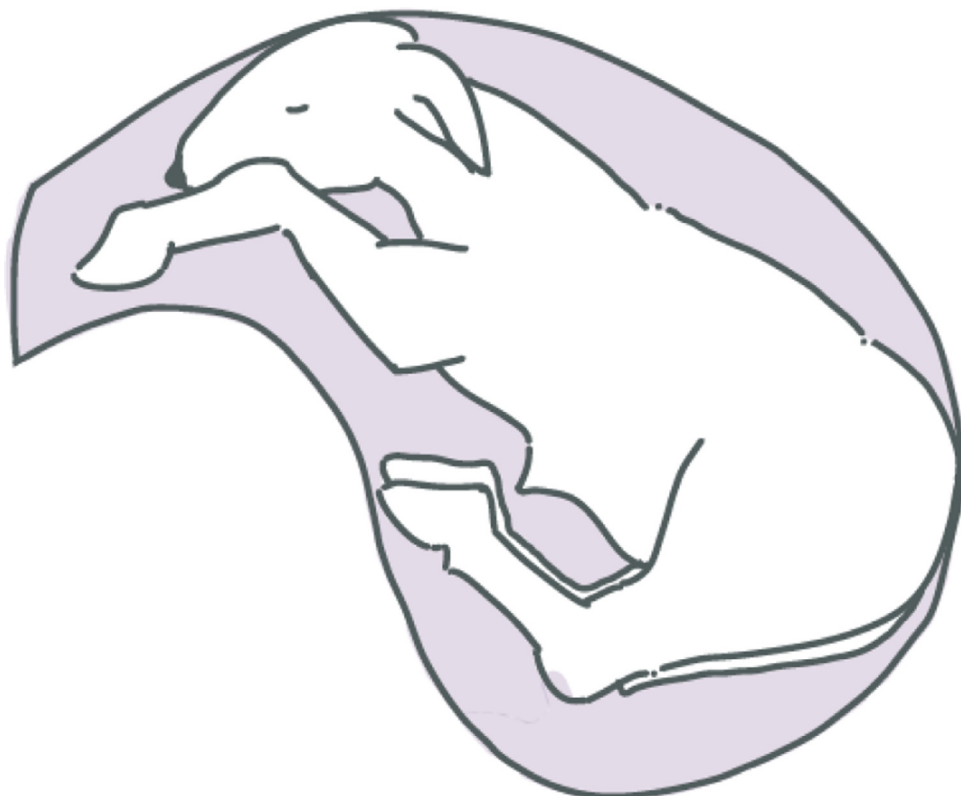

Figure 2. Example drawing of proper lambing birthing position. Drawing created by Chloe Englehart (Student at The Ohio State University).

activities planned and considerable effort by the instructor, especially in larger class sizes. The majority of students can pick up kits from campus to save on postage and are quite willing to do so; mailing them all prevents any student from coming to class empty-handed.

The Hybrid Lab Cohort

The continuation of COVID-19 throughout 2021 led to the topic of hybrid laboratories. With immunity on the rise and the resumption of college campus life, many courses and students were returning nearer full strength. However, students continue to have varied comfort levels with both in-person classes and vaccinations − leaving many on both ends of the spectrum unsure about their attendance pattern if the option to continue virtually continued to be offered. Instructors still need to reach those virtual students as many active learning techniques as practicable to ensure we are providing career-ready graduates with practical experience. With the option in Spring of 2021 to either 1) only teach labs online, 2) double the number of labs to reach equal numbers of students at half capacity, 3) cut the contact hours and run split sessions, or 4) a flexible virtual/in-person cohort, i selected option 4 for the biosciences laboratory.

Students worked in pairs in a virtual/in-person cohort experience. Most students traded turns at virtual versus in-person participation in labs but no neither mode was forced. Many students selected which labs they were most interested in attending and worked virtually for those where they were less comfortable (such as dissections). This flexible approach afforded students the opportunity to attend virtually when in quarantine or awaiting test results, and students used the technology of their choice to connect with their assigned lab partner. We were able to keep our physical lab space below 50% capacity.

To be most successful at this cohort approach, students need to have a relationship with each other if possible. The personal connection between students helped ease frustrations with technology or last-minute changes to attendance brought on by health factors. In our case, students self-selected partners and we had very few disruptions brought on by poor communication or technology failure. The in-person partner performed lab activities and was responsible for describing their actions and observations while the virtual partner was tasked with capturing the data, asking the questions, and keeping notes for the quizzes. Combining drawing activities with pair-sharing or explanations to peers may further enhance learning (Fiorella and Kuhlmann, 2020).

Keys to Success

As our need for virtual and hybrid laboratory courses continues, I would leave you with a few final thoughts. First, rethink the applied animal production system laboratory experiences to lessen the number of students in any single working group. With continued pressure to reduce student density and prevent exposure risk, one of the keys to keeping students in the classroom is to promote smaller group discussions and work. These small groups will also form bonds and that community can encourage attendance (Maquivar and Sundararajan, 2017) as students approach burnout mid-semester. Secondly, reevaluate the on-site class tours. Even if the class *can* go on the field trip, what learning objectives will be accomplished with that bus trip which could not be met from a distance? Virtual farm tours open the door to see a world far beyond the proximity of campus yet fit within the confines of a regular class period.

Lastly, we need to focus more than ever on meeting student needs for flexibility. Penalizing students for illness only incentivizes them to come to class sick; greater focus needs to be placed on providing a safe place to admit when a student needs help. Similarly, when asked for feedback on recordings or activities students will often say that they seek *interaction, not perfection*. Rather than get caught up in the multiple takes to get a perfect demonstration on video, keep those mistakes and talk the students through them. Even if they have a laugh or 2 along the way, the instruction will only be that much more memorable.

SECTION 4: A STUDENT'S PERSPECTIVE: INSIGHT FROM A STUDENT PANEL CONCERNING ONLINE LEARNING DURING THE PANDEMIC

Jessica Wells

A student panel comprised of 2 undergraduate students and one graduate student from the University of Georgia and North Carolina State University were prompted with questions concerning the transition and effectiveness of online learning for the 2020-2021 academic year. Those questions and discussion are as follows:

Question 1: Did you feel comfortable transitioning to online learning and were your course expectations clear?

Student	Discussion
1	The transition to online learning due to the recent COVID pandemic was a challenge because he preferred face-to-face teaching methods. He felt the course expectations were a bit unclear, but recognized professors were forced to switch to an online platform and were not familiar or experienced in utilizing the online method.
2	Felt that professors were a bit unprepared for the transition making the course expectations unclear due to a lack of experience. However, he felt his transition was smooth to the online learning due to being experienced as an online student.
3	Being a graduate TA, it was a difficult switch to the online platform mid semester and seemed to be a learning curve for instructors and students.

Question 2: Which activities promoted student interaction?

Student	Discussion
1	Surprised by the group activities during hybrid and full online classes. This promoted working together and helping facilitate student interaction. One course made students speak in class at least 2 times during the course to obtain participation points in the class.
2	Zoom break out rooms were beneficial. They do rely on the student to engage, and it allowed for students to meet and talk more instead of a single person in a class leading most of the class discussion.
3	I do not like the hybrid classrooms because either online students or face-to-face students do not get the same output from the course. As a TA we did a case report with students where students looked at lateral transmission of blackhead in turkeys. It allowed students to see a glimpse of graduate school and the students seemed to enjoy the experience.

Question 3: What can instructors do to build a sense of community in the course?

Student	Discussion
1	One course utilized a scavenger hunt in order to engage students. It gave a "chill" assignment that was fun and allowed students to interact on campus and then come back together to discuss their findings.
2	Because of small classes due to the departmental size labs were divided in half and instruction was still allowed face to face. Allowing for hands on experiences. Trying to keep normalcy was important, allowing students to still connect with someone. Students should also have a single option of online or face to face, having to transition back and forth became overwhelming and hard to keep track. Lastly, professors provided feedback which was helpful.
3	Having group discussions and break out groups made it easier to talk for all students. Attempting to include everyone and utilizing just one method (all virtual or all face-to-face) because online students in a hybrid classroom do not get as much experience with the professors.

Question 4: What online teaching strategies do you think will continue in the future when we return to face-to-face learning?

Student	Discussion
1	Recording lectures and posting them in the content sections for courses so that viewing them over and over is easier and students are not as stressed trying to make sure their note taking during classes is detailed enough.
2	Digital office hours are more convenient for students and a big help. This would be helpful for students who commute to campus even when attending face-to-face.
3	Being able to share webinars with students. Keeping webinars in courses in the future because there are individuals who are very knowledgeable in certain fields, and it adds a different perspective to the classroom.

The rapid transition to an online learning format posed challenges for instructors and students. Having no formal training and little warning before utilizing new technology/teaching techniques, coupled with internet connectivity issues made it difficult for all involved. However, it seemed as though students recognized this transition was not only difficult not only for them, but for those leading instruction as well. It is apparent after hearing each student's perspective from this panel; they seemed to agree there were areas of benefit with online instruction. This included attempting to keep normalcy, utilizing methods such as zoom breakout/small groups, and group activities, as well as still allowing wet labs to still meet at half capacity. Also, not using the hybrid methods, but instead utilizing face-to-face or online was a recommendation. Hybrid sections seem to disadvantage those who are not in the face-to-face environment, resulting in a difference in comprehension of materials. It was apparent that this panel provided much needed feedback to instructors. Moving forward some methods utilized during the online instruction could be beneficial for future courses. These included recording lectures so that students can review slides after classes, digital office hours for students who may have a commute to campus, and utilizing webinars to provide more expertise and guest lecturers to courses. Overall, this student panel gave useful insight to those utilizing online teaching formats and allowed those who are tasked with educating in the future an opportunity to improve classroom experiences.

SYMPOSIUM CONCLUSION

Although the transition to emergency remote learning presented instructors and students with a number of challenges, it also provided opportunities to reflect on teaching pedagogies to engage students. During this chaotic period, we learned that instructors needed support to increase their self-efficacy in developing online programming and that students needed to feel a sense of social presence in the virtual classroom. Utilizing strategies, such as "live" demonstrations, polls, and collaborative projects, emerged as opportunities in the virtual environment to engage students. Moving forward, instructors can reflect on the newly adopted technologies implemented during the pandemic and potentially finds a new place for these in their face-to-face classrooms. COVID-19 and the resilience of both instructors and students may influence how we approach and view the future of higher education in a post-pandemic world.

DISCLOSURES

The authors declare no conflicts of interest.

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