Remotely Hands-On

Line by line and curve by curve, Michael McGreal recently transformed a block of ice in his backyard into a swordfish. He drew a small, socially distanced crowd as he went: the buzz of his chain saw and the spectacle of ice carving during a pandemic caught the attention of some passersby.

McGreal was happy to provide distraction and a bit of beauty in a strange time. But this was about work. The chair of culinary arts at Joliet Junior College near Chicago was taping himself for an upcoming meeting of his ice-carving class. Typically, he makes swordfish live on campus in front of students, who then chisel away at their own blocks of ice with power tools.

But this is the COVID-19 era, in which instructors who teach fundamentally hands-on courses across fields are finding ways to make remote learning work.

“It’s not as difficult a transition as I expected,” said McGreal. “The labor part of it is a lot,” he admitted, “setting up our homes to do cooking videos live and taping them. And a lot of us have children at home now.”

At the same time, McGreal continued, “it’s an exciting chance for us to do some things for an online format that will make our face-to-face classes better than ever before.”

Take ice carving. McGreal plans to save the videos he’s made of fish and swan carvings for his students this semester and share them with his classes going forward. That way, he said, students can watch the videos in advance of class and be more prepared to attempt their own sculptures when they meet.

There's something intimate and effective about asking students to watch their instructors cook and bake in their own home kitchens, McGreal said, even if they're not cooking on their own now. (The department discussed asking students to cook along via Zoom but decided it was unwise to ask students to pay and even shop for ingredients. Still, many students stuck at home have been cooking on their own and sharing photos with their instructors and peers on chat boards.)

"They're coming into our worlds now instead of a steel, sterile classroom, and it makes you feel more comfortable," McGreal said. "Students seem to be loving it."

McGreal's students are in the hospitality business, after all, he added.

Comfortable doesn't mean sustainable, however. McGreal said his department's mostly synchronous cooking sessions, which are later posted to YouTube for students who can't watch live, are working because students spent at least eight weeks on campus prior to going remote. During that time they learned fundamental techniques in cooking, baking and carving, hands-on. Most of what they're learning about now, by watching their instructors cook, is the sophisticated application of those skills. It's hard to imagine that this *Food Network*-inspired approach to culinary education could work long-term without that kind of introduction, he said.

Remote STEM

Michelle Stocker, assistant professor of geobiology at Virginia Tech, agreed that "for this semester we can make it work. I wouldn't necessarily say we like doing this at all, though."

Aided by the many scholars of anatomy who have rushed to share 3-D mesh and other kinds of skeletal images online over the last six weeks on

such websites as MorphoSource and Sketchfab, Stocker has been able to continue teaching a lab course on vertebrate morphology with relative ease. Even so, one graduate student in the mixed-level class already asked to sit it on it the next time Stocker teaches it, for the authentic experience. Her answer? Of course.

The upper-level course is designed to be challenging and extremely hands-on, with students handling skeletal materials for 2.5 hours at a time. Now students examine specimens online in Zoom sessions. Stocker, who also took physical specimens home with her, sometimes logs in on a second account to magnify them with her cellphone camera. Because Stocker's students, like McGreal's, spent weeks on campus before going remote, they remember these specimens -- down to the way they smell.

Even so, students can't interact with the materials as they can in the lab. So Stocker asks them to interact with each other more. Students are encouraged to virtually share bones they found on COVID-19-safe walks in the woods, for example, and the class works to identify the animal and what might have happened to it.

This is also a way to counter the Zoom fatigue that many professors report: teaching remotely, it seems, feels more tiring than teaching in person, because it's hard to gauge student reactions.

"Talking to yourself for a long time can be super boring," Stocker laughed.

Julia Svoboda Gouvea, assistant professor of science education at Tufts University, coincidentally taught a computation-based module on the flu in her organisms and populations lab at the beginning of the semester. The goals of the project were to track the flu season on the genetic sequencing database Nextstrain and ultimately recommend a course of action to the World Health Organization for next year's flu season. But students became

more and more engaged in tracking COVID-19 as the weeks wore on.

“They could see how the transmission process was happening” via the genomic sequencing data on Nextstrain, Gouvea said.

Students had time to move on to another design-your-own-experiment unit involving the egg-laying behaviors of bean beetles before the campus closed due to the coronavirus outbreak.

By now, Gouvea said, “there are a bunch of beetles hanging out in the lab that we were never able to quantify. And students were designing these experiments knowing that they were never going to see the results, so that kind of undercut the authenticity of the activity.”

Presently, students are working remotely on a unit involving plants. Gouvea converted this final section of the course into a literature-heavy one, in which students read research papers and use a collaborative commenting tool to discuss them. Students will write their own responses to the literature by the end of the term.

Some of the papers Gouvea found for this unit are inspiring her to think ahead to other possible iterations of the course. A research area about how plants communicate through volatile chemicals and their roots has Gouvea thinking that she might ask future students to buy relatively inexpensive sensors to detect volatile chemicals on outdoor plants, or those in their own homes.

Doing lab science remotely is more than possible, Gouvea said. Still, she worried about capturing what is arguably the most important part of lab work: struggle.

“The labs that I design are very discretion-based,” she said. “They’re hard

for students and we use real data, not a pretend lab activity." Students are often confused, in a good way, for a portion of the lab, as they ask questions and move through challenges, Gouvea said. She asked if that process can be sustained online.

To teach lab work remotely from the outset, she continued, "You're going to have tell students it's OK not to understand this within the first five minutes of opening up a webpage."

Simulations and Accreditation

Simulated lab technologies are already available and seeing increased use due to COVID-19. Labster, for example, donated $5 million worth of services to K-12 and college and university instructors affected by the disruption. Ten thousand instructors signed up. Program usage increased by 10 times in the last two weeks, and Labster today announced a new partnership with the California Community Colleges.

Co-founder Michael Bodekaer said the company's mission is to engage students in science, in part through gamification of lab work, and to increase access. Many institutions lack top lab facilities, he said, and even campuses with the best equipment may bar students from using their high-end tools.

Labster's modules, he said, "are like a flight simulator for pilots." The purpose is not to replace labs entirely, but to keep students interested in and prepared enough for science to excel when they get there.

Labster

Ed tech has its skeptics, and there are certainly some things it can't teach. Gouvea's colleague at Tufts, Lauren Crowe, a lecturer in biology, for one, said remote instruction prevents her from teaching her students essential fine motor skills, like using a micropipette.

Labster brings its own data to that fight, including an article in *Nature* finding a twofold improvement in students' learning outcomes after using gamified simulations. To Gouvea's point about struggle, Labster's virtual guides sometimes allow students to fail at first.

"There are many ways you can do this, and each teacher has their own preferences, like blended learning and teachers providing courses as homework," Bodekaer said.

Accreditation is another piece of the puzzle. How do outside bodies responsible for assuring quality in hands-on programs adapt to the moment?

ABET, which accredits thousand of programs in the applied and natural sciences, computing, and engineering, has advised institutions not to alert it to short-term adaptations due to the coronavirus. Permanent changes will need to be flagged, however.

Joseph L. Sussman, chief accreditation officer at the organization, said, "We fully understand that institutions and programs are having to make accommodations to safeguard their communities and contribute to the containment of the virus."

Most important "is a program's ongoing ability, regardless of delivery method, to demonstrate that it is enabling the achievement of the student outcomes associated with program."

Sussman added, "ABET accreditation will not be a barrier to success."

The Arts Online

In addition to many colleagues in the sciences and job training programs, professors of the fine arts are adapting deeply physical work for a whole new world.

Douglas Russell, a professor of drawing at the University of Wyoming, sent an announcement to his drawing students last month about new modules he set up for the course. There is a recommended order to moving through them, but students may proceed in any order, at their own pace. Everything is due at the end of the semester. The typical module includes an assignment, a discussion component, instructional videos and images to view, plus slides.

Douglas Russell

Russell got organized fast in order to offer asynchronous instruction to students who are struggling in their own ways with the realties of COVID-19. Much of his real-time work now is providing detailed digital feedback to students as they proceed. So far, he said, students seem "fairly upbeat." Some have asked to take the class on a pass/fail basis, to which Russell agreed. He plans on sending out a reminder next week, telling students not to wait until the end of the class to get their work done.

If time management is a challenge for students, the hardest part of teaching

is “the lack of one-on-one, face-to-face instruction that automatically occurs in a normal classroom,” Russell said. There is an “unfolding of back-and-forth” teaching that happens with 20 students in a room all working on the same project, he said.

The “materiality” of the class also is lacking.

“I can't show the students how to do something by drawing on their actual drawing,” Russell said. “I can, of course, film a video, or digitally draw on their drawing photo. But this is not the same at all. And something is definitely lost in the process.”

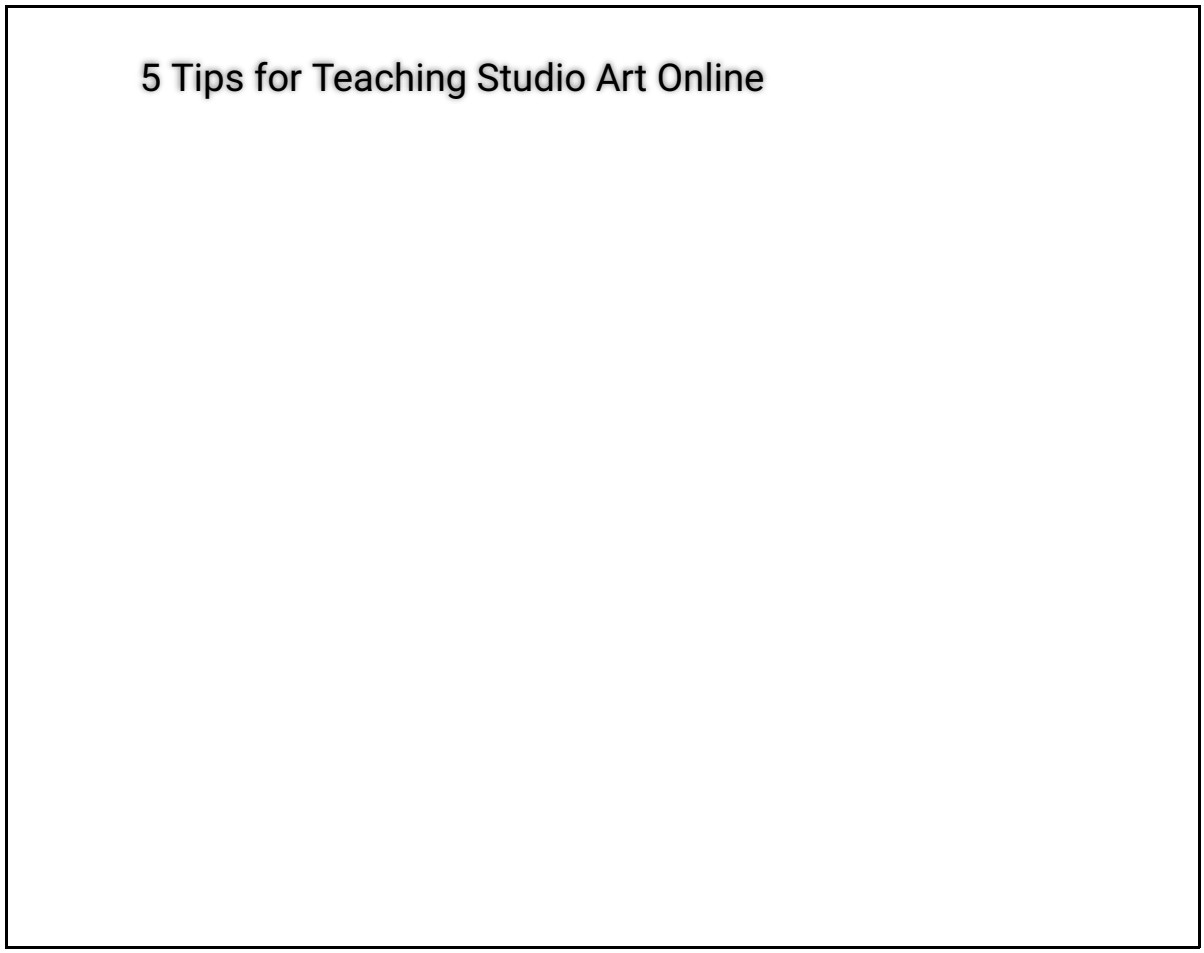
Clara Lieu, an adjunct instruct of art at Rhode Island School of Design, is teaching a figure-drawing course for illustration this semester. It is, of course, challenging, as there are no live models in the remote format and Lieu does Zoom calls with small groups of students, based on their availability. Some are as far away as Asia, so timing is a challenge.

“Online teaching is definitely more work than teaching in person,” as it requires more mental effort and even more preparation, she said. “What I find is that in person, you can be way more flexible and spontaneous.”

Still, Lieu knows that remote art instruction can be done. She’s been teaching art online for several years at the website *Art Prof*. Critiques can be purchased, but instructional videos and tips on the site and YouTube are free.

Particularly relevant for COVID-19 is Lieu’s video and lengthy post on five mistakes to avoid while teaching online. Lieu recommends putting yourself on video for you students, even if you’re camera-shy, to build presence. Set reminders and time-specific deadlines, use platforms your students already use (Lieu loves YouTube), offer students different modes of communication

with you, and be flexible and accept substitutions. Lieu also advocated distilling the essential points of any lecture down to their essence. Online attention spans are low, she said.



Just as a science instructor can't teach a student to hold a micropipette online, Lieu said she can't teach students in a print-making class precisely how to hold their tools.

"'No, don't do it that way.' That's such a big part of teaching" that's harder now, Lieu half joked.

Instructional videos generated as part of remote teaching do prove to be effective tutorials for students, however, Lieu said, especially in a field such as art, where students tend to be self-motivated. They spend many hours working on projects on their own time even in a typical semester, she said.

Andrew Schulz, dean of the University of Arizona's College of Fine Arts, said that "historically, the visual arts have been a solitary practice, so in some regard, it's easier to reproduce this in a remote teaching context."

Echoing Lieu, however, Schulz said doing so becomes more difficult with advancing technology, such as laser cutting, "which is like lab equipment."

Exhibitions Canceled -- and What's Ahead

Schulz also said the arts are meant to be shared, in visual art shows, music and dance performances, and more. Arizona quickly moved to cancel all its in-person events due to COVID-19 but has since found ways to move some of them online, including the annual Bachelor of Fine Arts Exhibition.

Schulz said all the cancellations are hardest on students who are finishing their degrees, as seniors and graduate students "were looking forward to public presentation and capstone experiences."

Performance cancellations have affected many programs across institutions. Melissa Heller, costume shop manager and design instructor at Pacific University, for instance, said her class is typically "a lot of learn as you go during each of the productions." There is no show to work on this semester, of course, so Heller's one and only current student is writing a research paper on a topic of her choice. She'll submit it at the end of the term.

As in the sciences, accreditation by outside bodies is a reality for many arts programs. Schulz said accreditors have, by and large, been accommodating in these usual circumstances.

In addition to day-to-day adjustments, Schulz was already looking ahead, to how COVID-19 will impact arts education as a whole.

“Artists are resilient, innovative and imaginative, and we’ll figure it out,” he said. “It might look different than we’re used to -- the whole landscape is going to look different.”