Science Societies

COVID-19 forced rapid changes in education, but which changes should we keep?

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October 8, 2021

COVID-19 Forced Rapid Changes in Education, but Which Changes Should We Keep? CSA News

- When the COVID-19 pandemic hit North America in the spring of 2020, safety considerations quickly turned in-person classes fully remote.
- A new special section in *Natural Sciences Education*, "Natural Sciences Education in a COVID-19 World," brings together 23 original articles documenting how education changed in North America during the pandemic.
- Here, editors and authors of the special section talk us through the impacts on high school and post-secondary education, and how we can change education for the better in a rapidly evolving world.

The very first poster sessions at the ASA, CSSA, and SSSA Annual Meetings in the late 1980s were like arts and crafts gone horribly wrong.

"You had some presenters that would take the staple out of the corner of their 24-page manuscript, then staple each page individually to their 4- by 8-ft poster board," Robert Mahler recalls. "It was ghastly."

Today, poster sessions feature gorgeously crafted, digitally formatted, full-color presentations—and there's almost no need to handle the scissors or the glue. The best posters have minimal text, an emphasis on visuals, and clear-cut categories that guide the viewer through the research experience.



Students work in the AMS Nest on the University of British Columbia's campus during COVID-19. Photo courtesy of Paul Joseph/UBC.

Like the transitional period of the late 1980s, we've been thrust into another intense period of technological change. When the COVID-19 pandemic turned learning fully remote in North America in the spring of 2020, educators used to in-person classes had to adapt, and fast. For many, it was a matter of getting something—*anything*—to their students to keep them learning at home.

Natural Sciences Education (NSE) journal Editor Maja Krzic and Associate Editor Robert Mahler saw an opportunity early in the pandemic to document teachers' and students' experiences. They sent out a call for papers in the spring of 2020 and captured 23 articles from educators across North America, compiling pandemic responses from 20

universities and two high schools in the special section, “Natural Sciences Education in a COVID-19 World” (see **https://bit.ly/38Tx3zM**).

Here, Mahler, Krzic, and article authors Aaron McKim and Tyson Sorensen discuss what we’ve learned from the pandemic and how we can make sure that education adapts to meet the demands of both in-person and remote learning.

Evolution, Intensified

The University of British Columbia (UBC) sits in the perfect spot for recreation. At the westernmost tip of the city of Vancouver, UBC overlooks the Strait of Georgia, just an island away from the Pacific Ocean. It has mountains for hiking, a city to explore, and woods to get lost in. When Krzic describes her home institution where she serves as an associate professor, you’d be forgiven for being tempted to get another degree just as an excuse to stay in Vancouver for a few years.



Tyson Sorenson instructing a teaching methods class at Utah State University. Photo courtesy of Tyson Sorenson.

The university’s gorgeous setting draws 67,000 students a year, 27% of whom are international. Prior to the pandemic, UBC offered 300 courses online—a mere 3% of its total offerings. When the pandemic struck, the school went entirely remote, adapting the remaining 97% of its courses to online learning.

“We recorded a lot of videos last year in a hurry,” Krzic says. “I co-taught introductory soil science, and what I keep hearing is students want more videos.”

Krzic explains that students think having video recordings of classes, which they can watch on repeat, will help them understand the material and retain information.

“What they don’t realize is when we have live classes, if I’m explaining a concept, and I notice it’s not sinking in, I can explain it in several additional ways depending on the questions asked in class,” Krzic says. “That’s not the same as when I say it only once in a video.”

The videos Krzic and other educators created last year might have served in a pinch, but Krzic cautions against re-using materials you made last year since they might not be your best option for the future. Teachers created them without researching best practices for the format, and university instructors are often untrained in pedagogy. Some of these early attempts at video instruction might, in spirit, look a bit like early poster sessions with manuscript pages stapled up: a bit painful to look at and not very effective.

As UBC juggles in-person and online learning (and with the looming threat of COVID variants), it’s more important than ever for instructors to be prepared. Because of UBC’s beautiful setting, there’s no doubt that on-campus students from around the world will drive the university to deliver in-person education, and Krzic anticipates a “hybrid” model of instruction, incorporating in-person and online classes in the fall of 2021.

Meanwhile, the University of Idaho (UI), where Mahler is a professor of soil science, presents a different kind of puzzle. Located in the northernmost tip of Idaho, more than 300 miles from the state capitol and population hub, UI has been struggling with a decline in enrollment. Hosting just 11,000 full-time students a year, UI is the smallest flagship university in the United States. Just 5% of classes in the Agriculture and Life Sciences (CALS) and Natural Resources (CNR) colleges were offered online prior to the

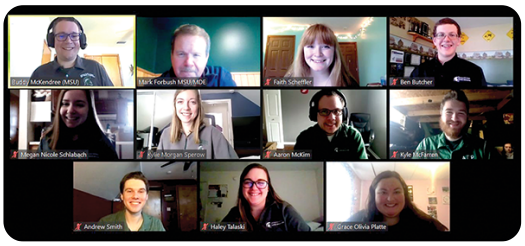
pandemic.

Like UBC, UI switched “virtually overnight” from in-person education to distance learning in 2020, but the transition was a success—enrollment declined just 4% in fall 2020 when compared with 2019.

For UI, Mahler thinks distance learning could be a serious boon for a fantastic research institution struggling with retention.

“A lot of students want college degrees from top-notch institutions but don’t have the means to be there physically,” Mahler says. Mahler has taught soil fertility fully online since 2012 from his off-campus post in Boise, ID. He cites the benefits of off-campus learning options for upperclassmen and graduate students. “They [distance learners] can be in their work environments and still take courses. It’s a win for both on- and off-campus students; it brings more perspectives into the classroom.”

Though COVID-19 upended higher education, it also illuminated that there are more possibilities for providing students with a rigorous education that meets their needs—and that might not mean being on campus. Universities will (hopefully) diversify their offerings, creating educational experiences that serve their students and the institutions themselves.



Undergraduate members of the Agriculture, Food, and Natural Resources Education Club at Michigan State University met virtually during the 2020–2021 school year. Photo courtesy of Aaron McKim.

“This is the day of for-profit universities,” Mahler says. “If our traditional universities don’t do a superior job of meeting students’ needs, somebody else will.”

The High School Perspective

If Mahler and Krzic offer edifying perspectives on the future of post-secondary education, Aaron McKim and Tyson Sorensen serve as ambassadors for agricultural education at the high school level.

McKim, an assistant professor at Michigan State University, and Sorensen, an assistant professor at Utah State University, met each other in graduate school where they were studying for their doctorate degrees in agricultural education. Now, they study how to best teach the teachers while researching agriculture education itself.

When the pandemic hit, it only took a couple of weeks for the two to hatch a plan for documenting what was going on with agriculture educators around America.

“We wanted to get a sense of the reality of what teachers were facing,” McKim says. So they created a survey, used the national FFA (previously the Future Farmers of America Organization) registry database to find contact information for 13,500 agricultural educators, and took a simple random sample of 790 registrants to contact for the survey. The team collected survey data in May–June 2020—just at the end of the spring semester after COVID-19 was declared a pandemic in the United States.

Sorensen, McKim, and coauthor Michelle Burrows used the survey to get a sense of the challenges impacting high school educators with a focus on the “three circle model” of agriculture education. This tried-and-true formula combines classroom instruction with FFA engagement and supervised agriculture experiences (SAEs). It gives students both book learning and hands-on ventures to put their knowledge into practice.

For their paper in NSE, “The COVID-19 Pandemic and Agricultural Education: An Exploration of Challenges Faced by Teachers,” the authors focused on one particular survey question: “What are the three most prominent challenges, brought about by

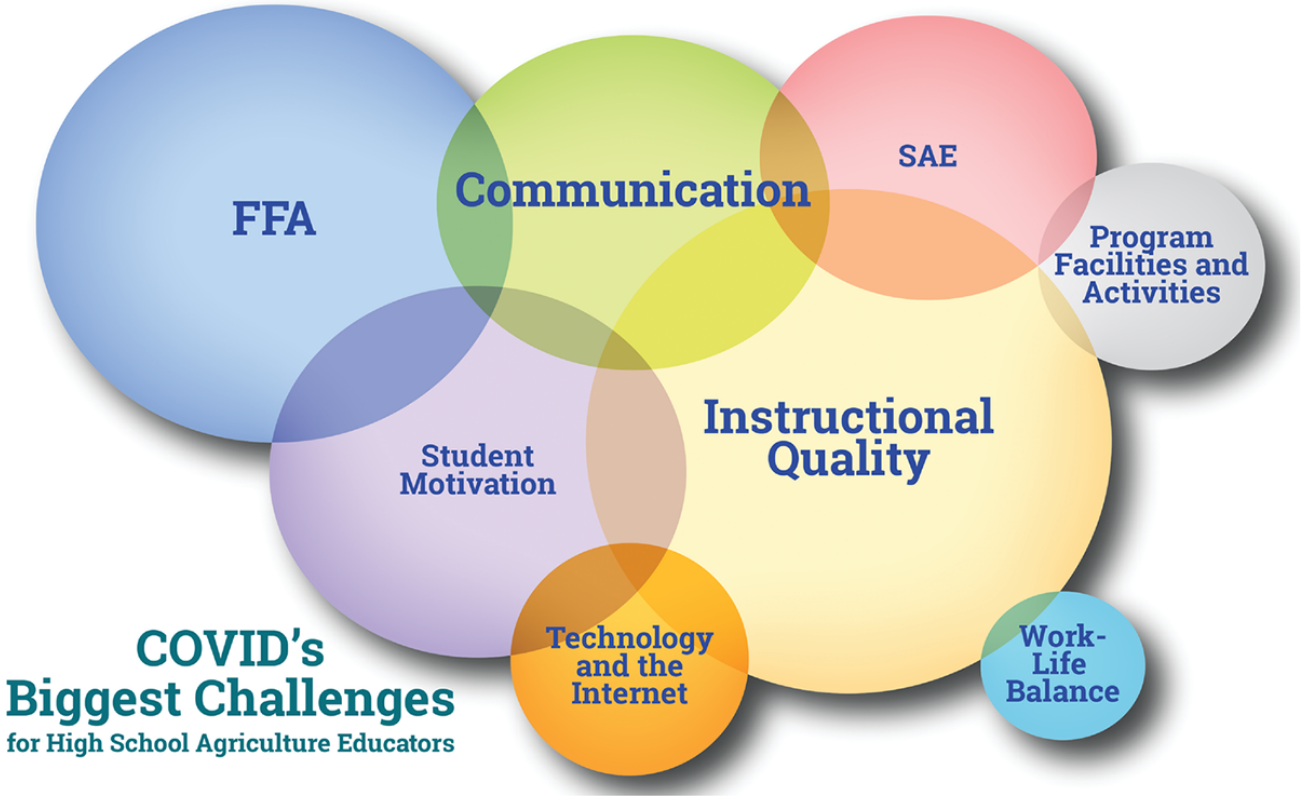
COVID-19, you experienced as you modified how you ran your agriculture program—including teaching, advising FFA, managing SAEs, etc." Participants completed three essay-style responses about these challenges, which the researchers grouped into themes and ranked by the number of responses for each theme (**https://doi.org/10.1002/nse2.20060**).

Notably, the team discovered that 71% of instructors were struggling to maintain their perceived educational quality while 61% cited the cancellation of FFA programs as a major challenge. The third most common challenge was the student motivation (or lack thereof), discussed by 43% of respondents.

"The thing that surprised me was the inter-relatedness, the connectedness of these responses," Sorensen says. "FFA is like a battery pack for these kids—when it was taken away, it was a domino effect. Students weren't engaged; teachers' job satisfaction decreased."

For educators, FFA and SAEs take up a big chunk of time. They might hold practices after school to teach kids parliamentary procedure for competition or work greenhouse sales on weekends and evenings as part of an SAE. As the pandemic progressed, agriculture teachers were working fewer hours—down to about 30–35 hours from the average 60.

"We've always assumed the relationship between job satisfaction and hours worked was linear. If hours worked decreased, job satisfaction would increase," McKim says. "But during the pandemic, we saw a major decrease in job satisfaction."



A visual representation of the relationships between challenges experienced by agricultural teachers based on their survey responses. Adapted from McKim et al (2021) by Karen Brey.

Both McKim and Sorensen emphasize that the hands-on aspects of the three-circle model of agriculture education bring both teachers and students fulfilment—they're the "battery packs" that keep agriculture education running. It's an incredibly important issue, particularly since there's a shortage of agriculture educators.

"This is a big opportunity for us to find ways to do more of the things that charge us up as educators and minimize the things that drain us," McKim says. "And it's a chance for us to see what drives our students to stay engaged and learn, and implement as much of that as we can, no matter where we are."

Taken together, the findings presented in the NSE special section paint a picture of what we've learned from a period of intense upheaval. Educators and students are

both more flexible and more resilient than we ever could have anticipated, but now's the time to take a step back and see what we should keep and what we should revise or abandon.

Like the very first poster sessions, it shouldn't take us too long to understand that just stapling up manuscript papers on a poster board might not be the best way to make use of a specific medium. In the same way, we can adapt to the new model of education that incorporates the very best of in-person instruction while creating fantastic materials and methods for online education.

Dig Deeper

- View the special section in *Natural Sciences Education*, "Natural Sciences Education in a COVID-19 World," at **https://bit.ly/38Tx3zM**
- Read the introduction to the special section: **https://doi.org/10.1002/nse2.20067**
- Check out McKim, Sorensen, and Burrows' article "The COVID-19 Pandemic and Agricultural Education: An Exploration of Challenges Faced by Teachers": **https://doi.org/10.1002/nse2.20060**
- Find Mahler's article, "The Pros and Cons of Teaching Soil Fertility Live Versus Online": **https://doi.org/10.1002/nse2.20053**
- Find Krzic's article, co-authored with Sandra Brown, "Lessons Learned Teaching During COVID-19 Pandemic: Incorporating Change for Future Large Science Courses": **https://doi.org/10.1002/nse2.20047**

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