Contactless U: Higher Education in the Postcoronavirus World
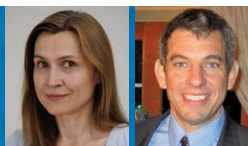
Phil Laplante, Pennsylvania State University

The profound impact of the coronavirus COVID-19 has tragically affected the world, including undergraduate and graduate university education. These impacts will be very long lasting, significantly changing the nature of higher education forever. A contemporary account of what is happening and predictions on how this situation will transform higher education are offered.

By late February 2020, the world was reeling from the onslaught of COVID-19, many had already died, and the predicted trajectory was catastrophic. Worldwide, a large majority of university administrators realized that they would need to prohibit or severely limit physical access to campuses, thereby threatening completion of the current academic session, research programs, and the conduct of university business. This dire situation could only be mitigated by virtual meetings and research activities and by reinventing courses already in session or about to launch into online equivalents. Across the globe, decisions were made to put courses online and move all meetings to virtual formats.

Faculty and students who never tried online learning before (and were reluctant) were suddenly faced with it. The implementation issues and second-order effects impacted housing, scholarships and other funding sources, travel arrangements, and more. The forced conversion made sensational news with everyone, even outside academia, discussing the subject in email threads, on social media, and on radio and television. Teaching and taking online courses are difficult, and this fact surprised many except those with experience.

EDITORS

IRENA BOJANOVA NIST, irena.v.bojanova@gmail.com
PHIL LAPLANTE Penn State, plaplante@psu.edu

TECHNOLOGY CHALLENGES

There are always significant technological challenges to delivering content online, but these were intensified as faculty rushed to convert courses. Lectures were hastily recorded, and there were issues with quality, high-speed network access for streaming, and compatibility. Many course materials needed to be put online for the first time, sometimes into learning management systems, or sometimes without the benefit of such systems. Simulation software for laboratory courses needed to be identified, acquired, and installed and lab activities modified accordingly.

Where synchronous communications were used, there were numerous compatibility, processing power, and configuration issues. Many university networks and cloud services were not ready for or capable of the tremendous increase in demand. On the student end, throughput and bandwidth were often not sufficient.

Many universities found their technical support departments overwhelmed or underprepared, and many professors who may have been technologically challenged were forced to face their weaknesses. During course delivery, the technological disparity in ability and access to technology for certain students were exposed.

Impact

Universities need to address the technical weaknesses in faculty and staff, reevaluate their technical support departments, and, more significantly, address students' technological disparity.

PEDAGOGICAL SOUNDNESS

Some faculty and administrators had already questioned the pedagogical soundness of online courses, but the COVID-19 pandemic crisis brought this issue to the fore. While lectures and advising could be delivered online, "show-stopping" challenges such as how to conduct virtual labs in chemistry,

physics, and engineering were solved, even if suboptimally. There was the usual time-zone challenge for synchronous courses and meetings. Many new problems related to internships, clinicals, and field work, both logistical and bureaucratic, needed to be resolved through telepresence or other means. In solving these problems, new issues involving mobility of students across borders in the post-COVID-19 world were identified, for example, how to handle certain programs and visa rules that don't allow for online components.

Impact

Universities will need to provide more training and incentives for faculty on how to build and deliver pedagogically sound online courses.

AUTHENTIC PRESENCE AND ENGAGEMENT

An important aspect of online courses is providing students with a sense that they are having ample interaction with the professor and other students and not just self-teaching, that is, providing an "authentic presence." Creating an authentic presence, whether with live streaming, asynchronous learning, directed activities, or a combination, is difficult. Engagement involves creating a "community" of learners, and this can also be difficult to do in virtual communities. Faculty teaching online for the first time, and even those with experience, had to provide engagement often in a hastily constructed "classroom" with scared or unenthusiastic

students. Using appropriate online learning management systems and providing supporting media and activities have already been part of the solution, but professors and students explored innovative ways of engagement during the COVID-19 crisis.

For teleconferenced meetings, attendees had to worry about what they looked like (showered, shaven, made up), what to wear (business professional, casual, pajamas), where to set up their attendance (appropriate venue or sitting on a bed), and how to organize

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the background. Many online attendees worried about stifling academic freedom online. For example, professors and students were less likely to say controversial things if they are written in text messages or clearly being recorded as part of the course (as opposed to surreptitiously and possibly illegally being recorded, as now occurs).

University administrators also confronted the restrictions of employer tuition reimbursement and stipend restrictions for online courses. In many cases, reimbursement is lower for online courses; this needed to be ignored during the pandemic. In addition, onsite attendance requirements for courses, presentations, internships, dissertation defenses, and so forth had to be relaxed.

Impact

Universities and employers may have to reconsider relaxing certain residency restrictions permanently.

ASSESSMENT AND GRADING

Assessing student learning and assigning a grade are major challenge for online courses. While many residential courses already use online testing (at testing centers or over secured remote systems), some question the efficacy of this mode. Many professors find that it might be easier for students to cheat when not under the watchful eye of the professor or a graduate assistant. Proctoring of re-

mote exams is often done via telepresence by the university or a third party, but during the COVID-19 pandemic, third-party monitoring services such as Examity were overwhelmed. One way around these problems is to offer open-book exams, but identity management is still an issue. In addition, there have always been issues with online learning involving securing exams and online material, stolen curricula, and overall security to learning management systems. The COVID-19 pandemic, once again, reminded us of these problems.

During the crisis, many universities adopted relaxed grading, that is, students could elect to earn a pass/fail grade only. This approach is thought to reduce cheating on remote tests, relieving the pressure of achieving a certain grade. It also takes into consideration that students working from home may have unique obstacles, for example, taking care of children or having to share computers at home, all likely scenarios during the pandemic. However, pass/fail grading presents other problems with respect to tuition reimbursement policies and minimum GPA requirements.

Impact

Assessment and grading policies and practices for online courses will need to be reevaluated.

SECURITY AND PRIVACY

Some of the most serious objections to online education involve security and privacy. Unfortunately, the COVID-19 pandemic highlighted the validity of these concerns.

Throughout the pandemic, news outlets reported teleconferencing security issues, phishing attacks, and network vulnerabilities. In teleconferencing, services like Zoom were exploited, potentially allowing unauthorized users to attend (bomb) meetings, potentially disrupting classes, dissertation defenses, and university business. Phishing attacks included a variety of official-looking university emails that directed recipients to malicious sites, caused them to reveal confidential information, or contained harmful payloads. Malware may have been resident in some of the freeware software applications hastily selected for courses.

Impact

New attention to security and privacy issues, both old and new, is needed. Universities must invest more resources into fixing these problems.

CHANGING ATTITUDES

Many university officials and professors have seen their objections to the remote delivery of courses disappear, as out of necessity courses were flipped on very short notice from residential to remote format. More profoundly, and surprisingly, many parents, students, and tuition sponsors (for example, employers and government grant agencies) have begun to question their objections to online education and even the need for a residential component. These stakeholders are now asking questions such as "If students can complete their programs virtually from home, why do they need to stay on campus?" and "If the business world is operating virtually, then why not go to school virtually (and work part time)?" Similarly, the economic damage done by the COVID-19 pandemic will require students to defer college and choose online education, thus saving on room and board and allowing them to work full or part time at home (or help at home) while getting their education.

During the COVID-19 pandemic, universities held all meetings via teleconferencing. Those who were previously reluctant to hold or attend such meetings may now be less likely to object to this format, since they are easier to attend (and greener since they cut down on driving to campus). Virtual meetings may have improved faculty and other stakeholder engagement and removed many excuses for participation.

Jobs that were previously thought to be "in residence only" were performed partially or entirely at a distance, challenging previously held notions, and perhaps changing the way things are done on campus forever. Administrators who objected to the work level performed remotely discovered that some people may work harder when given the flexibility of working from home.

Impact

Administrators, professors, and students have gained confidence to work in remote environments, and university administrators may be convinced that online learning can significantly lower the cost for students and the university. Universities will have to face these realities and bring more courses and programs online. Universities that already had a strong online presence will have a huge advantage.

PREDICTIONS

There are many advantages and disadvantages to online education, and the COVID-19 pandemic portrayed these in sharp relief. Online learning is not for everyone nor practical for some courses, but its role in the higher education

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mix will exponentially increase. The COVID-19 pandemic has converted many naysayers, shown how previously insurmountable problems could be overcome, exposed waste, and spurred many innovations for online learning. Similarly, the way that academia conducts business has been transformed with the mandate for remote work. In the post-COVID-19 world, higher education will never be the same. Here are some of the ways I predict it will change.

> Many students will opt to take some time off to let the COVID-19 pandemic subside, but this number can be mitigated by online alternatives.
> Of those who choose to return to school, many will be reluctant to attend any in-person classes or at least close-contact courses (such as labs and large seminars) for the near future, if not forever, thus driving up enrollments in online learning.
> Socioeconomic and political forces will result in fewer international students, driven by an abundance of caution and travel, funding, and visa restrictions.
> Many schools will lower admissions standards for residential students due to decreased admissions applications.
> The justification for certain meetings, infrastructure, hardware, and equipment on site or at all will be strongly challenged.
> Academia will use new ways of working to include significantly more online interatction.

During the COVID-19 pandemic, restaurants advertised "contactless delivery." Will we see the same promoted in higher education? As computer science professionals, we can act as resources and advocates to those who challenge the efficacy of online learning, are afraid to try it, or just don't know how to make it work. ⊏

PHIL LAPLANTE is a professor at Pennsylvania State University, University Park. Contact him at plaplante@psu.edu.