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Higher Education Response to Challenges During COVID-19 Pandemic

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Abstract

This paper explores the response of international higher education to the COVID-19 pandemic through the lenses of broadband connectivity, faculty fatigue over teaching online, and student performance during the public health crisis. It also addresses the global supply chain challenges the world experienced and their effect on higher education related to technology. Finally, this paper identifies lessons learned and strategies for future success for higher education in an online environment.

Keywords: Higher education, global supply chain, COVID-19 pandemic, student engagement, student wellness, mental health, students with disabilities, online learning, online teaching, technology, student success, student performance

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Higher Education Response to Challenges during the COVID-19 Pandemic

The global COVID-19 pandemic has had significant impacts on higher education in the United States and around the world. It has also had many effects on student success, including teacher-student engagement, student performance, access to technology, and students' mental health. With the increase of COVID-19 cases, most universities shifted their classes and services to a remote online learning environment, which created some challenges for students and faculty alike. With such global challenges, attempts by universities and disadvantaged individuals to access technology at greater quantities led to a delay in the global technology supply chain during the pandemic, which impeded the delivery of high-quality instruction at higher education institutions. The pandemic illuminated the challenges of higher education during the public health crisis from the standpoints of student success and mental health, the difficulty of broadband connectivity, and access to technology because of the supply chain delays and socioeconomic status of students.

Background

COVID-19 was declared a pandemic by the World Health Organization (WHO) on March 11, 2020, and was first identified in Wuhan, China. The WHO defines a pandemic as "the worldwide spread of a new disease" for which most individuals do not have immunity (Tharakan et al., 2020). The Centers for Disease Control and Prevention COVID Data Tracker reports over 40 million cases of COVID-19 across the United States and more than 700,000 deaths since January, 2020. As of October 5, 2021, approximately 76% of all eligible persons age 12 and over have had at least one vaccine dose, (CDC, 2021). Over the nineteen months of the pandemic (and counting),

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the number of deaths and cases of COVID-19 have increased rapidly, rising in large waves. The primary reason for this, especially in the United States, is due to the lack of a national response, proper mask wearing, and social distancing. However, there are locations in the world that have implemented all these preventative measures, and still have a relative increase of cases, because of the appearance of variants. This is not only harmful to the health and safety of all, but the global economy, too. The COVID-19 virus has caused a worldwide crisis that has put unprecedented stress on millions of people and nearly every sector in the economy, including industries, small businesses, nonprofits, hospitals, schools and universities, childcare centers, technology, and retailers.

Impact of Supply Chain on Higher Education's Access to Technology

COVID-19 has had an immense impact on the global supply chain, or the worldwide production of needed products. A supply chain is defined as the entire process of making and selling commercial goods, including every stage from the supply of the items and materials and the manufacture of goods, through to their distribution and sale to the consumer (Grimshaw, 2020). Many companies rely on overseas manufacturers and the arrival of a global pandemic brought many of these production chains to a halt. Instead, the supply chain focused on manufacturing personal protective equipment (PPE), such as masks, because of the pandemic. Even companies with different specialties, such as Apple, shifted to manufacturing PPE. Even nineteen months later, the world continues to face a global pandemic health crisis, meaning every process needs to be improved for streamlined efficiency and coordination of the supply chain (Cook, 2020).

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Due to the early pandemic focus of producing personal protective equipment (PPE) and technology items such as laptops, a shortage in the supply chain caused delays in the shipment of technology to higher education institutions. The demand was high, and production could not keep pace. Higher education institutions worked diligently to get technology into the hands of students who needed it. Universities received financial support from the CARES Act, which included a funding package from the federal government to assist in the response to COVID-19, to provide support for their students during the pandemic which included technology related expenses (Dortch et al., 2020). The Tacoma Community College Foundation purchased 600 computer laptops to support students who could not afford the computers they required for online learning (T. Lindgren, personal communication, December 2020; B. Ryberg, personal communication, December 2020). It was a herculean task for the Foundation to secure hundreds of laptops despite the supply chain delays which otherwise prevented students and faculty in higher education from obtaining needed technology for their studies. Those with socioeconomic barriers may have been impacted, as they possibly had no other means to obtain technology.

Broadband Connectivity and Higher Education's Local Impact

Internet usage and efficiency has also been greatly impacted by the pandemic. Due to telework and online classes, broadband and internet services usage has increased dramatically. According to Anderson and Vogels (2020), roughly three quarters of Americans have been relying on email and other telecommunication tools to remain engaged during the pandemic. Consequently, Americans have been fearful that the increased usage of internet services would lead to outages. More specifically, there

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were worries that internet service providers would be unable to keep up with the high capacity of users, potentially leading to daily interruptions as users navigate life during a pandemic (Anderson & Vogels, 2020). Increased rates of at-home internet use did result in lower efficiency for many broadband internet service providers. Therefore, these internet service providers have undertaken company-wide initiatives to introduce higher broadband capacity, increased data usage capabilities, and more easily accessible Wi-Fi hotspots (Lenoir & Olgeirson, 2020). It is incredibly important to continue reducing service interruptions and delays, so all can engage in daily activities that now often utilize higher bandwidth for video conferencing, such as working remotely, learning online, and talking to loved ones.

In the midst of a global pandemic, internet connectivity became more important than ever. To address this problem, the United States Congress took action to assist the Federal Communications Commission (FCC) in expanding broadband. The FCC has focused its COVID-19 response on expanding internet access and ensuring that networks can support the increased internet traffic. Congress was helpful to the FCC's efforts in ensuring network connectivity with the increased traffic by appropriating $200 million in the CARES Act. This Act was included in one of the stimulus packages passed by Congress to assist individuals and businesses in the response to the effects of the pandemic. The FCC took several regulatory actions to promote internet connectivity including providing telecommunications services, information services, and devices necessary for telehealth services during the emergency period (Holmes, 2020). This funding and effort by the FCC were needed to ensure that hospitals and emergency rooms were not overloaded with patients, and to help control the volume of

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patients seeking in-person healthcare services, in addition to helping the thousands of people in the country who have been relying on increased internet connectivity to complete their work and school activities.

Technology Needs in Higher Education

With respect to technology and internet access for universities, the needs of each university are quite diverse based on their student population; therefore, the universities responded in a variety of ways. According to higher education consultant Tim Culver from the Ruffalo Noel Levitz consulting firm, in spring 2020, universities responded by providing technology bundles for students who needed such equipment to complete their coursework (T. Culver, personal communication, November 17, 2020). These technology bundles included such items as Wi-Fi hotspots and laptops. According to Tacoma Community College's (TCC) psychology department chair Craig Cowden, the institution similarly purchased hundreds of laptops and Wi-Fi hotspots for students in need. Additionally, the campus projected Wi-Fi to some of the parking lots so students could connect their devices for free (C. Cowden, personal communication, November 10, 2020; S. Johns, personal communication, November 11, 2020). This dedication to helping students was essential for other universities to emulate, as some students simply do not have the financial means to cover these expenses necessary to do well in their classes. TCC was not the only campus to project its Wi-Fi to a parking lot. According to Libi Sundermann, a history faculty member at the University of Washington Tacoma (UWT), that campus also extended its internet connectivity to a specific parking lot for students to access the Wi-Fi.

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For some students, however, socioeconomic status prohibited them from gaining access to necessary technology such as laptops. TCC, for example, gave out some computers, but simply could not meet the demand. Many students faced unemployment or underemployment due to the pandemic and were without familial support. Those who could afford high-quality technology and stable internet had an advantage over those who could not. According to faculty co-chairs Mary Fox and Steve Johns of the Writing and Oral Communication Department at TCC, the college opened a limited number of computer labs in response to those needs, although the times and days were quite minimal (personal communication, November 13, 2020). These disparities highlighted already existing inequities in education for students of color and students with disabilities.

Online Learning and Faculty Professional Development

Online teacher training support and more time for class planning were shown to be necessary for faculty. Libi Sundermann, history faculty at UWT, noted that faculty did not have time to be equipped for online teaching in the spring due to the rapid spread of the pandemic. After a difficult start, the UWT campus did provide intensive professional development training in the summer in advance of the fall quarter; however, not all faculty were prepared to teach online, just like many students were not ready to learn online (personal communication, November 17, 2020). Universities worked to provide additional professional development in order to be prepared for similar circumstances in the future that require online learning and teaching (T. Culver, personal communication, November 17, 2020). The education of students who may have depended on the use of campus spaces or the public library, for access to Wi-Fi was threatened. This lack of

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access remained a danger in the ongoing pandemic when students did not have the benefit of internet access at home, since these locations have suffered sporadic or ongoing closures to reduce spread of the virus. All of this demonstrates there is a strong need to create more robust online experiences for faculty and students alike, both during this pandemic and beyond.

Online Teaching, Faculty Fatigue, and Student Performance

Being forced into a remote learning and teaching environment took a physical and emotional toll on students and faculty. With two billion students worldwide forced to receive their education online, there was a serious concern for the physical and emotional needs of students (Erkut, 2020). Implementation of physical exercise and provision of academic support, such as counseling and tutoring supports are essential to persevere through the many months of remote learning. From personal experience and those of my classmates, the many hours of class utilizing increased technology, such as classroom management systems and video conference platforms, has been exhausting and overwhelming. Managing the increased use of technology is vitally important as fatigue from its use is overwhelming, even though it has been the only mode for learning and teaching during the pandemic.

Yet, there have been successes, too. The outcome for some online students has not been entirely not evenhanded, particularly for those who struggled both academically and emotionally during this challenging time of the pandemic. However, for some students with disabilities, this online learning better met their accessibility needs with greater flexibility of their environment and schedule and the ability to take breaks as needed due to their disability.

While the physical and emotional toll of the pandemic was extremely apparent to many faculty and students, there were also positive outcomes for students in the online learning environment. Some students found online learning was a more conducive learning environment and that it was convenient to attend classes remotely on video conferencing platforms. The online learning environment was more convenient as it eliminated travel time to school. Learning online was also a benefit to some as quizzes and exams were online in classroom management systems. Open book/notes exams made it easier to do well on exams and other assignments, even when those exams had time limits. There are several advantages for instructors in online exams compared to in-class exams, including limited administrative costs, greater availability of multimedia assessment tools, convenience for students, and faster analysis of results.

At the same time, for some students with physical or mental health disabilities or learning difficulties, remote learning was a challenging and inequitable environment. Students who are blind, for example, had to confront inaccessible file types, such as PDFs and other platforms that were incompatible with their screen readers. This aspect of accessibility is critically important to students who are blind, as they use screen readers to read the files and text on the screen out loud.

There also remains a potential risk of academic dishonesty. Anecdotal evidence suggests that cheating is pervasive in online exams, but most of the literature has focused on in-class exams compared to online exams. Vazquez et al. (2021) analyzed the effect of two different proctoring methods on exam scores in a field experiment. Average scores on non-proctored exams were over 11 percent higher than proctored

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exams. The effect of web-based proctors is found to be smaller than live, in-person proctors. The marginal effect of proctoring is stronger among lower ability students. So, there was significant change in the scores between those with face-to-face proctored exams and those proctored online.

In addition, there has been a need for faculty to support each other during these challenging times. Using video conferencing software is fatiguing. The increased time spent sitting at a desk is also physically challenging and painful. Steve Johns says he typically stands and moves about the classroom, which gives him more energy and creativity and makes him feel "sharper." Some students and faculty both had extreme difficulty in doing their work from home since on-campus locations such as the library, computer lab and faculty offices were closed (S. Johns, personal communication, November 11, 2020). This has been a common theme in education during the COVID-19 era for students and faculty. The psychology department faculty at TCC held regular Zoom check-ins to discuss pedagogy, but instead, these check-ins were often spent talking about family happenings (C. Cowden, personal communication, November 10, 2020). It is challenging for faculty to manage their families and teaching simultaneously, and even more so for those who are home schooling for any children (Kirk, 2020). To manage parents' work schedules and their children's class schedules, while making sure everyone has access to technology devices, can be incredibly challenging.

Students have found the transition to online education to be very taxing, especially those who lack educational justice. Educational justice "focuses on ensuring that each student has the opportunities to find, figure out, and develop their skills and abilities based on their values and their communities' values. A just education does not assume

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the same means or the same ends for every student" (Levitan, 2016, para. 9). The transition to online learning has resulted in the absence of structure that a university environment typically provides (Sycamore, 2020). The typical structure allows students to thrive and ensures universities provide the necessary support through traditional methods such as library services, academic advising, technology support, tutoring, and other services. However, the pandemic has forced universities to convert these services to remote options, which have not been ideal for many students. Students who lack educational justice are at greatest risk, including students of color and students with disabilities who may not benefit from the remote service options that the universities offered throughout the pandemic.

Surprisingly, some college students' success had been positively affected during the COVID-19 period. The COVID-19 quarantine radically changed the course of the 2019-2020 academic year because students in higher education were required to perform a higher number of tests each week. Additionally, students' learning strategies before quarantine showed that students did not study on a continuous basis. According to Gonzalez et al. (2020), COVID-19 confinement changed students' learning strategies to a more continuous habit, improving their efficiency. Gonzalez et al. (2020) conducted a study on student performance during the pandemic which involved data that had been collected anonymously from 458 students at a university in Madrid. Students were identified by numerical code rather than personal identifiers. The higher number of tests each week were significant, since it seemed as though they were a direct result of the need for online classes. Exams were held online, which increased the time students were required to be online and significantly increased fatigue because of computer

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screens (Gonzalez et al., 2020). Tests could be interpreted broadly as both formal exams and quizzes, as Gonzalez et al. (2020) did not specify the term tests. It is no surprise that the conditions students were working under, after moving to an all-remote online environment, changed. Yet the fact that some students performed better in the online environment during the pandemic compared to when not in a pandemic period was surprising. One would think an international health crisis would create increased stress on students to the point that their academic success would decline. According to Gonzalez et al. (2020), however, results demonstrated some students obtained better test scores in all types of tests performed after the shift online and lockdowns began. The results showed a positive difference in performance during confinement compared to performance in previous periods where educational opportunities were not limited to distance learning.

The outcomes also showed that some students received better grades in activities that did not change their format after the COVID-19 confinement ended (Gonzalez et al., 2020). In this study, student performance was not impacted significantly as a result of the pandemic. The common factor which impacted student performance was internet infrastructure. Furthermore, a survey study was done, including a total of 275 students in South Africa from a variety of schools in both higher income and lower income areas. The survey contained questions about face-to-face classes before the pandemic as well as online classes. The results demonstrated that performance from the students' perspective was positive. It was observed in the study that lower academic performance was found among students who found transitioning to the online environment challenging. The study also involved the averaging of student grades. The main barrier

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to student performance was poor internet connection (Chisadza et al., 2021). Having internet connection difficulties was not surprising since students continued to have challenges with internet connection and broadband throughout the pandemic.

Pandemic Response for International Higher Education

Global mobility has also been a significant factor in the response to the pandemic. According to Wu et al. (2020), "global mobility" refers to border crossings which often take place for temporary purposes, such as for a program of study, mid-career international experience, or employment (p. 1). Global mobility in the higher education context refers to non-permanent border crossings among college students for study and work. The student mobility numbers increased from two million in 1999 to five million in 2016 with an average annual growth rate of 5.1 percent (p. 1). Mobility may decrease as the pandemic persists, although it is unclear whether that will remain true (Altbatch & Wit, 2020). After border crossings at the U.S.-Mexico border, "Border Patrol agents apprehended about half as many migrants at the U.S.-Mexico border in fiscal 2020 as they did the year before according to federal data" (Gonzalez-Barrera, 2020, para. 1). Current border crossings at the United States-Mexico border are at an all-time high. The number of migrant encounters per month had fallen to 16,182 in April 2020, right after the COVID-19 pandemic had forced the closure of the border (Gramlich, 2021). But the U.S. Border Patrol reported nearly 200,000 encounters with migrants along the U.S.-Mexico border in July, the highest monthly total in more than two decades (Gramlich, 2021). "The July figure is the highest monthly total since March 2000 and far surpasses the peak during the last major migration which occurred in May 2019" (Gramlich, 2021, para. 3).

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In contrast to the southern border, the U.S. Canadian border was shut down throughout the pandemic and only reopened the border August 9th to "American citizens and permanent residents who are living in the United States and have been fully vaccinated at least 14 days prior to enter Canada for non-essential travel" (Public Health Agency of Canada, 2021, para. 3). The border reopened to all travelers who were fully vaccinated at least 14 days prior to entering Canada on September 7th (PHAC, 2021). Prior to this, the mobility rate halted because of border shutdowns due to the pandemic. Maintaining global mobility requires international cooperation (as seen recently with Canada and the U.S.), and many factors affect mobility, such as socioeconomic status, academic achievement, and social relationships. Many of these factors have been at play during the COVID-19 pandemic. Countries across the world have implemented education policies to encourage global mobility among students. With global mobility interrupted, the stakeholders are the students and faculty members involved with study abroad and international exchange.

The responses to the issues of higher education on a global scale during a worldwide pandemic were varied and challenging. The actions taken around the world varied depending on the changes made by the individual institutions. Most countries shifted in-person instruction to online instruction. Some institutions postponed or cancelled certain examinations and many universities had research impacted and study abroad programs cancelled. Some universities, such as those in the United States and China, delayed the start of spring semester or quarter in order to allow for faculty to prepare and train to teach online.

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Many institutions consequently saw enrollment drop for local and international students. Only 10 percent of institutions were prepared to deliver online classes according to a survey; most of those institutions are in South Africa (Crawford et al., 2020; Shrestha et al., 2020). South Africa had the technology and infrastructure in place to meet the needs of the students to go remote compared to other countries. According to the International Trade Administration (2021), South Africa has a major information technology industry and infrastructure. "Several international technology corporates operate subsidiaries including IBM, Microsoft, Intel, and Dell" (International Trade Administration, 2021, para. 1). This is a major factor as to the infrastructure that is present in the country, which allowed it to respond in the manner it did with remote learning. Yet, even meeting the technology challenges of conducting online classes does not assist in weathering the storm of the pandemic.

Strategies for Online Higher Education and Lessons Learned

There are several principles recommended for online learning in higher education that can help provide an equitable online learning experience for all students during the ongoing COVID-19 era and beyond. The best way for students to learn is when their instructors provide a positive environment and encouragement for them to learn. Continuous encouragement is vitally important to the success and support of students (Kirk, 2020). When faculty or instructors make encouraging comments and remarks, these can increase student success. This also demonstrates that faculty value the voices of students, which increases students' confidence in their academics, personal growth, and professional development.

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Providing asynchronous content for online classes is especially important for several reasons. A study by Guo (2020) examined an introductory calculus-based physics class which had 21 students. The class consisted of a large number of Marine Science majors, as the institution has a large marine science program, but also had several other science majors. The class was taught in the SCALE_UP (Student-Centered Active Learning Environment for Undergraduate Programs) format, with the classrooms consisting of seven six-person round tables situated around an instructor's podium. The classroom also had whiteboards spanning all four walls. Additionally, instead of three one-hour lectures plus a three-hour lab session every week, there was instead a two-hour class session on a hybrid schedule three days a week. Students also participated in the class in a flipped classroom format, where they read and listened to the lecture before class so when they arrived in class, they could begin problem solving scenarios related to the content for that session. In the study, the class was held with an optional synchronous online session, held on Zoom, during the original class time. The study looked at how students' grades changed after the transition. Those students who attended synchronous sessions saw an average test grade drop of 3.5 percent compared to those who did not attend; they saw a drop of 14.5 percent (Guo, 2020). A survey was also completed, and it was determined that those who did not attend the synchronous sessions found the course more difficult. Guo (2020) recommended that online courses require attendance for synchronous participation rather than having it be optional. This is not surprising since there was a clear message from students that synchronous classes are more desirable as they are more engaging.

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For example, Peking University in China provided a superior model for online learning by offering about one hundred online courses. However, compared to face-to-face courses offered by universities, this number of online classes is still low. The university was forced to "launch live online programs for a total of 2,613 undergraduate online courses and 1,824 graduate online courses in order to [ensure normal] teaching operation with over 44,000 students staying at homes or dorms" (Bao, 2020, p. 113). The university discovered six instructional strategies to ensure effectiveness in transition to online learning. First, making emergency preparedness plans for unexpected problems, such as when the online platform may shut down because of overload, is critical. Second, "dividing the teaching content into smaller units to help students focus" can be useful. Third, it is important to emphasize the use of 'voice,' as body language and facial expressions are important teaching tools which are difficult to execute over the screen when teaching. Fourth, because "the technical requirements are far greater" in online teaching, working with teaching assistants and gaining online support from them is important. Fifth, "strengthening students' active learning ability outside of class" is important, as "faculty have less control over online teaching" compared to in-person and students are more likely to "skip the class." Finally, it is worthwhile to combine "online learning and offline self-learning effectively," as "insufficient pre-class study preparation, limited participation in class discussions, and inadequate discussion depth are common" even during in-person classes and should not be overlooked for online classes (Bao, 2020, pp. 114-115). Utilizing these instructional strategies during the pandemic and after will substantially improve online learning and teaching into the future.

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It is therefore important to ensure that all content is accessible for all student learners. Asynchronous content is content that is recorded or provided in a way so students can access the information at a suitable time that works for their schedule. This is important since online learning is most difficult for disadvantaged students. Asynchronous learning may be convenient for students who are parents who are tending to the educational needs of their children at home, or for those who are in different time zones. The online environment is often better for students who may need accommodations and the kind of flexibility they require to succeed in on-campus programs. Access to the internet and digital resources is not equitable for all students, so it is important to separate large lecture sections into multiple videos (Nordmann et al., 2020). Separating content can also help to ensure steady broadband bandwidth. Providing asynchronous learning is essential in promoting educational justice, particularly during times like the COVID-19 pandemic. As mentioned previously, it is noteworthy, despite all best efforts, that the online environment does create inequities and accommodation issues for students with certain disabilities.

Several points need to be considered for communication with both synchronous and asynchronous styles of online learning. It is important to set clear expectations for all types of online classes. Professors should provide scaffolding opportunities so students can seek clarification about course materials and examinations. It is important for professors teaching asynchronously to set clear and reasonable expectations and timelines for when students can expect to receive feedback and grades, and when instructors will return email messages with answers to their course questions. Furthermore, development of collaborative skills during small group discussions and

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activities is still possible and creates valuable learning opportunities (Nordmann et al., 2020). It is also important for synchronous classes to ensure security in remote classes, as reports of Zoom bombing – the unwanted, disruptive intrusion of internet trolls in online video calls – have been made (Nordmann et al., 2020). Security measures such as passwords and waiting rooms on platforms such as Zoom can ensure secure classes.

Regardless of whether a synchronous or asynchronous format is selected, successful online classes are possible with special accommodations. For example, Pamela Jeffries (2020), a nursing dean at George Washington University School of Nursing in Washington, DC, shared four lessons she learned during this unprecedented time. The first lesson is that change is difficult but can be more easily accomplished through transparency, setting context, and providing resources for the necessary changes. Without transparent communication and providing the necessary resources for the changes, change is extremely challenging (Jeffries, 2020, p. 229). The second lesson is that building the culture and community within the school is important to demonstrate care and attention to faculty and staff (p. 229). This is critical to provide opportunities to build trust among each other during this time. The next lesson is setting clear expectations for a new normal realizing the roles and responsibilities of staff and faculty may look different – not just now, but permanently (pp. 229-230). Perhaps in the future it may be more convenient for faculty to work remotely and exclusively teach online. The last lesson is for the leaders of higher education, such as the dean. The leader must be positive, creative, and grateful, and be able to effectively manage the anxiety coming from uncertainty (Jeffries, 2020). This is essential; the leader is only

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effective when they can competently respond to the situations that arise in a calm and collected manner. These lessons are invaluable and will help leaders of organizations and higher education to respond in the future to crisis.

Conclusion

COVID-19 has caused much interruption to many areas of the economy, daily life, and education. In addition to the interruptions to the economy, COVID-19 has brought with it endless cases and deaths in the millions worldwide. The pivot to online learning and teaching has forced faculty to shift their teaching style, which caused them to become fatigued due to the need for further training to teach online (L. Sundermann, personal communication, November 18, 2020; T. Culver, personal communication, November 17, 2020). For some students, it has increased performance in online classes, but potential challenges and inequities come with online learning, as well. Internationally, universities have had to respond to this unprecedented health crisis in ways that protect the health and safety of all in their communities. Universities have learned several strategies to help their students and faculty, which will hopefully last long after the pandemic, depending on their infrastructure. Institutions had to react to the delays in the supply chain to receive the technology they needed to support their campuses and provided support in large part due to the CARES Act funding. These tools and strategies learned during the pandemic will help, in the years to come, to provide more equitable and accessible experiences for students during non-crisis times. The strategies will also help universities respond to similar crises that may arise in the future.

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References

Altbach, P. G., & Wit, H. (2020, March 14). *COVID-19: The internationalization revolution that isn't [web article].* University world news. https://www.universityworldnews.com/post.php?story=20200312143728370

Anderson, M., & Vogels, E. (2020, March 31). *Americans turn to technology during COVID-19 outbreak, say an outage would be a problem [web article].* Pew Research Center. https://www.pewresearch.org/fact-tank/2020/03/31/americans-turn-to-technology-during-covid-19-outbreak-say-an-outage-would-be-a-problem/

Bao, W. (2020). COVID-19 and online teaching in higher education: A case study of Peking University. *Human Behavior and Emerging Technologies 2*, 113-115. https://doi.org/10.1002/hbe2.191

Centers for Disease Control and Prevention. (2021). *COVID data tracker [webpage].* https://covid.cdc.gov/covid-data-tracker/#datatracker-home

Cook, E. (2020, July 31). *Blockchain technology in supply chain during COVID-19.* Supply chain digital. https://supplychaindigital.com/technology-4/blockchain-technology-supply-chain-during-covid-19-1

Crawford, J., Butler-Henderson, K., Rudolph, J., Malkawi, B., Glowatz, M., Burton, R., Magni, P. A., & Lam, S. (2020). COVID-19: 20 countries' higher education intra-period digital pedagogy responses. *Journal of Applied Learning & Teaching*, *3*(1), 9-28. https://doi.org/10.37074/jalt.2020.3.1.7

Dortch, C., Fountain, J. H., Hegji, A., & Zota, R. R. (2020). *CARES Act higher education provisions (*Report No. IF11497). Congressional Research Service*.*

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Erkut, E. (2020). *Covid-19 sonras› yükseкö¤retim. Yükseкö¤retim Dergisi*, *10*(2), 125-133. https://doi.org/10.2399/yod.20.002

Gonzalez-Barrera, A. (2020, November 4). *After surging in 2019, migrant apprehensions at U.S.-Mexico border fell sharply in fiscal 2020.* Pew Research Center. https://www.pewresearch.org/fact-tank/2020/11/04/after-surging-in-2019-migrant-apprehensions-at-u-s-mexico-border-fell-sharply-in-fiscal-2020-2/

Gonzalez, T., de la Rubia, M. A., Hincz, K. P., Comas-Lopez, M., Subirats, L., Fort, S., & Sacha, G. M. (2020). Influence of COVID-19 confinement on students' performance in higher education. *PLOS ONE*, *15*(10). e0239490. https://doi.org/10.1371/journal.pone.0239490

Gramlich, J. (2021, August 13). *Migrant encounters at U.S.-Mexico border are at a 21-year high.* Pew Research Center. https://www.pewresearch.org/fact-tank/2021/08/13/migrant-encounters-at-u-s-mexico-border-are-at-a-21-year-high/

Grimshaw, J. (2020, May 17). *What is supply chain? A definitive guide.* Supply chain digital. https://supplychaindigital.com/supply-chain-2/what-supply-chain-definitive-guide

Guo, S. (2020). Synchronous versus asynchronous online teaching of physics during the COVID-19 pandemic. *Physics Education 55*(6), 1-9. https://doi.org/10.1088/1361-6552/aba1c5

Holmes, E. N. (2020). *Broadband connectivity and COVID-19: The FCC's response* (Report No. LSB10475). Congressional Research Service.

International Trade Administration. (2021). *South Africa – country commercial guide [webpage].* https://www.trade.gov/knowledge-product/south-africa-information-technology

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Jeffries, P. R. (2020). Academic nursing dean's role during COVID-19: Lessons from the frontlines of higher education. *Nurse Educator*, *45*(5), 229–230. https://doi.org/10.1097/NNE.0000000000000903

Kirk, A. (2020). COVID-19 unfolding in higher education. *Journal of Paramedic Practice: The Clinical Monthly for Emergency Care Professionals, 12*(6), 219.

Lenoir, T., & Olgeirson, I. (2020, March 24). U*.S. broadband usage surges as America enters COVID-19 crisis*. S&P global. https://www.spglobal.com/marketintelligence/en/news-insights/blog/us-broadband-usage-surges-as-america-enters-covid-19-crisis

Levitan, J. (2016, May 2). *The difference between educational equality, equity and justice… and why it matters*. AJE forum. http://www.ajeforum.com/the-difference-between-educational-equality-equity-and-justice-and-why-it-matters-by-joseph-levitan/

Nordmann, E., Horlin, C., Hutchison, J., Murray, J.-A., Robson, L., Seery, M. K., & MacKay, J. R. D. (2020). Ten simple rules for supporting a temporary online pivot in higher education. *PLOS Computational Biology*, *16*(10). https://doi.org/10.1371/journal.pcbi.1008242

Public Health Agency of Canada (PHAC). (2021, July 19). *Government of Canada announces easing of border measures for fully vaccinated travellers.* *https://www.canada.ca/en/public-health/news/2021/07/government-of-canada-announces-easing-of-border-measures-for-fully-vaccinated-travellers.html*

Shrestha, N., Baghbanzadeh, M., Wardrup, R., Aghamohammadi, N., Cervantes, D., Nahiduzzaman, Kh. M., Zaki, R. A., & Haque, U. (2020). The impact of COVID-19 on globalization. *One Health*, 11(100180). https://doi.org/10.1016/j.onehlt.2020.100180

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Sycamore, R. (2020). Anxiety during COVID-19. *Journal of Paramedic Practice*, 12(6), 247.

Tharakan, S. M., Salaam-Blyther, T., Gottron, F., & Lawrence, S. V. (2020). *COVID-19: Global implications and responses* (Report No. IF11421). Congressional Research Service.

Wu, S.-J., Chang, D.-F., & Sun, F.-R. (2020). Exploring college student's perspectives on global mobility during the COVID-19 pandemic recovery. *Education Sciences*, *10*(9), 218. https://doi.org/10.3390/educsci10090218