Tools to Create Interactive Digital Communities as our World Embraces Virtual Learning

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Abstract

This interview study offers educators practical tips on how to use tools to improve online learning experiences. Eleven instructors, professors and instructional designers were interviewed about challenges they faced designing and teaching online university courses in Florida. The purpose of this study was to explore how educators and instructional designers innovated learning design to improve instructor presence, engagement, and interactivity. In the wake of a pandemic that expedited the adoption of online learning, this paper is intended to offer advice for educators transitioning from emergency remote learning to strategic online course design that integrates emerging technology. This paper is intended to share what educators learned by experimenting with interactive 360-degree multimedia, virtual reality, videography, and visual design in learning management systems. Some of the tools featured in this paper include Roblox, Flipside, Plotagon, Articulate 360, Canvas, Kaltura and video conferencing apps.
Introduction

While to some it may feel like we are back to normal, it would be a shame if we found ourselves in the same spot we began after living through such a turbulent time of innovation. We must not be so eager to forget the COVID-19 pandemic that we fail to process the moments of magic that grew out of the turmoil. The landscape of learning evolved at supernatural speed. While educators were busy recovering from whiplash, the future arrived. Companies poured millions of dollars into expediting immersive technology to create a new reality. Hired.com called 2020 the year of augmented and virtual reality when they reported a 1,400% increase in AR/VR engineering job openings (Patel, 2020). In 2022, the edtech company Labster raised $47 million to build an “eduverse.” Then, Meta announced a $150 million Immersive Learning project (Whitford, 2022). The money is going to help 10 universities open their own metaverse campuses equipped with Meta Quest VR headsets for students. Educators are now on a fast-track to adopt higher-quality technology that was too cost-prohibitive to even imagine before the pandemic. We are perhaps finally about to enter the coming of age that instructional technologists have been waiting for.

Massive investments in immersive virtual learning have not only been coming from the Zuckerbergs of the world. Investments in time, money and effort happened on the front lines of education. As educators, we were aware of how dramatically our teaching changed because of the pandemic. So, we wanted to find out how others were using technology to create interactive digital communities as our world embraced virtual experiences. The purpose of this research was to understand how educators innovated during the pandemic and to share their successes. This paper outlines different tools educators used in their university courses and what they learned about engaging students online. We hope to encourage more collaboration as we explore emerging technology that can bring learning to life.

Research Questions

The questions guiding our research were:

- What are some challenges that educators faced when designing and teaching online courses?
- What are some of the innovative, disruptive solutions educators created or discovered that helped them overcome challenges associated with designing and teaching online courses?
- How have educators embraced emerging technology to increase engagement and promote social learning in online courses?

Literature Review

Prior to the pandemic, the U.S. Department of Education reported one-third of American college students had taken online courses (2020). The number of undergraduates exclusively enrolled in distance education courses grew from 2.4 million in 2019 to 7 million just one year later (2020). This created challenges for educators who tried to battle the negative impacts emergency remote learning had on student engagement and mental well-being (Petillion & McNeil, 2020). Researchers found the abrupt transition from in-person to online courses increased student anxiety and decreased motivation (Petillion & McNeil, 2020). Students lost
peer communication networks (Jeffery & Bauer, 2020). The psychological toll of isolation, loss and financial burdens wasn’t only felt by students.

While some educators were prepared to teach online, most felt they had insufficient bandwidth and preparation to transition in-person courses to online courses (Dietrich et al., 2020). Strategic online course development was found to be significantly different from courses offered online in response to the COVID-19 crisis (Hodges et al., 2020). Campus support and instructional design teams were not staffed sufficiently to suddenly assist every educator with unique obstacles related to class size and subject matter (Hodges et al., 2020).

Educators struggled to engage students who became increasingly hard to reach. A survey of nearly 3,000 undergraduate students from 30 American universities found access to adequate technology was a major barrier for student success in online classes (Katz et al., 2021). Researchers pushed for more nuanced measurements to better understand digital inequality students experienced. While previous studies found most American students had access to a computer, Katz et al. found that the pandemic revealed a detrimental number of students were under-connected (2021). In their survey, students reported unreliable or slow internet access and digital devices that were insufficient for the needs of fulltime online education. Some students reported needing to share devices with family members because they lost access to on-campus technology they relied on before the pandemic.

In addition to dealing with new obstacles created by the pandemic, remote classes amplified challenges educators already faced adapting to new technology like lack of resources, training, and time (Ballock et al., 2021). Even before the pandemic, many educators struggled to create visually compelling online courses because they lacked multimedia content creation and technical skills (Kebrighchi et al., 2017). Van der Heijden (2003) found that visual attractiveness of a learning management system (LMS) can positively impact perceived ease of use and perceived usefulness. In 2020, Ghapanchi, et al. built on this research and evaluated the importance of visual design. They found the impact of “space design on both perceived ease of use and perceived usefulness were significant,” (Ghapanchi, et al, 2020). Because strategic instructional design can make it easier for students to engage in online classes, educators need to constantly be on the cutting edge of content creation. Perceived ease of use and perceived usefulness are two main elements in the Technology Acceptance Model (TAM) that we used as our framework for this study (Martín-García et al., 2019).

Some universities are leading the way in acceptance of new education technology and crediting the pandemic with fueling their innovative initiatives. In November 2021, Stanford University published an article describing the Virtual People course which they claim is “among the first and largest courses to be taught almost entirely in virtual reality.” Students attend fully remote class meetings through VR headsets using handheld controllers to move around (Hadzay, 2021).

Many recent studies affirm VR’s potential to improve learning. In a meta-analysis of more than 60 research studies, Merchant et al. (2014) not only found that virtual environments are effective teaching tools in higher education. They specifically identified VR gaming as achieving the best student learning outcomes.

Some researchers found that virtual gamified training platforms expanded during the pandemic and created an opportunity for the development of new learning experiences that promoted higher-order thinking (Dustman et al., 2021). In November 2021, Roblox announced they’re spending $10 million to launch Roblox Community Fund (Baszucki, 2021). The fund will enable educators to bring virtual reality gamification to their schools. The CEO even wrote
about constructivism in the announcement stating that “students learn most effectively when given the opportunity to deepen their knowledge through hands-on experiences, problem solving, and collaboration with other people.” Roblox allows users to create and explore immersive 3D places. More than 9.5 million developers have produced their own immersive multiplayer experiences using Roblox Studio since 2018. Roblox Studio is a desktop design tool. But you can access Roblox on PC, Mac, iOS, Android, Amazon Devices, Xbox One, Oculus Rift, and HTC Vive. In April 2020, Roblox had 146 million monthly active users. A year later, that number grew to 202 million monthly active users (Dean, 2021). Sixty-seven percent of them are under 16 years old. As the metaverse becomes more of a reality, it’s not unlikely that students will begin to expect immersive co-experiences. Roblox is gearing up to provide customized and more nuanced experiences that will change the way we communicate with one another (Bronstein, 2021). Educators and academic institutions, need to be ready to make the most of these opportunities. In October 2021, Paris Hilton announced on her YouTube channel that she was launching Paris World in Roblox where fans can explore digital replicas of her mansion. In November 2021, Nike launched Nikeland in Roblox where players can wear digital Nike shoes, clothes, and accessories while they play games with friends. A month later, Tommy Hilfiger announced a collaboration with designers from the Roblox community to develop digital clothing for avatars. The popularity of games like Roblox could not only help gamify learning, but their familiarity with this technology could help reduce cognitive load as students start using Roblox for education.

Framework

Because we wanted to understand what impacts an educator’s decision to embrace new learning technologies, our research was informed by TAM. Under TAM, perceived usefulness and perceived ease of use are crucial factors in adoption of new technology (Martín-García et al., 2019). The pandemic created a unique ecosystem in which educators faced new and worsening challenges engaging with students. To examine how educators met that challenge, we framed our study around the theory that educators were more likely to embrace a solution that was useful in solving their problems and easy to learn. For that reason, we spent time asking about the problems they faced. Some educators admitted that a new technology had the potential of addressing their problems, but they struggled to accept the technology out of fear of the unknown, time it would take to learn, and cost. Because we hypothesized that emerging technologies had the power to solve some of the educators’ problems, we were curious to investigate the factors that influenced their decision to embrace new technology so we could better understand what stands in the way of innovation.

Methods

We started our qualitative study by reaching out to educators and instructional designers at the University of South Florida (USF). We interviewed two professors, four instructors and five instructional designers via Zoom. Interviews ranged from 30 minutes to nearly two hours. Their disciplines included music, journalism, biology, English, advertising, graphic design, and sustainability.

During the interviews, we asked initial questions about their discipline, class size and grade level. We asked how they designed classes in their learning management system and why.
We were curious to learn more about whether their online courses were previously in-person and what challenges they faced transitioning the courses online.

For our qualitative data analysis, we coded memos and reviewed interview transcripts for thematic analysis. We coded each tool educators mentioned to better understand who used it and why. Our codebook included tools like online gaming creation systems, 3D animation software, learning management systems, course authoring tools, video platforms, videoconferencing tools, discussion platforms, virtual reality (VR), and augmented reality (AR). We coded for hybrid, HyFlex, asynchronous, in-person and synchronous courses.

**Findings**

Many of the people we interviewed shared similar struggles teaching online. Online discussions came up in every interview. Several people we interviewed complained about the time it took to find and learn tools to solve their problems. Visual design was a common topic educators spoke about. The most fascinating responses came from the questions we asked about solutions they found or created to meet these challenges. While pedagogy and design theory were often considered as part of their course creations, the emerging theme was a strong focus and reliance on tools.

A common thread in our interviews that appeared to mirror sentiment across the country stressed that universities need institutional support to meet the challenges educators face engaging students online. Several educators we interviewed argued that virtual reality (VR) headsets should be sent to every student to empower them to have an experience that is as immersive as possible.

Another theme identified in our interviews was apprehension. It’s a bit scary to use a new tool with students who may expect you to be all-knowing. It can be intimidating to try to learn a new tool that you haven’t used before. People also said it’s hard to know what new technology is available. Some struggled to think of ways to create engaging experiences for students online. Nonetheless, every person we interviewed found a way to use a tool to meet these challenges. The following findings are organized by the tools educators adopted and how they perceived those tools improved student engagement and motivation.

**Roblox**

Let’s start with one of the most innovative professors we interviewed and the tool he used, Roblox. Before the pandemic, this professor taught climate change and sustainability in person. When COVID-19 forced him to move his classes online, he used the Roblox game to digitally recreate his classroom to give students a sense of normalcy. He soon realized, “if I could take the students anywhere, why would we go back to the classroom?” Instead of teaching students with PowerPoint decks, he turned his slides into digital billboards in their Roblox world. Student avatars rode together in a cart on a rail and virtually passed the digital billboards. Shortly after launching the digital billboard tour, he asked, “why are we walking around in the virtual world, when we can fly?” He geocoded a map and let student avatars fly. He offered his students a fun way to socialize and create community, which he believes was a key reason for this tool’s success. Roblox may have helped reduce isolation and loneliness students felt during the pandemic because students could interact with the course content and engage as an active
participant in their learning. The effort this professor put into creating something special appeared to give the students more motivation to learn.

As his experiments gamifying learning evolved, he shifted his thoughts from solving problems created by the pandemic, to better understanding the problems associated with teaching in person. He couldn’t shake thoughts of the “sage on the stage” concept. He realized that the traditional classroom is “horribly designed.” The space itself is intimidating for students since the educator is physically often placed at the front of the class behind a lectern. He found that online learning was more human because it fights this concept of a professor as a power figure. When the pandemic forced educators to teach remotely, professors often taught from home, sometimes with babies and pets on their laps. He appreciated that online teaching meant that professors could be themselves and not feel so pressured to play a role. He insisted that, if done correctly, online teaching can be less conforming, more authentic, and more fun.

He felt like the pandemic was an excuse to be more generous with students. “Suddenly, everything I dreamed of was ok to try.” Instead of deadlines, he gave “lifelines” to students who need extensions to reduce anxiety. He said part of him wishes we didn’t have to go back to normal after the pandemic. He noted that the pandemic pointed out the shortcoming of physical buildings. On top of costing a lot of money, he argued that campus buildings aren’t sustainable. He said classrooms don’t know if they’re theatres or detentions or jail cells. “We can use classrooms in theatrical ways with mood music and adventures with storytelling, but most professors aren’t teaching that way, so why be in classrooms that are designed like amphitheaters?”

Flipside

Flipside is another innovative tool that one of the educators we interviewed used to engage students in virtual production. Flipside says it’s the world’s first virtual TV studio for live real-time motion capture of animated content. It allows creators to customize animated 3D characters and their environment. While Flipside Studio lets users create and voice simple animations, its extended reality (XR), VR and AR tools are expansive. It can use data from full-body suits to track real movement that appears in 360-degree environments as animated characters. A professor we spoke with used Flipside to create animated videos for his online course. He voiced animated characters to make the course more fun and add instructor presence. The videos introduced the course materials and helped students understand what’s expected of them.

Plotagon

One professor used Plotagon so students could create a virtual world together to learn applied research. Plotagon is a mobile and desktop app that turns text into videos. The user interface lets students customize the way characters look and what they wear. Students wrote scripts and narrated character dialogue. Then they assigned movements to the characters that they selected from a bank of animations. Students had the choice of narrating the character scripts themselves or Plotagon can automate text to speech. The professor said students felt engaged and motivated when they were empowered to create their own learning content in a creative way.
360-degree video

Instructional designers we spoke with used 360-degree cameras to shoot videos and photos that students could view on a desktop, a mobile device or in a mobile VR headset. 360-degree video can have great appeal since it’s still novel in education, and can have profound effects on cognition and emotion (Makransky & Petersen, 2021). For a death and dying course, USF digital learning videographers created a virtual reality tour of a cemetery at the height of the pandemic using a 360-degree camera. Students learning from home could wear a mobile-VR headset and turn their heads around for a personal and intimate point of view that made them feel like there were standing in the middle of the cemetery. The video team also interviewed people who worked there on camera to give students a more impactful and memorable viewing experience. As 360-degree video cameras increase in quality and ease of use, they’ve become a powerful tool to immerse students in online course content.

Video conferencing

It was no surprise that everyone we interviewed talked about videoconferencing tools. Zoom went from 10 million to 300 million daily meetings in the first four months of 2020 (Evans, 2020). Microsoft Teams usage grew 894% from February to June of 2020 (Marks, 2021). Educators and instructional designers we spoke with agreed that video conferencing tools enabled schools to quickly transition to remote learning at the beginning of the pandemic. But when teachers were met with black squares instead of web cams, they felt the lack of social connection, and felt nostalgic for in-person classes. While many expressed frustration that they couldn’t convince students to turn on their web cameras, others acknowledged that they developed more empathy for students who lacked sufficient devices and broadband to fully engage in courses over Teams and Zoom from home.

As a result, several educators we spoke with began offering resources about how to connect computers to routers using ethernet cables. Some said their students didn’t understand how to get the most out of their at-home internet, like sitting closer to their Wi-Fi routers. Others recommended students access free Wi-Fi or hotspots at libraries.

Educators expressed that at the start of the pandemic, they struggled to think of ways to advance their video conferencing meetings beyond passive learning like lecturing at the students for the entire duration of the class. But as time passed, their institutions had more conversations about how to design and get the most out of synchronous sessions. Some found success with chunking sessions to improve the pacing and keep students interested. They created synchronous lesson plans where they would start with ice breakers, then do breakout rooms followed by short assessments and frequent knowledge checks. Breakout rooms became one solution that several educators appreciated to make larger class discussions more manageable.

A music professor shared his unique experience using video conferencing tools for ensemble lessons. While he struggled to record high-quality audio of synchronous student performances, he discovered one element of video conferencing that he preferred over in-person class. He said that Zoom breakout rooms allowed smaller groups of students to practice together more effectively. While in person, his students would break into groups and practice playing instruments in their own corner of the room. Online breakout rooms meant they weren’t distracted by the noise of other groups practicing different parts of the music.
Another advantage of video conferencing tools is that it enabled collaboration with guest speakers or teams across the country or even around the globe. An online Spanish class used video conferencing to pair students up with other students in Spanish speaking countries. They engaged in conversations in Spanish in a more authentic way than they would if the class was in person. This also added a cultural learning element to the course.

Videoconferencing played an interesting role in courses with large class sizes. One professor we interviewed taught a biology course with 250 students. Before the pandemic, the course was taught in one very large lecture hall. To accommodate that many students during the pandemic, she experimented with flipped hybrid-flexible, or HyFlex, course delivery where students could choose whether they would attend in person or online. She used a combination of in-class instruction, asynchronous content and synchronous sessions using Microsoft Teams. Her goal was to create a flipped course where students watched video lectures on their own time and then came to class prepared to discuss or work on activities based off the online course learning materials. Most classes contained 15 to 25 multiple choice clicker questions that gave her real-time data about what students understood or failed to understand. Then, she had students break into smaller groups to complete an activity or discussion. In-person students physically grouped together, while online students went into Teams breakout rooms. Toward the end of the 75-minute course, students returned to share what they learned in their groups.

The professor was surprised at how well this teaching method worked for her class. She expected to have less connection and less accountability with the online students but wondered if it was better because those students chose to be online. She noted that it was easier to learn students' names on Teams since their names appear on the screen. This may have helped students get to know one another better. She also admitted that it was easier for students to hear one another in Teams breakout rooms, so discussions may have been better online than in-person where students were physically distanced.

The professor assessed students on first day and then repeated the questions on the final exam to see if they learned. She found zero difference between scores from the online students and the in-person students. The main challenge she acknowledged was not with the videoconferencing part of the class, but with executing a flipped class. She believes that students prefer showing up to class and being passively entertained, but in the flipped classroom they had to show up to class and work. While she felt that flipped classes lead to greater learning, she assumed that students think flipped models are harder because they have to be pro-active and complete the readings and videos before class. Especially combined with the clicker assessments, students knew they’d have to answers questions on the spot so there was more pressure to be prepared for class sessions regardless of whether they were in person or online.

Perusall

In an attempt to increase engagement between students, one professor we interviewed used the social annotation tool Perusall, in the learning management system, Canvas. He uploaded readings and videos into Perusall where students wrote comments and took notes. Perusall marked timecodes when students commented on video lectures to make it easy to find video annotations. He felt like it was a more authentic form of communication than traditional threaded discussions. It also offered a form of automated grading where student comments can get more points when they’re upvoted.
The Canvas learning management system (LMS) was seen as both a challenge and a solution to teaching online. Canvas was without a doubt the most frequently talked about tool that every instructional designer and educator brought up during the interviews. While some offered tips for getting the most out of Canvas, others critiqued downsides of Canvas that led them to switch parts of their online classes to other tools.

Generally, instructional designers spoke more favorably about Canvas than educators. This appeared to be tied to familiarity with the LMS and department training and support or lack thereof. Instructional designers saw Canvas as an integral part of their jobs. They were trained more thoroughly on Canvas and were more aware of options unknown to most educators. One solution that was mentioned by several instructional designers was templates. Instructional designers created more classes than most instructors and professors, so templates were especially useful at increasing efficiency. Instructional designers use and create templates that they share in the Canvas Commons section for anyone at their institution to download. The challenge with this solution is that not many people outside of the instructional design team were aware these templates existed. Canvas Commons allows you to see how many times the templates are downloaded. During one interview, an instructional designer noticed a template they considered useful, barely had any downloads and insisted they would try to bridge this disconnect in conversations about communication with colleges.

While templates in Canvas saved time, they also provided another solution that became a common theme in interviews. Templates provided consistent visual design. This visual design wasn’t only aesthetically appealing, several instructional designers pointed out that consistent placement of content and resources in an LMS helps students reduce cognitive load (Sweller, 1988) that hopefully results in improved student learning and less frustration.

Several people we interviewed stressed how important it is for educators to use a “getting started” module at the top of their Canvas courses to provide resources for students who don’t necessarily know how to navigate their online courses. They mentioned that educators often assume that digitally native students know how to use every tool, but often find students struggling well into the semester because they lacked an understanding of how to use Canvas.

An instructor who taught large asynchronous online courses for years recommended educators consider using Canvas’ peer review function. Canvas can automatically assigns two peers to review each assignment. This encourages students to get to know one another and helps students see where their work stands compared to classmates. For the peer review to work, he said it’s vital to create clear and concise grading rubrics and deadlines. In addition to grading one another’s assignments, students also had to provide rationale which he argued helps students learn as they review.

The most common complaint educators had about Canvas was about discussions. Many felt that Canvas threaded discussions felt inauthentic. One instructional designer stressed the importance of phrasing a threaded discussion in a way that elicits more authentic engagement. He recommended that any teacher assigning a discussion think more thoroughly about their discussion prompts. He argued poor discussions are often a result of poorly thought-out questions. He insisted that discussions are more successful if educators in large classes break discussions into smaller groups. He said this improves the user experience because it eliminates the need to scroll past a hundred posts.
He also made a point about due dates. Many educators set assignment due dates for Sunday at 11:59 p.m. He argued it’s “somewhat criminal” to not be available to students before an assignment is due. He insisted, if you don’t work on Sunday, don’t have assignments due on Sunday. His tip was to have assignments due on a weekday when educators are accessible. Regardless of which day/s and time/s an educator selects, many people we interviewed argued that consistent due dates are crucial at helping students succeed while they’re often balancing deadlines for several other classes at the same time. Making assignments due on the same day every week should help students stay organized.

Another critique is that Canvas is not designed for real-time social interaction like Slack and Discord. Several people we interviewed also complained that Canvas analytics are limited. While it’s possible to see how much time students spend in the course, educators said they wished analytics were more detailed so they could use the data to adjust their courses.

Kaltura

Several of the instructional designers we interviewed said the media hosting platform Kaltura can be a great tool to get those in-depth analytics that educators can use to fine tune their decisions. Kaltura can be integrated into an LMS like Canvas which makes assessments more efficient. Educators or instructional designers can embed check points during a video that asks students to answer questions or reflect on what they’re watching before they can watch the rest of the video. Student answers can go directly into the Canvas gradebook. This type of assessment can be more interactive and engaging than traditional quizzes. It also keeps students accountable to watch course videos. Educators can also see exactly when a student stopped watching. Identifying patterns in student viewing habits can inform how long videos should last, for example, or whether certain parts of the videos can be improved.

One instructional designer we spoke with said she often uses these analytics to show educators that their course videos are too long. Kaltura lets users create chapters which segments videos into shorter durations. This chunking method is now common practice in instructional design. It was originally credited to George A. Miller in 1956. He researched working memory and argued that chunking content helps educators reduce cognitive load that leads to better retention (Mathy, & Feldman, J. 2012).

A few other cool features include the ability for students to search though video captions for keywords and then jump to that part of the video. Teachers can also use Kaltura to screen capture what’s on their computer, like a PowerPoint presentation. Kaltura can also record from your web camera.

Articulate 360

Articulate 360 also offers more options for educators to incorporate frequent assessments in creative ways that aren’t always available directly in an LMS. Instructional designers we spoke with mostly used Storyline 360 but some also used Rise 360. Storyline 360 is an eLearning authoring tool that resembles PowerPoint. It comes with more template options that are specific to the needs of educators or trainers. It also has a large bank of real and animated character images with different body language or facial expressions. Storyline 360 allows for more engaging interactions than traditional linear presentations. For example, an educator can create branching scenarios where students “choose their own adventure.” Instructional designers
we met with often used the drag and drop feature to give students a break from traditional multiple-choice questions. They often embed videos of instructors inside the Storyline 360 experience.

One of the use cases we encountered during our interviews was for a geosciences course. The digital learning group teamed up with a professor to take online students on a trip down a river. They used drone cameras to capture the trip from above. Videographers kayaked alongside the professor as he spoke to the camera from the middle of the river. They also used waterproof cameras to immerse students in the environment. The point of the lesson was to teach students about how the water and environment changed as the river flowed south. The video team edited short videos at several stops along the river. Then, the instructional design team created a map of the river and embedded it into the Canvas course. Students could click on hotspots along the river to watch the videos. While students may have enjoyed kayaking down the river in person, it would have been harder to hear what their professor was saying. With high-quality video cameras and microphones, the videos of the professor may have led to greater learning for students.

Discussion

To make it easier for educators to embrace new technology, institutions must prioritize supporting educators and learners with devices that enable them to engage in powerful, new ways. Additional funding and more affordable technology mean more educators could begin to utilize VR and AR to gamify learning. However, devices are only half of the solution. TAM suggests that ease of use is an important factor in technology acceptance. Instructional design departments in higher education can offer structure and support that educators need to feel confident embracing new technology in their courses. The relationship between educators and instructional designers can be better nurtured by institutions that can do a better job of communicating available resources to educators. Institutions should implement a culture of innovation by promoting exploration and experimentation with emerging education technologies that may be able to solve our current challenges with online education. Blaming emergency remote classes on student learning loss and lack of engagement is not helping us move toward a more innovative future. Instead of rushing to return to normal, institutions could learn from the pandemic and identify opportunities to improve online learning. According to TAM, perceived usefulness plays a large role in accepting technologies. More research on this topic could help educators and institutions identify ways in which innovative tools can be useful in engaging students and achieving student learning outcomes. More research like this is also needed to support educators to strategically develop methods of adopting and adapting to new technology.

As we work toward creating more connected online communities, accessibility must be considered and adjusted for. Technology is great, but we still live in a world where low-income students are likely to face greater challenges getting the most out of new technology because they lack access to powerful digital devices and reliable high-speed internet. This inequality must be designed for. That means making files as small as they can be without sacrificing quality. It means creating content that can be accessed on a variety of devices. It also means being compassionate toward students who may need to call into a video conference instead of joining with a webcam. Accessible design should of course also comply with the Americans with Disabilities Act which, in part, requires things like providing captions or transcripts of videos or audio, and adding metadata in photos for screen reading software.
Conclusion

At the end of each interview, we asked whether people could think of a course that could not be taught online. Every person we spoke with thought about the question and came to the same realization. No. After facing pushback from students against emergency remote learning at the start of the pandemic, every educator we interviewed emerged from their experiences with confidence that anything can be taught online. Some hands-on classes may be better in person. But educators came away from this trying time with a new mindset. Not only can new tools be used to solve their problems, strategic course design and adult learning theories can give them confidence to know they’re approaching their obstacles with evidence-based solutions.

Many found the pandemic helped validate research-based instructional design principles and more deeply engrain them into the university culture. Several people recommended that educators approach course design by asking themselves why they’re changing an assignment and how technology serves this purpose. They offered advice that focused on deeply understanding how any element in a course directly helps achieve strategic goals. They also found that sometimes, less is more. Removing unnecessary content or assessments helped reduce extraneous cognitive load and give students the time to focus on what really matters. One interviewee may have summed it up best when he said, “if I can create relevance, that overcomes anything. There’s no tool in the world that can beat relevance. When a student understands why they’re doing something, and they believe that there’s a good reason to do it, then they’re much more willing to engage.”

While different disciplines may lend themselves to different design techniques, all of them can be improved by integrating more interactive emerging technology and greater instructor presence. The flexibility that this affords students can also help prepare them for a world where remote work is becoming increasingly more common.

When faced with an immense challenge, they all did what good educators do. They learned. They figured out creative workarounds to their problems. They embraced the inquiry mindset that we try to instill in our students. They experimented and found solutions to problems they didn’t every realize they had before the pandemic. While the success of innovation doesn’t mean that every class will be taught online from here on out, it did empower educators to approach courses with an open mind. Perhaps there is a better way of doing things than the way it’s always been done. As the culture in our schools evolves in the wake of COVID-19, educators are now more comfortable with technology and online learning strategies that will lead us into the future of teaching.
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