Learning from COVID-19: Universal Design for Learning Implementation Prior to and During a Pandemic

Jennifer Renée Kilpatrick , Suzanne Ehrlich, & Michelle Bartlett

This study examined whether higher education faculty knowingly and/or unknowingly applied UDL principles prior to and during the COVID-19 rapid online teaching and learning (ROTL) transition. Researchers collected data through a survey that was disseminated nationwide and completed by higher education faculty (n = 38). Findings included a shift in instruction modality where 50 percent of synchronous in person instruction moved to asynchronous online instruction or optional synchronous remote instruction. Additionally, there was an unsurprising, considerable increase in the use of technology to support student engagement with course content. Researchers identified themes in the barriers (e.g., time, resources, training) to applying UDL principles both prior to and during the COVID-19 ROTL transition. Suggestions for overcoming those barriers are also included.

Introduction

Higher education has gone through many periods of change and transition throughout history with none quite so abrupt as the COVID-19 rapid online teaching and learning (ROTL) transition in March 2020 (Bartlett, 2020). At the time that we are writing this article, our discussions in higher education are focusing on before and during the COVID-19 pandemic because we do not know what after will look like. The world has changed in many ways, from the way we attend events, to the way we shop and dine out, to the way we teach and learn. We will likely never return to the way that life was before COVID-19 (Daniel, 2020).

Instead, we will adapt to a new normal. In higher education, we will want to learn from and continue any adaptations or innovations that were beneficial, so that we can continue to improve teaching practice.

Universal Design for Learning (UDL) is a promising approach to instruction with the potential to maximize learning experiences and minimize barriers for all students (Bernacchio & Mullen, 2007; Rose & Mayer, 2008) by using a flexible course design that incorporates UDL principles. Research indicates UDL is effective in responding to the challenges of online teaching and learning (Coombs, 2010; He, 2014; Lancaster, 2011). Knowing this, our research team was interested in determining whether or not higher education faculty were intentionally and/or unintentionally implementing UDL principles in their course design prior to and during COVID-19. We developed and disseminated a survey to explore what higher education faculty were doing nationwide.

 This survey study examined the retrospective perspectives of higher education faculty on their implementation of UDL principles in course design both prior to and after the onset of COVID-19 in Spring 2020 and Summer 2020 courses. The purpose of the study was to determine whether faculty were knowingly and/or unknowingly applying UDL principles prior to and during the COVID-19 ROTL transition. In this article, we will share what faculty reported regarding their course design, as well as barriers faced with regard to UDL implementation. The findings provide valuable insights and recommendations that could be applicable in future higher education course design.

It is important to clearly differentiate the type of online teaching and learning that happened during the ROTL transition from online teaching and learning that is intentionally planned (Hodges et al., 2020; Lambert & Schuck, 2020). ROTL vastly differs from well-planned, intentional traditional online teaching and learning. Throughout this manuscript, we will use the term ROTL to differentiate from any intentional remote or online instruction that happened prior to or during the pandemic. Given the limited time and resources to get content online during the ROTL transition, this distinction is especially important (O'Keefe et al., 2020) to the findings and interpretation of this research.

Universal Design for Learning (UDL)

UDL is a framework designed to support learners by reducing barriers and maximizing learning by creating equity, and providing an opportunity for all students to achieve (Black, Weinberg, & Brodwin, 2014). It guides the design of instructional goals, assessments, methods, and materials. UDL guidelines "can be

applied to any discipline or domain to ensure that all learners can access and participate in meaningful, challenging learning opportunities" (CAST, 2020). The framework is organized according to three principles from CAST (2020): multiple means of engagement, representation, and action and expression. All students, including those with disabilities, can benefit from a course designed with UDL principles because there are less barriers in place (Schelly et al., 2011). While students with disabilities are able to receive accommodations in higher education classrooms, many students do not disclose accommodation needs to the university. According to Dickenson & Gronseth (2020), "UDL involves planning flexibility into curricular design from the outset, recognizing that learners are varied in their learning preferences and capabilities, motivational characteristics, and environmental constraints" (p.1008). This flexibility supports faculty and students in overcoming barriers to teaching and learning through a proactive, rather than reactive, approach. Studies find a positive effect of UDL implementation on both teachers and students with and without disabilities (Davies et al., 2013; Hall et al., 2015; Kumar & Wideman, 2014).

UDL & Online

The majority of UDL implementation and research has been done in the context of face-to-face K12 environments. However, with the continued acceleration of online course design in higher-education environments, UDL has recently been seen as valuable in shaping online course design. Quality Matters (QM™), a certifying body of online course design structures, recently added UDL as a measure in their primary evaluation tool (Robinson & Wizer, 2017). While QM has contributed to the spotlight on consideration for UDL in online course design and delivery, not all courses undergo review. Therefore, online courses are not necessarily assessed for the presence of UDL principles. Al-Azawei, Serenelli, and Lundqvist (2016) note while UDL adoption cannot address all the obstacles of online learning, "using multiple means of representation, expression, and engagement can motivate learners to achieve their learning goals more effectively and enjoyably" (p. 52).

When designing and delivering higher education online coursework, there are several considerations that are important. Chertoff and Thompson (2020) created a list of best practices for online instruction. Many of these practices are related to UDL principles and keeping students' needs at the forefront. While Chertoff and Thompson write with K12 education in mind, three important steps that higher faculty can employ to make sure that student needs are taken into account. First, it is vital for faculty to provide opportunities for students to share their experiences and needs and for instructors to engage in empathetic listening to make sure that students feel understood, heard, and connected (Baran & AlZoubi,

2020). Second, instructors should check in frequently for understanding (O'Shaughnessy, 2020). Finally, faculty should give students ample opportunities to reflect on their learning (Costa & Kallick, 2008). Chertoff and Thompson (2020) also recommend considering motivational design principles and communicating frequently and flexibly, both of which are relevant to higher education teaching and learning.

UDL and Faculty

One of the most significant gaps in UDL research is an understanding of the applicability of the framework (Al-Azawei et al., 2016). Instructors from disciplines outside of education and psychology are largely not aware of UDL principles and may not know how to implement the framework in their discipline. While UDL is still relatively new in the higher education setting, Black, Weinberg, and Brodwin (2014) found that familiarity with UDL is not significantly correlated with implementation of UDL principles. In fact, they found that some faculty were implementing UDL principles unknowingly. However, research has identified training, resources, and time as critical factors to the successful implementation of UDL (Fovet, et al., 2014; Tobin, 2018). These factors may be helpful in overcoming barriers to UDL implementation.

Faculty experience a number of barriers to UDL integration in designing online teaching and learning (Chapko, 2017). According to Kumar and Wideman (2014), preparing multiple means of representation or grading learner achievement in a UDL-inspired course design requires more time than traditional courses. Therefore, it is not surprising that time (lack thereof) is often a major barrier for faculty consideration of UDL implementation (Green, 2019). Another potential barrier is the lack of UDL training and/or resources. Haynes (2020) found that implementation is more effective when well-documented strategies for implementing UDL in online courses is available indicating a need for faculty to have clear examples for how to implement UDL in their discipline. It is important to note that faculty members cannot be the only catalyst for UDL integration in higher education. Administration and students must also become knowledgeable in understanding the value of and advocating for UDL use in support of learning design (Kramer, 2019).

UDL & Resistance

Another gap in the research on UDL is examining whether there is actual resistance to implementation of UDL principles. LaRocco and Wilken (2013) surveyed higher education faculty and found they were at a stage of concern

(Hord et al., 2006) that centered on themselves for each of the principles of UDL. In other words, "individuals are most often thinking about how an innovation will affect them personally, and what is required on their part in terms of effort, time commitment, and knowledge and skill development" (p. 9). They concluded that non-users were likely due to a lack of campus-wide initiatives and the limited research on application in postsecondary settings. Fovet (2018) suggests there is resistance and that the resistance is related to technology integration. He asserted "UDL becomes almost mythically feared because teachers assume that a mastery of technology is required before one can use and implement the framework" (p. 8). Naturally, training in UDL and technology supports integration of UDL; however, existing structures may not have values embedded to support the mindset and action of UDL implementation across an institution. There needs to be a systematic institutional approach for implementation to be successful. Fovet (2018) found that schools in Canada attempted the following approaches to respond to barriers, including resistance: ecological context mapping, top-down and bottom-up implementation, communities of practice, demystifying the role of technology, focusing on sustainability, and strategic planning.

Purpose

While there is an ongoing demand for further research on the implementation of UDL, suddenly now there is an additional need to examine the impact of COVID-19 on implementation of UDL principles. We hypothesized the ROTL (Bartlett, 2020) course delivery impacted the ways in which faculty approached engagement, representation, and action and expression in higher education courses. This study examined these impacts via a retrospective faculty perspective. Faculty, many of whom were not experienced with online teaching, suddenly and unexpectedly encountered a number of new instructional design challenges as they adapted instruction to an online format for the remainder of the Spring 2020 semester and into the Summer 2020 semester.

Although the Centers for Disease Control and Prevention (CDC) publishes recommendations on school preparedness for pandemic flu (CDC, 2017), schools, both K-12 and higher education institutions, were underprepared for the sudden instructional impacts of the COVID-19 pandemic (Bartlett & Warren (2021). Many higher education institutions have documented plans for the continuity of education during a pandemic. In fact, it is often referenced in course syllabi. While institutions have not faced a pandemic with this level of impact in the last century, they did have opportunities to learn from past pandemics, including the H1N1 pandemic in 2009.

The Center for Infectious Disease Research and Policy (CIDRAP, 2010) published a report on lessons learned from twelve universities during the H1N1 pandemic. The report identifies the lessons learned and actions and challenges ahead. CIDRAP outlines that institutions prepare for flexible modification of attendance policies and provide "distance learning," and the report emphasizes developing distance learning capabilities in some institutions, including teaching strategies, faculty preparation, and information technology infrastructure. Similar to CIDRAP (2010), we aim to document lessons learned from this pandemic and discuss potential challenges and responses in the future. The purpose of this study was to examine implementation of UDL by higher education faculty, exploring whether knowledge of UDL principles and strategies better prepares faculty to provide instruction and continuity in the event of future pandemics or emergencies.

Methods

In this study, we collected data using an open-ended survey and analyzed data using qualitative analysis methods. The survey, developed by the research team, was distributed through various instructional design and higher education networks using listservs and social media to capture a wide-range of participants. The survey, which consists of a total of 14 questions, was designed to gather data on course modalities, application of UDL principles, and perceived barriers to the application of UDL principles through questions regarding pre- and post-COVID-19 instructional practice. In August 2020, participants were asked to reflect on their Spring 2020 and Summer 2020 courses, to consider their instruction prior to and during the COVID-19 ROTL transition, and to answer the questions accordingly. The following primary research questions guided both the development of the survey and the analysis of the data:

1. How did higher education faculty engage students with course content pre- and post-the onset of COVID-19?
2. How did higher education faculty represent course content pre- and post-the onset of COVID-19?
3. How did higher education faculty assess students' knowledge/understanding of course content pre- and post-the onset of COVID-19?
4. What barriers do higher education faculty report around implementation of UDL principles during course design and development both pre- and post-the onset of COVID-19?

Instrumentation

The online survey was designed by the researchers to examine higher education faculty perceptions about UDL prior to and during the COVID-19 pandemic that caused many instructors, who were inexperienced in online teaching and learning, to shift rapidly to teaching in online environments. The online survey, which can be found in the Appendix, consisted of a total of 14 questions organized into seven sections. The first section consisted of two multiple-choice questions about the course format prior to and during COVID-19. The second section included only 1 question, which asked whether or not faculty used UDL in their courses prior to and during COVID-19. After completing section two, participants were provided with a definition of UDL. In sections three through six, they were asked to respond to nine open-ended questions that were grouped into sections according to the constructs being examined in the four research questions: *engagement, representation, action and expression,* and *barriers.* We chose to use an open-ended question design for the questions because of the disadvantages of leading participant responses with a closed question design (Krosnick, 1999). Prior to each of these sets of questions, participants were provided with definitions of the construct being examined in the section. In section seven, participants were asked to respond to two multiple choice demographic information questions to provide the research team with context for their responses.

Data and Participants

Faculty from four-year higher education institutions were invited to participate in the study through purposeful sampling. The survey was administered via Google Forms, and participants were asked to give informed consent prior to beginning the survey and provided with contact information for the researchers. A total of 41 participants began the survey; however, only 38 participants completed all questions in the survey. These 38 participants were used in the analysis. Table 1 provides information regarding the participants' course modality prior to and during COVID-19 instruction. The survey question allowed for multiple responses by participants to indicate the various formats they taught their courses. As a result, there is overlap in the responses, and the numbers for each modality add up to a total (n = 53; n = 39) that is greater than the total number of participants (n = 38).

Table 1

Modality of Instruction

	Pre COVID-19	During COVID-19
In Person	**30**	**N/A**
Online Asynchronous	15	19
Required Online Synchronous	2	13
Optional Online Synchronous	N/A	15
Hybrid	6	N/A
Other	0	2

Prior to the pandemic a majority (n = 30) of participating faculty taught some or all in-person courses. During the pandemic, a portion of these faculty members (n = 11) transitioned to required attendance synchronous online learning, half (n = 15) transitioned to optional attendance synchronous online learning sessions, and the remaining (n = 4) transitioned to asynchronous online learning. While the majority of participants (n = 27; 71%) indicated that they believed they did apply UDL principles both before and during the pandemic, some participants (n = 5; 13%) indicated that they did not know what UDL was.

Because course-level and course size impact course design, we also asked about these topics to provide context for the participants' responses to the questions about UDL principles. Participants were asked (see Figure 3) to indicate the level of students they primarily taught (i.e., freshman, sophomore, junior, senior, masters, doctoral, other). Participants were permitted to select more than one response, so there is overlap in the following participant responses: 19 (50%) taught freshmen, 18 (47%) taught sophomores, 16 (42%) taught juniors, 15 (39%) taught seniors, 11 (29%) taught Masters students, 6 (16%) taught doctoral students, and 2 (5%) taught other (e.g., JD, MD) students. See Figure 1.

Figure 1

Level of Course(s) Taught
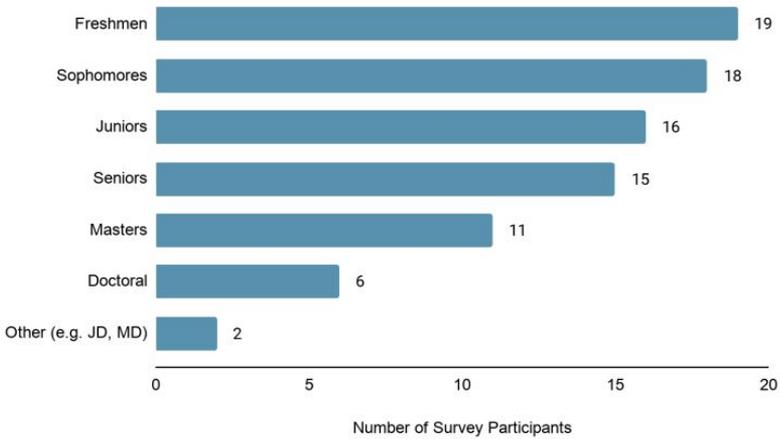
Participants were also asked about the size of their courses. Again, because participants were able to select more than one response, there is overlap in the responses that follow: 25 (66%) taught courses of 25 students or less, 15 (39%) taught courses of 26-50 students, six (16%) taught courses of 51-100 students, and four (11%) taught courses of over 100 students. See Figure 2.

Figure 2

Average Course Enrollment Size(s)
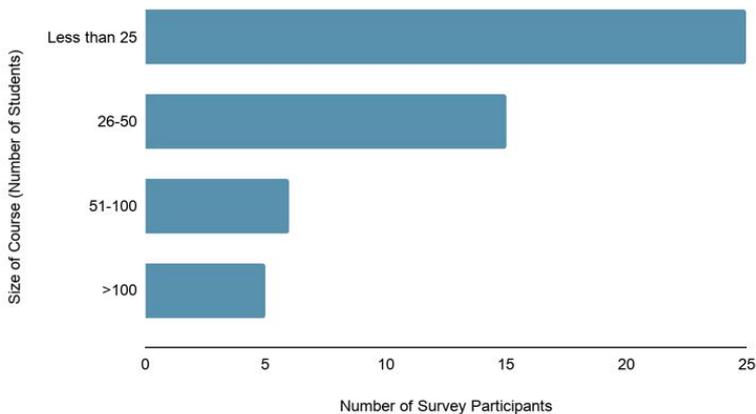
Data Collection and Ethical Considerations

Data was collected for several weeks at the beginning of the Fall 2020 semester. We used purposive volunteer sampling in order to not limit the data findings by geography, discipline, or institution-type. Higher education faculty teaching in Spring 2020 at any type of four-year institution (e.g., state college, public university, private university) were eligible to participate. Survey recruitment was done via higher education organization listservs as well as relevant social media groups. The recruitment statement contained information regarding the IRB approval, the study, and the research team, along with a link to the survey created on Google Forms. Participants provided informed consent prior to beginning the survey and were not contacted for follow-up. The survey was intentionally designed to take approximately 10-15 minutes to complete, knowing higher education faculty are limited in the time they have to participate in survey research.

Data Analysis

Data was read in its entirety by all three researchers before applying a manual, open, qualitative coding process in Google Sheets. We began with using open coding (Strauss, 1987; Strauss & Corbin, 1990) examining the responses for the set of questions in each section to identify the differences between the pre- and post-COVID-19 responses for each participant. We then used the differences in the participants' responses to create both descriptive and in-vivo codes (Saldana,

2016). In subsequent rounds of analysis, we identified patterns in the data (Miles & Huberman,1994) and collapsed similar codes into categories (Lincoln & Guba, 1985). Throughout all rounds of analysis, all three researchers engaged in analysis of the data and met several times to understand varying perspectives, illuminate blind spots, and develop a group consensus (Harry et al., 2005). Triangulation (Patton, 1999) was used to establish credibility and confirmability (Lincoln & Guba, 1985).

Findings

Modality

Upon initial review of the data, responses to survey questions 1 and 2 demonstrated a substantial *synchronous-to-asynchronous shift* in instructional modality pre-COVID-19 instruction to during COVID-19 instruction. Of the 38 participants, 30 taught face-to-face prior to the pandemic. Of these 30 instructors, 15 moved to a required synchronous online format, 11 moved to an optional synchronous online format, and four moved to an asynchronous online format. Roughly half of the instructors who originally delivered synchronous instruction moved from required weekly synchronous interaction with students to primarily asynchronous interaction with students. This notable shift potentially impacts engagement, representation, and action and expression as a result of COVID-19 (Smith, 2020). Because we did not ask what was required or suggested by participants' institutions, it is unknown whether these modality decisions were made by institutions, faculty, or a combination of the two.

Engagement

RQ1: *How did higher education faculty engage students with course content pre- and post-the onset of COVID-19?* Faculty identified various instructional methods for representation of content pre-COVID-19 such as whole group discussion, small group discussion, discussion boards, group activities/projects, practice/demonstration of skills, and presentations. The majority of participants indicated distinct changes in the strategies used to engage students during COVID-19. In examining the changes made in the engagement strategies used by faculty after the onset COVID-19, there was an unsurprising substantial increase in engagement through technology. See Table 2.

Table 2

Methods Used Pre and Post Onset of COVID-19

Principle	Methods Reported	Changes during COVID-19
Engagement	**• Whole Group Discussion** **• Small Group Discussion** **• Discussion Boards** **• Group Activities/Projects** **• Practice/Application of Skills** **• Presentations**	**• Majority indicated distinct changes** **• Increased use of technology** **• Increased use of discussion boards** **• Use of breakout rooms, virtual polling, wikis, and chat features**
Representation	• Lecture • Discussion • Assigned Readings • Videos • Slides • Handouts/Worksheets • Writing on Board • Interaction/Practice • Attention to accessibility	• Approximately half indicated changes • Methods were eliminated, added, and/or replaced • Increased attention to accessibility • Use of videos, podcasts, video conferencing, and narrated screencasting
Action & Expression	• Quizzes • Exams • Application & Skills-Based Assignments • Written Assignments • Reflection Assignments • Presentations • Discussion Boards • Projects (Group & Research)	• Approximately half indicated changes • Most common change was the elimination or replacement of exams and skills-based assignments • Some added assignments • Some provided of options for assignments/ assessments

Prior to COVID-19, participants indicated that discussions took place in whole groups and small groups via face-to-face conversations, discussion boards, and Facebook groups. During COVID-19 there was increased mention of discussion board use. Participants also noted the use of breakout rooms, virtual polling, and chat features to engage students in whole group and small group discussions (Lowenthal et al., 2020). One participant used the chat feature and mentioned less engagement post-COVID-19. Another participant chose to eliminate discussion, but added individual student conferences. While one participant eliminated group activities, most faculty indicated that group activities were still conducted with the support of breakout rooms, wikis, and other digital collaboration tools. Additionally, one participant noted adding group activities post-COVID-19. Although one participant mentioned reducing the scope of group projects, most

participants indicated the same level of group projects and skills-based learning, and one faculty member added more "hands-on project-based learning opportunities." One participant noted that live demonstrations were replaced by virtual demonstrations (i.e., via telepractice).

It is not surprising that the use of technology emerged as a significant change noted from pre-to post-COVID-19, as faculty needed to use technology to accomplish the same types of engagement they used prior to COVID-19 (Johnson et al., 2020). Participants provide insight into *how* technology tools can be used for engagement purposes. One participant wrote:

I think that the engagement aspect post COVID-19 also required me to have extra flexibility as STUDENTS transitioned. Just because *I* knew about all of this did not mean *they* did and I found that students (across the board for different delivery types) needed a lot of grace in their transition. I had to remember that everyone was learning FROM a different place (both metaphorically and physically) than they may have been accustomed to (just as I was teaching from a different place in the same way).This fluidity of my teaching and acceptance of them made a big difference to the students (based on their feedback and continuation of the course post COVID-19).

 The effort of faculty to quickly adapt and incorporate new technologies was noted in their use of Zoom, Team, and other platforms not only to host class sessions, but also to connect with students one-on-one for meetings and debriefings. Technology was a bridge for learning and a means of engaging with students. Without technology the same methods of engagement would not have been possible. While this highlights synchronous connections, asynchronous video also provides an alternative for engagement as highlighted in the study on moving beyond Zoom by Lowenthal et al. (2020).

Representation

RQ2: *How did higher education faculty represent course content pre- and post-the onset of COVID-19?* Faculty identified various instructional methods for representation of content prior to COVID-19 such as lecture, discussion, assigned readings, videos, slides, handouts/worksheets, writing on a board, and interaction. Additionally, attention to accommodations and accessibility was noted by several participants who taught online pre-COVID-19 (Smith, 2020). For example, faculty used closed captioning, American Sign Language (ASL) translations, and alt-text for images. These additions made their content more accessible for English Language Learners, as well as students who are deaf, hard of hearing, and/or

visually impaired. Participants also included some responses to these questions that were related to engagement (i.e., RQ1) both individually and in groups. For example, they noted "exercises to apply the knowledge" and "group work to work on example problems." See Table 2.

Approximately half of the participants indicated that there was no change in the representation of course content after the onset of COVID-19. Other participants indicated that they had eliminated, added, or replaced representation strategies previously used (Johnson et al., 2020). For example, two participants eliminated discussion. However, two participants added online discussion forums. Participants also added videos, podcasts, video conferencing, and narrated screen-casting. Some participants also indicated attention to accommodations and accessibility. For example, they provided slides and recordings of synchronous lectures. One instructor indicated that labs were replaced by videos, simulations, and animations. This demonstrates the potential for establishing digital resilience in learning from the pivot and what will last beyond this remote and online learning event (Baghat & Kim, 2020).

Action and Expression

RQ3: *How did higher education faculty assess students' knowledge/understanding of course content pre- and post-the onset of COVID-19?* Participants noted the use of the following primary methods of action and expression in their courses: quizzes, exams, application and skills-based assignments, written assignments, presentations, and reflections. Also mentioned were discussion boards, group projects, research projects, and homework. Discussions did not specifically address whether content was designed and easily transferred to the online space, which could have been a contributing factor in the decision-making process for assessments (Chang & Fang, 2020). See Table 2.

In examining the changes from instruction prior to and during COVID-19, we found that approximately half of the participants did not change their assessment methods. For example, one participant used reflective journals/blog posts, quizzes with unlimited attempts, writing assignments, and lesson activities both prior to and during the pandemic. Another reported reflective journaling, quizzes, exams, skill-based assignments both prior to and during the pandemic. Among the participants who made changes, the change most common was elimination or replacement of exams and skills-based assignments. While many participants chose to move exams online, some eliminated exams. One participant replaced exams with quizzes and open-book assessments. Another participant replaced exams with a skills-based project. Participants were creative in their approach to

skills-based assignments. One participant replaced a live practicum with a simulated project. Another participant replaced skills-based assignments with discussion boards.

Some participants added assignments, such as quizzes and self-reflections. Some faculty provided additional choices post-COVID-19. For example, one participant adjusted the assessment format by giving students additional options to demonstrate learning, they wrote "gave students additional options, for example, write a 5-page paper or create a 10-minute video or podcast that discusses the topic and cites sources. The objectives are the same but the delivery can be to their comfort." Another participant allowed students to do a group/team project, as was originally assigned, or to submit an individual project. In summing up the changes to assessment, one participant wrote, "There was very little change in how I assessed students (it was just a change in how they delivered their knowledge to me)."

Barriers and Challenges

RQ4: *What barriers do higher education faculty report around implementation of UDL principles during course design and development both pre- and post-the onset of COVID-19?* The majority of participants (73%) reported intentionally applying UDL principles both before and during COVID-19; however, in response to survey questions 10 and 11, a majority of participants also listed specific barriers to application of UDL principles both pre-and post-COVID-19, with only five participants reporting no barriers pre-COVID-19 and four participants reporting no barriers post- the onset of COVID-19.

Participants primarily reported a lack of awareness, resources, time, and technology tools as barriers to UDL both before and after the onset of COVID-19. See Figure 3. A total of seven participants indicated unawareness of UDL principles. One participant indicated unawareness mostly. Hadn't sat down and figured out what it would mean in my courses." Nine participants indicated lack of supports/preparedness. Some of these participants there was a "lack of examples," lack of "university guidance," "lack of familiarity with best practices," and "lack of awareness on how best to accomplish UDL in a remote teaching/learning environment."

Insufficient time was the most commonly reported barrier to UDL application both pre-and post-COVID-19. Over half of the participants responded "it's very time consuming" and "I feel like I'm already stretched too thin by just doing the very, very basics." One participant replied "it takes time, preferably free of distraction,

to think about additional options and opportunities for students to interact with content and express their learning." Another indicated "survival; playing too many roles outside of instructor, both personally and professionally (chief tech officer, chief homeschooler, chief cook and cleaner, chief mentor and emotional support for students)."

Technology was another commonly cited barrier to application of UDL, especially post-COVID-19, with almost one third of participants providing responses related to technology availability. One participant specified a "lack of easily accessible resources (OERs) that were available," while another mentioned a "lack of technology available in F2F classrooms." Post-COVID-19, many participants mentioned additional technology barriers, including student lack of access to high-speed internet and the limitations of platforms (e.g., Zoom) used by their university. This finding was similar to barriers noted in Bhagat and Kim (2020).

Figure 3

Barriers: Lack of Awareness, Resources, Time, and Technology
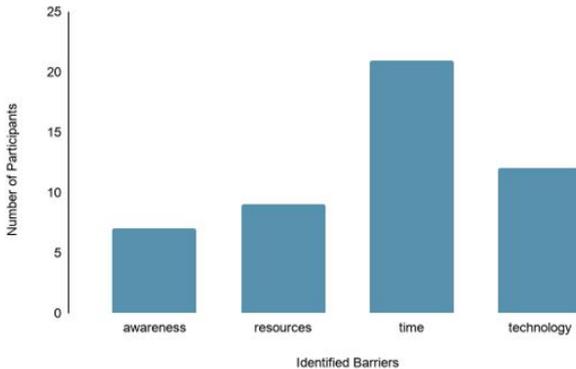
Four participants indicated that they (intentionally) did not attempt to implement UDL. Two of these participants reported that the course had already been designed and they did not make any changes. One reported that the course was "already designed for UDL." However, the other did not explain whether or not the course design applied UDL principles. Additionally, two participants reported lack of desire to implement UDL. One participant wrote, "Never heard of UDL. Sounds like pretty much everything else out there. I have been teaching asynchronously online for 20 years and figured out how to make this work some time ago."

Another replied, "I don't know of specific barriers, I tend not to like initiatives like this (and I have already forgotten what it is)."

Overcoming Barriers

While a few participants reported that they have not overcome the barriers, the majority of the participants shared strategies that were successful. We found that these strategies could be organized into the following categories: staying determined/committed, asking for support, engaging in professional development, finding technology solutions, and neglecting other responsibilities. Participants focused their responses on overcoming barriers presented during the ROTL. Many shared responses related to staying determined and committed to engagement, representation, and action and expression. They reported creating new materials and redesigning learning experiences. Additionally, using coping skills and setting attainable goals helped keep them focused and moving forward. One participant revealed "I redesigned the course top to bottom about 5 times as I tried one idea after another to get to the goals I wanted." Another participant mentioned "building up material over time." As one participant pointed out, they had "no choice but to make things happen."

While faculty were able to overcome many barriers with commitment and determination, they also sought support from colleagues. Participants reported reaching out to other faculty and collaborating with others to share resources and tips throughout the ROTL. They mentioned asking for help, talking to colleagues, asking friends, finding new materials through connections with colleagues, and collaborating with team members and a learning designer. These findings are similar to Cutri et al.'s (2020) findings that there is a need among faculty to connect with others for empathetic support. One participant stated "the pandemic has brought together faculty in my discipline from all over the US and other countries. We've shared a wealth of resources with each other including strategies, assignments, OERs and other phenomenal support."

In addition to asking for support from colleagues, faculty also engaged in both formal and informal professional development, often learning informally through participation in social networks (Buckley & Nimmon, 2020). Several participants attended training or workshops and one participant reported "I went to several UDL workshops to get a better idea of how to implement it in my courses." Another revealed "I spent the summer strengthening my hybrid and online teaching knowledge." Others reported searching the internet or using websites to "find tech workarounds" and increase their instructional skills.

Many participants shared that integration of technology helped them overcome barriers. Instructional technology, such as utilizing more discussion boards, online quizzes, and web conferencing allowed faculty to represent course content, engage students, and assess learning through action and expression. Participants reported specific personal or university offered solutions to overcome barriers. For example, one participant replied "I purchased some less expensive tech to use over the summer." Another participant reported "we use a streaming service for videos so students don't have to wait to download videos. Our campuses and centers are open with computer access and WiFi for students."

Even with determination, support, professional development, and technology, time remained a significant barrier. Several participants reported not being able to overcome this barrier. Additionally, many participants discussed having to make sacrifices. One participant wrote "I neglected my research." Another replied "I did more work for the same crappy pay." Several mentioned working longer hours. However, one participant revealed, "I let some stuff go/skipped some assignments." Whether the elimination of content and assignments was due to time or re-evaluation of course objectives, it is clear that there was a substantial change in the course design prior to and during COVID-19 (Johnson et al., 2020).

While participants reported the strategies mentioned to overcome barriers, not all barriers seemed to be surmountable. One participant shared "most barriers were structural and beyond my control. I worked to redesign learning experiences to make the barriers irrelevant. This took time, and the time requirement barrier is insurmountable." Additionally, not all participants were interested in making changes. In reference to overcoming barriers, one participant wrote "I did not. I did not wish to." On the other hand, most participants did respond with strategies they had used to overcome barriers or indicated that they had not yet overcome the barriers, which indicates they are still seeking, or expecting, solutions. One participant replied, "For now, (there are) no real solutions yet." Another participant wrote, "I still need to work on it. Another participant responded, "I have not overcome them yet. (It is a) work in progress."

Discussion

The findings of this study were related to modality, flexibility, time, resources, and technology. These were the primary factors impacting both the implementation of UDL and the barriers to the implementation of UDL.

Modality and Flexibility

While we noted the finding of change in teaching and learning modality, what remains unknown is *why* more than half of participants who were originally teaching face-to-face chose not to shift to a required synchronous delivery during the pandemic. A shift in instruction modality from synchronous to asynchronous has a number of implications for the types of engagement, representation, and action and expression strategies that can be implemented (Dickinson & Gronseth, 2020). For example, while discussion is possible in both modalities, synchronous and asynchronous discussion (in any format) is qualitatively different. After the onset of COVID-19, there was an increased use of discussion boards among study participants. The type of organic verbal conversation that happens in a face-to-face or synchronous online course is quite different from a written conversation that does not happen in real time. Because we did not ask a question about modality decision making, the reason for this shift remains unknown. It may have been the result of an intentional decision (made by the professor alone or in conjunction with students) or it may have been a recommendation or directive given by the institution.

Another consideration of modality is its relationship to accessibility. Considering accessibility could have impacted the choice to use asynchronous or optional synchronous session delivery for some faculty. At the same time, the modality chosen could have knowingly and/or unknowingly impacted accessibility for some faculty and students (Barton, 2020). There was an increase in attention to accessibility and accommodation during ROTL. This indicates that faculty were more aware of accessibility needs during ROTL and were designing instruction with accessibility in mind. This may be why some research has indicated that online teaching and learning can be more effective for students with disabilities (Hall et al., 2015).

A final consideration of modality is its relationship to flexibility. Half of the participants who were teaching face-to-face prior to the onset of COVID-19 moved to an optional synchronous format allowing students flexibility in attendance. Students were able to attend or not attend sessions according to individual needs. Optional synchronous sessions allowed faculty to communicate flexibly, and perhaps more frequently with students, as recommended by Chertoff and Thompson (2020). Also related to flexibility, some faculty reported providing choices in assessment during ROTL. This suggests that faculty were not only more aware of accessibility needs for students with disabilities, but also the need to be flexible and provide options for all students which can impact motivation, engagement, and outcomes.

Time & Resources

The pandemic instigated changes in workload for both faculty and students (Adedoyin & Soykan, 2020). During ROTL, time was clearly a scarce resource for many, with over half of the participants mentioning it as a barrier to UDL implementation. Time also impacted UDL implementation in other ways. The most common change to assessment was the elimination or replacement of exams and skills-based activities. These changes appear to lighten the load for the students or for faculty during this unprecedented time. Faculty have had the time or support to transition exams or skills-based activities to an online format. Additionally, they may have been checking in with students to determine their needs and how to best support and assess their learning (Baran & AlZoubi, 2020).

Another factor related to time is value. tend to devote time to the things that we value. While Black and colleagues (2014) found that familiarity with UDL is not significantly correlated with implementation of UDL principles, indications in our findings reveal UDL implementation was not a priority for those unaware of UDL or unconvinced of the benefits of UDL. These participants did not devote their time to UDL implementation. Instead, they resisted it as similar to a trend rather than a framework for learning, as Fovet (2018) also found.

A few participants noted support and resources offered by the university (e.g., instructional design support, collaboration with peers, etc.) eased the workload required for transitioning to ROTL. Resources mentioned by participants are similar to the approaches that Kovet (2018) reported have been used in K12 settings in Canada. This suggests that faculty at institutions with a support system for implementation from the top-down are better equipped to overcome the barriers to UDL implementation. It also supports the findings that training, resources, and time are critical factors to the successful implementation of UDL (Fovet et al., 2014; Haynes, 2020; Tobin, 2018).

Technology

There was a clear increase in the use of technology in teaching and learning after the onset of COVID-19 (Johnson et al., 2020). This is unsurprising. Because faculty were no longer able to deliver content in person, they were forced to use technology as the vehicle for delivery. Also unsurprising was the finding of a substantial increase in the infusion of technology by the faculty who were teaching face-to-face prior to the onset of COVID-19. These faculty likely had greater demand for creating new course content because courses were not initially designed for the online/remote environment. Of the participants who reported

teaching face-to-face prior to the sudden shift to remote teaching and learning, only one participant specifically stated that they used a learning management system (LMS) to supplement the in-person class. While many faculty members were likely using LMS to some extent prior to the pandemic, they did not mention this in their survey responses. This could indicate that they were not using it extensively and taking advantage of all of the features and instead relying on face-to-face opportunities for engagement, representation and action and expression. Therefore, the instructors who were teaching in person prior to COVID-19 made the largest transition in their instructional practices during the ROTL by considering new ways to represent content and engage and assess students.

Despite the increased use of technology, not all experiences with technology during ROTL were positive. Some faculty noted the limited opportunities for engagement with some technologies they used (e.g., YouTube Live) or the limited access to certain technologies among faculty and students. For example, some students and faculty did not have access to high-speed internet and used hotspots or access to computer devices to access courses through cell phones (Bartlett, 2020). Faculty who did not typically teach online may not have had the financial support to have paid accounts for their courses and their students. As with any situation, not all technologies are created equal, nor the opportunities to choose which technologies to use to delivery course content. The limitations of the technology provided by universities may have contributed to the limited delivery options available to faculty. Coupled with limitations of foundational knowledge of online learning pedagogy, access to technology compounds an already challenging scenario in which faculty were not fully prepared to leverage advanced technologies to support learning. These findings add support for the promise of the intentional strategy of demystifying the role of technology and focusing on technology as the tool and not the driver of UDL (Fovet, 2018).

Limitations

The study had several limitations. First, the study included a small sample size. Although it was disseminated through several networks, the response rate was low. It is probable that the low response rates were due to the saturation of surveys regarding COVID-19 practice within higher education at the time of data collection, as well as limited time faculty have to devote to activities outside of main priorities during the pandemic. More participants could have provided more variety in the responses and additional insights into different experiences. Second, the survey itself included a limited number of questions and did not ask about motivations during decision making. Third, the study only captured the experiences of faculty at four-year year institutions because it was not distributed

to additional types of academic institutions (e.g., technical colleges, community colleges) in higher education spaces. Finally, this study focused only on faculty perspectives and does not provide insight into student experiences or perceptions of instruction during COVID-19 ROTL.

Implications and Future Directions

When the pandemic is over, higher education teaching and learning need not return to the way things were prior to the pandemic. Our findings indicate that faculty made changes and overcame barriers to UDL implementation. We can learn from this forced opportunity and continue to use technology to increase UDL implementation, expanding the various means of engagement, representation, and action and expression. Given the findings of this study, we offer several suggestions to incorporate UDL into online course design in the future. This section highlights specific examples of what online instruction designed with UDL principles in mind does and does not look like, provides suggestions for overcoming barriers, and includes recommendations for future research.

Non-UDL Vs. UDL Design

Often courses, whether due to unawareness or resistance, are designed in opposition to UDL principles. Rather than creating avenues for student success, non-UDL design presents undue barriers to student learning and decreases access, outcomes, and validity of learning assessments. Table 3 provides examples demonstrating the differences in non-UDL and UDL design. While Table 3 shows a few examples of how to alter existing course design and deliverables to incorporate UDL principles, there are countless ways to do so. UDL can be adapted and modified for various disciplines and relies on the experimentation of faculty members to advance UDL integration across curricula. It may look different depending on the content, context, and modality of the course.

Table 3

Non-UDL vs. UDL Design

Principle	Non-UDL Example	UDL Example
Multiple Means of Engagement	**Students engage in rote learning of information that has been provided to prove memory mastery during quizzes and exams.**	**Students write or record a self-reflection of a course concept so that they can personally apply, evaluate, and synthesize their own learning by considering how the content relates to their own life experiences and context.**
Multiple Means of Representation	Important course concepts are provided to students through one primary mode. For example, the majority of content is provided via the course textbook.	Important course concepts are available to students through various sources/avenues. Images, audio, video, text, and lecture with voice and closed-captioning are used to provide content information to students that they need to meet the course learning objectives.
Multiple Means of Action and Expression	One large assignment is due at the end of the semester. The instructor provides feedback after the paper is turned in. Students did not receive feedback during the assignment construction process. The grade and assessment is a one-time snapshot judgment of students' work.	Smaller sections of a paper or project are due throughout the semester and faculty provide feedback along the way, providing scaffolding for students as they complete a cumulative assignment due at the end of the semester. The final assessment of the assignment reflects the student's application of feedback and development of knowledge, skills, and/or competencies.

Overcoming Barriers

This study suggests while the term UDL is widely known among university professors, significant barriers exist to UDL implementation, including awareness, time, resources, and technology. However, if institutions approach UDL implementation using a top-down approach, provide campus-based services (e.g., training, instructional design support, implementation examples), and facilitate communities of practice, outcomes will be more successful. Knowing that time is a significant barrier, administration should look for ways to support faculty with instructional designers, graduate assistants, and course load assignments. It will be helpful for institutions to collect information from faculty on what is working in their particular context and amplify success stories. Focus should not be how technology can drive engagement, representation, and action and expression. Instead, faculty should determine which technologies can support types of

engagement, representation, and action and expression included in their teaching. Finally, faculty should keep flexibility and accessibility in mind when designing teaching and learning (Dickinson & Gronseth, 2020).

Future Directions

This study leaves several questions to be answered in future research. Because this study examined only faculty experiences and perceptions, a logical next step would be to examine student experiences and perceptions. Within the discussion of instructional modality, we noted that the rationales for choosing specific course delivery options are unknown. There is an opportunity for further research around factors impacting delivery decisions (e.g., institutional requirements, faculty choice, etc.) and how these decisions impact student experiences and outcomes. Additionally, the ways technology hinders or fosters instructional delivery and student success is a topic for future inquiry related to implementation of UDL in higher education courses, including accessibility (or lack thereof) of such technologies. Finally, after COVID-19 instruction, there should be further examination into how current teaching and learning practices during COVID-19 can impact future teaching and learning. As instructional design approaches continue to evolve and faculty continue to employ strategies and technologies used during the pandemic, the implementation of UDL principles post-pandemic need to be explored.

Conclusion

COVID-19 forced a ROTL transition for instructors and learners around the globe in PK12 through higher education institutions. This examination of instructional design in higher education prior to and during COVID-19 provides valuable insights to guide future instructional design. In comparing course design prior to and during COVID-19, changes were noted in all areas of UDL – engagement, representation, and action and expression. Participants also provide insights for overcoming barriers to UDL implementation. The lessons learned from this study of instruction during initial months of COVID-19 potentially inform UDL implementation efforts in higher education currently and after the pandemic.

References

Adedoyin, O. B., & Soykan, E. (2020). Covid-19 pandemic and online learning: the challenges and opportunities. *Interactive Learning Environments*. https://edtechbooks.org/-dqZB

Al-Azawei, A., Serenelli, F., & Lundqvist, K. (2016). Universal design for learning (UDL): A content analysis of peer-reviewed journal papers from 2012 to 2015. *Journal of the Scholarship of Teaching and Learning*, *16*(3), 39-56. https://edtechbooks.org/-msdu

Baran, E., & AlZoubi, D. (2020). Human-Centered Design as a frame for transition to remote teaching during the COVID-19 pandemic. *Journal of Technology and Teacher Education*, *28*(2), 365-372. https://edtechbooks.org/-Bxzy

Bartlett, M. E. (2020, November 30-December 4). *High-quality online design, teaching, & learning for students with low-bandwidth access*. ITLC Lilly Online Conference.

Bartlett, M.E. & Warren, C. (2021). Leadership support for helping community college faculty transition to rapid online teaching and learning (ROTL) during a worldwide pandemic. *Online Journal of Distance Learning Administration*, *24*(1).

Barton, D. C. (2020). Impacts of the COVID-19 pandemic on field instruction and remote teaching alternatives: Results from a survey of instructors. *Ecology and evolution*, *10*(22), 12499-12507. https://edtechbooks.org/-LYHh

Bhagat, S., & Kim, D. J. (2020). Higher Education Amidst COVID-19: Challenges and Silver Lining. *Information Systems Management*, *37*(4), 366-371. https://edtechbooks.org/-kqco

Bernacchio, C., & Mullen, M. (2007). Universal design for learning. *Psychiatric Rehabilitation Journal*, *31*(2), 167-169. https://edtechbooks.org/-PPwN

Black, R. D., Weinberg, L. A., & Brodwin, M. G. (2014). Universal design for instruction and learning: A pilot study of faculty instructional methods and attitudes related to students with disabilities in higher education. *Exceptionality Education International*, *24*(1), 48-64. https://edtechbooks.org/-smE

CAST. (2020). CAST homepage. http://www.cast.org/

Centers for Disease Control and Prevention. (2017). *Get your school ready for pandemic flu*. U.S. Department of Health and Human Services. https://edtechbooks.org/-csA

Center for Infectious Disease Research and Policy. (2010). *H1N1 & higher ed: Lessons learned pandemic influenza tools, tips, and takeaways from the big*

10+2 universities. https://edtechbooks.org/-ZPSo

Chang, C. L., & Fang, M. (2020, June). E-Learning and online instructions of higher education during the 2019 novel coronavirus diseases (COVID-19) epidemic. *Journal of Physics: Conference Series 1574*(012166). https://edtechbooks.org/-oRd

Chapko, N. (2017, March). Faculty voices: Barriers to implementing UDL strategies. *Society for Information Technology & Teacher Education International Conference* (pp. 2516-2520). Association for the Advancement of Computing in Education (AACE). https://edtechbooks.org/-CoT

Chertoff, Natalie G. and Thompson, Ashleigh B. (2020). Applied strategies for remote student teaching due to COVID-19. *CUNY Academic Works.* https://edtechbooks.org/-Iynw

Coombs, N. (2010). *Making online teaching accessible: Inclusive course design for students with disabilities.* Jossey Bass.

Costa, A. L., & Kallick, B. (Eds.). (2008). *Learning and leading with habits of mind: 16 essential characteristics for success.* Association for Supervision and Curriculum Development.

Cutri, R. M., Mena, J., & Whiting, E. F. (2020). Faculty readiness for online crisis teaching: Transitioning to online teaching during the COVID-19 pandemic. *European Journal of Teacher Education*, *43*(4), 523-541. https://edtechbooks.org/-nMmB

Daniel, J. (2020). Education and the COVID-19 pandemic. *Prospects*, *49*(1), 91-96. https://edtechbooks.org/-nNuT

Davies, P. L., Schelly, C. L., & Spooner, C. L. (2013). Measuring the effectiveness of Universal Design for Learning intervention in postsecondary education. *Journal of Postsecondary Education and Disability*, *26*(3), 195-220. https://edtechbooks.org/-DXIg

Dickinson, K. J., & Gronseth, S. L. (2020). Application of Universal Design for Learning (UDL) principles to surgical education during the COVID-19 pandemic: UDL for surgical education during COVID-19. *Journal of Surgical Education*. *77*(5), 1008-1012. https://edtechbooks.org/-nPR

Fovet, F., Mole, H., Jarrett, T., & Syncox, D. (2014). Like fire to water: Building bridging collaborations between disability service providers and course

instructors to create user friendly and resource efficient UDL implementation material. *Collected Essays on Learning and Teaching*, *7*(1), 68-75. https://edtechbooks.org/-nPZb

Fovet, F. (2018). Making it work! Addressing teacher resistance in systemic UDL implementation across schools. In N.K. Jangira, S. Limaye, & S. Kapoor (Eds.) *Inclusive Education: Practitioners' Perspectives.* School Inclusive Education Development Initiative.

Green, K. R. (2019, March). UDL and the university: Understanding the utility and affordances of Universal Design for Learning in postsecondary contexts. *Society for Information Technology & Teacher Education International Conference* (pp. 2582-2587). Association for the Advancement of Computing in Education (AACE). https://edtechbooks.org/-mYyj

Hall, T. E., Cohen, N., Vue, G., & Ganley, P. (2015). Addressing learning disabilities with UDL and technology: Strategic reader. *Learning Disability Quarterly*, *38*(2), 72-83. https://edtechbooks.org/-Wxno

Harry, B., Sturges, K. M., & Klingner, J. K. (2005). Mapping the process: An Exemplar of process and challenge in grounded theory analysis. *Educational Researcher, 34*(2), 3–13. https://edtechbooks.org/-MUgG

Haynes, A. S. (2020). UDL in action: Implementing strategies in a large online course. In A. S. Haynes. (Eds.), *UXD and UCD Approaches for Accessible Education* (pp. 59-79). IGI Global. https://edtechbooks.org/-dNpI

He, Y. (2014). Universal design for learning in an online teacher educational course: Enhancing learners' confidence to teach online. *MERLOT Journal of Online Learning and Teaching, 10*(2), 283-298. https://edtechbooks.org/-TZnU

Hord, S. M., Rutherford, W. L., Huling, L., & Hall, G. E. (2006). *Taking Charge of Change.* Southwest Educational Development Laboratory.

Hodges, C., Moore, S., Lockee, B., Trust, T., & Bond, A. (2020). The difference between emergency remote teaching and online learning. *Educause Review*, *27*. https://edtechbooks.org/-sZA

Johnson, N., Veletsianos, G., & Seaman, J. (2020). US Faculty and Administrators' Experiences and Approaches in the Early Weeks of the COVID-19 Pandemic. *Online Learning*, *24*(2), 6-21. 1. https://edtechbooks.org/-qjU

Kramer, A. (2019). UDL and administrators. In W. W. Murawski & K. L Scott

(Eds.), *What Really Works with Universal Design for Learning*, 241-254.

Krosnick, J. A. (1999). Survey research. *Annual review of psychology, 50*(1), 537-567. https://edtechbooks.org/-Aaqk

Kumar, K. L. & Wideman, M. (2014). Accessible by design: Applying UDL principles in a first year undergraduate course. *Canadian Journal of Higher Education*, *44*(1), 125-147. https://edtechbooks.org/-GTK

Lambert, R. & Schuck, R. (2020). "The wall now between us"; Teaching math to students with disabilities during the COVID spring of 2020. *Open Science Framework Preprints.* https://edtechbooks.org/-cukc

Lancaster, P. (2008). Universal design for learning. *Colleagues. 3*(1), 4-5. https://edtechbooks.org/-Miw

LaRocco, D. J., & Wilken, D. S. (2013). Universal Design for Learning: University faculty stages of concerns and levels of use. *Current Issues in Education*, *16*(1), 1-13. https://edtechbooks.org/-SYxz

Lincoln, Y. & Guba, E. G. (1985). *Naturalistic inquiry.* Sage.

Lowenthal, P., Borup, J., West, R., & Archambault, L. (2020). Thinking beyond Zoom: Using asynchronous video to maintain connection and engagement during the COVID-19 pandemic. *Journal of Technology and Teacher Education*, *28*(2), 383-391. https://edtechbooks.org/-zepc

Miles, M. B. & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook* (2nd ed.). Sage Publications, Inc.

O'Keefe, L., Rafferty, J., Gunder, A., Vignare, K. (2020, May 18). *Delivering high-quality instruction online in response to COVID-19: Faculty playbook.* Every Learner Everywhere. https://edtechbooks.org/-jgJ

O'Shaughnessy, T. (2020, December 2). Quick tips for teaching online: Accessibility, educational material and Universal Design for Learning (UDL). https://edtechbooks.org/-QyoC

Patton M. Q. (1999). Enhancing the quality and credibility of qualitative analysis. *Health Services Research*, *34*(5, Pt. 2), 1189–1208. https://edtechbooks.org/-RsWP

Robinson, D. E. & Wizer, D. R. (2016). Universal Design for Learning and the

quality matters guidelines for the design and implementation of online learning events. *International journal of Technology in Teaching and Learning*, *12*(1), 17-32. https://edtechbooks.org/-Qag

Rose, D. & Meyer, A. (2008). *A Practical Reader in Universal Design for Learning.* Harvard Press.

Saldana, J. (2016). *The Coding Manual for Qualitative Researchers (3rd edition).* Sage.

Schelly, C. L., Davies, P. L., & Spooner, C. L. (2011). Student perceptions of faculty implementation of Universal Design for Learning. *Journal of Post Secondary Education and Disability*, *24*(1), 17-30. https://edtechbooks.org/-ndYL

Smith, C. (2020). Challenges and opportunities for teaching students with disabilities during the COVID-19 pandemic. *International Journal of Multidisciplinary Perspectives in Higher Education*, *5*(1), 167-173. https://edtechbooks.org/-cHBv

Strauss, A. L. (1987). *Qualitative Analysis for Social Scientists.* Cambridge University Press.

Strauss, A. L & Corbin, J. (1990). *Basics of Qualitative Research: Grounded Theory Procedures and Techniques.* Sage.

Tobin, T. J. (2018). Re-framing UDL for broader adoption in higher education. *Learning Disabilities*, *21*(2), 3-14. https://edtechbooks.org/-YpPI

Appendix

Universal Design for Learning (UDL) in Higher Education Instruction

Pre- and Post- COVID 19 Instruction Faculty Survey

Course Format

1. Pre-COVID 19 Onset Instruction: What was the primary format of your course? (Select all that apply)
    1. Online Asynchronous
    2. Online Synchronous
    3. Face-to-face
    4. Hybrid

5. Other: _____
2. Post-COVID 19 Onset Instruction: What was the primary format of your courses? (Select all that apply)
    1. Required Online/Remote Synchronous
    2. Optional Online/Remote Synchronous
    3. Online Asynchronous
    4. Other: _____

Application of UDL Principles

3. Do you intentionally use or apply Universal Design for Learning principles in your course design the majority of the time?
4. Yes, only before the onset of COVID-19
5. Yes, before and after the onset of COVID-19
6. Yes, only after the onset of COVID-19
7. No
8. I'm not sure
9. I don't know what UDL is

Universal Design for Learning

Universal Design for Learning (UDL) Is a Framework to Improve and Optimize Teaching and Learning for All People Based on Scientific Insights into How Humans Learn. It Is an Instructional Approach That Includes Considering the Diverse Needs, Strengths, and Interests of Individuals, as Well as the 'What', 'How', and 'Why' of Learning, During Curriculum Design (CAST, 2020).

Representation

UDL, the "What" of Learning Is Referred to as Representation. Representation Refers to the Means Through Which Instructors Present Content to Be Learned. UDL Encourages the Use of Multiple Means of Representation to Present Content to Students (CAST, 2020).

4. Pre-COVID 19 Onset Instruction: How did you primarily represent the content you teach to students? (e.g., spoken lecture, slides, assigned reading, videos)
5. Post-COVID 19 Onset Instruction: How did you primarily represent the content you teach to students? (e.g., spoken lecture, slides, assigned reading, videos)

Engagement

In UDL the "Why" of Learning Is Referred to as Engagement. Engagement Refers to the Means Through Which Students Engage with the Content. UDL Uses Multiple Means of Engagement to Stimulate Interest and Motivation for Learning (CAST, 2020).

6. Pre-COVID 19 Onset Instruction: How did you primarily engage students in learning the content of your course? (e.g., whole-class discussion, discussion boards, small group activities, practice of skills)
7. Post-COVID 19 Onset Instruction: How did you primarily engage students in learning the content of your course? (e.g., whole-class discussion, discussion boards, small group activities, practice of skills)

Action/Expression

In UDL the "How" of Learning Is Referred to as Action/expression. Action/Expression Refers to the Ways in Which Students Are Assessed. UDL Uses Multiple Means of Action/expression to Differentiate the Ways That Students Can Express What They Know (CAST, 2020).

8. Pre-COVID 19 Onset Instruction: How did you primarily assess students' knowledge or understanding of the content of your course? (e.g., reflective journaling, quizzes, exams, skill-based assignments)
9. Post-COVID 19 Onset Instruction: How did you primarily assess students' knowledge or understanding of the content of your course? (e.g., reflective journaling, quizzes, exams, skill-based assignments)

Barriers

This Section Inquires About the Perceived Challenges Faced in Implementation of UDL Principals During Course Design and Development Both Pre and Post COVID-19.

10. Pre-COVID 19 Onset Instruction: What barriers did you encounter with attempting to apply UDL principles to course development? (e.g., unaware of UDL principles, the course was already designed, time required to provide multiple means, type of technology available)
11. Post-COVID 19 Onset Instruction: What barriers did you encounter with attempting to apply UDL principles to course development? (e.g., unaware of UDL principles, the course was already designed, time required to provide multiple means, type of technology available)
12. Post-COVID 19 Onset Instruction: How did you overcome the barriers you mentioned in question 11?

Course Information

Consider the Majority of the Courses You Taught in Spring 2020 When Answering the Following Questions.

13. What level students do you primarily teach? (Select all that apply)
    1. freshmen
    2. sophomores
    3. juniors
    4. seniors
    5. masters level
    6. doctoral student
    7. other (i.e., JD, MD)
14. What is the average enrollment in the courses you teach? (select all that apply)
    1. Less than 25 students
    2. 25 - 50 students
    3. 51 -100 students
    4. more than 100 students
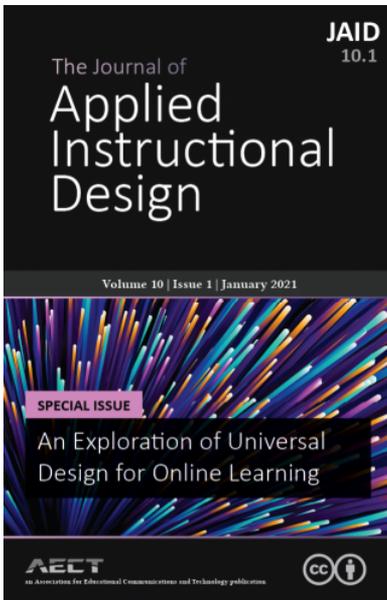
Kilpatrick, J.R., Ehrlich, S. , & Bartlett, M. (2021). Learning from COVID-19: Universal Design for Learning Implementation Prior to and During a Pandemic. *The Journal of Applied Instructional Design, 10*(1). https://dx.doi.org/10.51869/101jkmbse