Applying UDL to Online Active Learning

Instructional Designer Perceptions

Sandra A. Rogers & Susie L. Gronseth

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In online environments, active learning techniques can facilitate varied ways that learners engage and enact skill development, understandings, and connections across concepts. The Universal Design for Learning (UDL) framework supports providing options and design flexibility. Using a multi-site, mixed method case study design, this exploratory study investigated how 23 instructional designers at three large, urban, US public higher education institutions view alignment between UDL and active learning approaches in online course design. Techniques, strategies, tools, enablers, and challenges of these practices are highlighted. Study data collected included survey responses and focus group sessions. Emergent themes of belongingness, social learning space, structuredness, and universality are discussed.

Introduction

Instructional design for online formats has been shifting pedagogically from *expository* to *active* and *interactive* approaches, fueled by constructivist practices and aided by newer technologies (Means et al., 2013; Rudestam & Schoenholtz-Read, 2010). Expository and active learning approaches are presented as two sides of a dichotomy, with the traditional expository approach involving content delivery through lecture or instructor-directed means, and active learning constructively engaging learners to explore, connect, and apply focal concepts and skills through exercises, discussions, and projects. By adding a collaborative dimension, it becomes interactive.

Despite wide support for active-learning practices, there have been mixed empirical findings regarding the effectiveness of active-learning experiences contrasted with expository experiences (e.g., Andrews et al., 2011; Prince, 2004). This could be due to the importance of context regarding the scaling up of educational interventions in online learning

(Kizilcec et al., 2020) and the lack of expertise in the science of online learning and skillful development of planned interactions. For example, Andrews et al. (2011) reported on the inability of regular science instructors to replicate the successful active-learning studies of science education researchers. Instructional designers (IDs) thus play a crucial role in providing guidance and support for effective course design and teaching (Kumar & Ritzhaupt, 2017).

Just as learners vary in learning abilities, experiences, and other dimensions in face-to-face instructional settings, learner variability is also observed in online instructional settings (Black et al., 2015). The flexibility that online learning affords can facilitate increased educational access in support of a diverse array of student needs, including remote instruction during a crisis (Dickinson & Gronseth, 2020). Such potential for designed flexibility in online courses (e.g., time, location, pace) aligns with the Universal Design for Learning (UDL) framework through the provision of multiple ways that content is represented, students engage in a course, and learning is expressed (Meyer et al., 2014).

Supporting learner diversity as part of strategic course design upfront not only supports learners with disabilities (Black et al., 2015), but is also considered a best practice for learners in general (Gronseth, 2018). Sufficiently structured, action-oriented learning activities contrast with loosely-designed, passive-oriented activities. Further, there is evidence that active learning reduces failure rates for unprepared students because they have the potential to build student learning skills as part of the activity design (Freeman et al., 2011; Styers et al., 2018; Theobald et al., 2020).

Related Literature

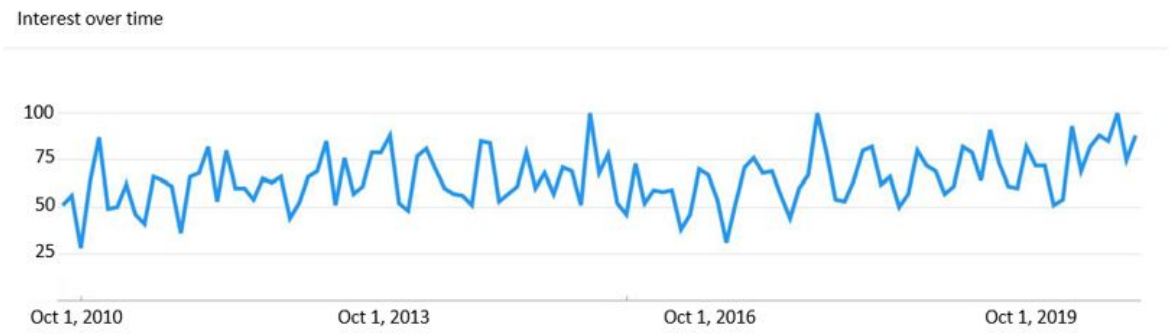
Universal Design for Learning

UDL is a *front-loaded* curricular design approach, which conveys the considerable time and forethought that designers invest in planning for flexible and varied means of learning. Applying UDL involves designing engaging opportunities that support students' accessing, building, and internalizing of target content. Planning active learning activities through a UDL lens can involve expansion in the areas of engagement (the *why* for learning), representation (the *what* that is being learned), and action and expression (the *how* of the learning process; CAST, 2018). The why aspect is associated with the affective domain of learning (Bloom et al., 1956; i.e., attitudes, emotions, feelings), aiming to capture and sustain students' interest and persistence to reach their learning goals. The what aspect refers to the information processing of content for the cognitive domain of learning (i.e., knowledge, comprehension, application) to facilitate perception and comprehension. The how of learning addresses affective, cognitive, and psychomotor domains and involves varied methods, media, tools, and executive-functioning strategies that enable learners to communicate, navigate, and self-monitor their learning progress.

Though interest in UDL has fluctuated over the past decade (as illustrated in the Google Trends analysis in Figure 1), the ideals of flexibility and empathy have become ever important in continuing education during recent complexities brought on by the global COVID-19 pandemic (Debruler et al., 2020; Gelles et al., 2020). Learner-supported design approach enables educators to meet varied student needs during other times of crises, such as natural disasters of hurricanes, fires, floods, and earthquakes (Baytiyeh, 2018). Such challenges necessitate instructional design that affords flexibility for online and remote learning to meet the extraordinary needs of learners facing additional familial duties, limited or unaffordable resources, unemployment, illness, or eviction (Roman, 2020). These ideals serve as rudders in navigating such complexities as differing access to technology, barriers related to learner availability and disrupted schedules, and social-emotional stressors (Gronseth et al., 2020).

Figure 1

Google Trends' Analysis of Google Searches for the Term "UDL" from 2010-2020



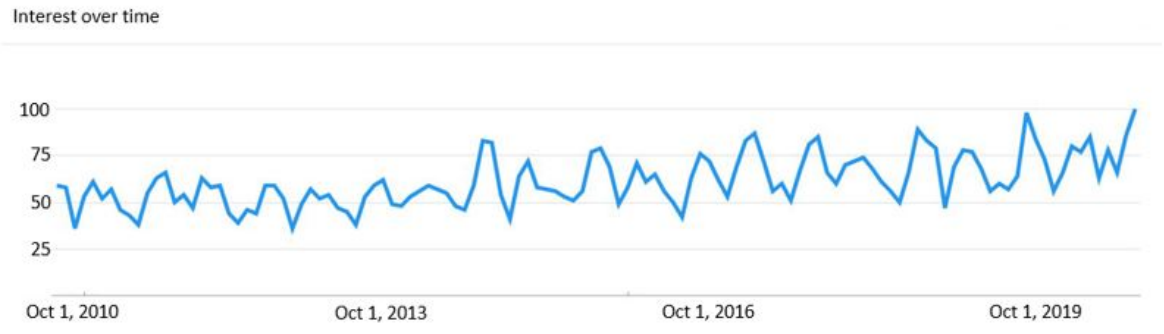
The relevance of UDL in present instructional design practices garner attention for recognizing and planning intentionally for variations in learner characteristics and needs and cultivating the development of learners' self-regulation skills through strategic course structures and facilitation strategies. For example, the UDL principle of providing multiple means of action and expression expands ways learners can practice and demonstrate progress toward target course objectives to have options for how they might utilize and show what they are learning regarding a target learning goal or objective. In this way, learners seem to appreciate having voice and choice, contributing to increase in enjoyment and proficiency (Goldowsky & Coyne, 2016).

Active Learning

Educational reform efforts promoting active learning include Dewey's (1938) experiential learning, Johnson and Johnson's (1999) cooperative learning, and inverted learning commonly known as a *flipped classroom* (Lage et al., 2000; Mazur, 1997). General interest in active learning has continued to rise over the past decade (as indicated in the Google Trends analysis shown in Figure 2). Active learning triggers cognitive functioning (Freeman et al., 2014; Harris & Bacon, 2019) and enhances or refocuses student attention. Student mental models are called upon and shaped directly in the learning process through student-centered interactive instructional activities. This contrasts with passive learning, which tends to occur indirectly with limited student interaction and is often characterized as teacher-centered and replication. Active learning opportunities allow learners to self-direct and utilize supportive resources as they develop their mental models for concepts. Active learning can be individual or group based and may involve a range of complexities in setup and engagement. Clear activity guidelines are highly recommended to ensure effective interactions within an online course experience (Quality Matters, 2018).

Figure 2

Google Trends' Analysis of Google Searches for the term "Active Learning" from 2010-2020



Planned Interactions

Within the UDL principle of providing multiple means of engagement, planning for collaboration and community is a key component (See checkpoint 8.2; CAST, 2018). Some IDs use the community of inquiry (COI) framework (Garrison et al., 2000) to promote cognitively challenging learning through planned interactions (e.g., student-student, student-content, student-teacher/practitioner). For an online COI, learner and instructor presence in the areas of social, cognitive, and teaching are essential to the communication loop and should be based on course design that includes engaging events, exploration of mental model versus the shared world, integration of ideas, and resolution through consensus building (Garrison et al., 2000). Active learning tasks combined with planned interactions serve as mechanisms for a COI. Empirically, social presence either has a causal or correlational relationship to achievement, and teaching presence correlates with cognitive presence (Arbaugh, 2019). COI aligns with UDL guidelines to provide options for comprehension, communication, and executive functions (CAST, 2018).

Role of Instructional Designers

Bain (2020) described the following challenges facing IDs in higher education: collaboration with faculty, research-based best practices, competing standards, quality and uniqueness, feedback-loop design, and performance-focused outcomes. Our study focused on the broader challenges of collaboration with various stakeholders in course design specifically in designing active learning within the UDL framework. Miller and Metz (2014) reported instructors' perceived barriers to active learning as insufficient class time, lack of time to develop material, and comfort with traditional lectures. Generally, instructional design degree programs prepare IDs to address such challenges with coursework on educational psychology, needs assessments, organizational behavior, educational research, evaluation, and instructional design theory and best practices. Additionally, IDs come from various fields of study and have prior work experiences to incorporate into how they approach their ID roles.

The present study was conducted during the COVID-19 pandemic in 2020, in which institutions of higher education across the US transitioned instructional activities to online delivery, dramatically expanding online instruction. IDs were in a crucial position of supporting faculty to re-envision course activities for the synchronous and asynchronous online formats and equipping them with the needed pedagogical and technical skills. IDs in the development and support of online courses take on many roles beyond design such as faculty training, project management, and project evaluation (Kumar & Ritzhaupt, 2017). In this way, they often work with varied members of the campus community, as they " . . . primarily serve faculty in their roles, but also perceive students as their final audience" (Kumar & Ritzhaupt, 2017, p. 371).

Method

Using a multi-site, mixed method case study design, this exploratory study investigated how IDs view the alignment between UDL and active learning approaches in online course design, highlighting techniques, strategies, and tools used, perceived enablers of these practices, and challenges faced. Four research questions were addressed:

1. How do IDs perceive connections between UDL and active learning approaches in online course designs?
2. How do IDs apply UDL to active learning approaches in their online course designs?
3. What do IDs perceive as enablers to the application of UDL to active learning approaches in their online course designs?
4. How do IDs address barriers to the application of UDL to active approaches in their online course designs?

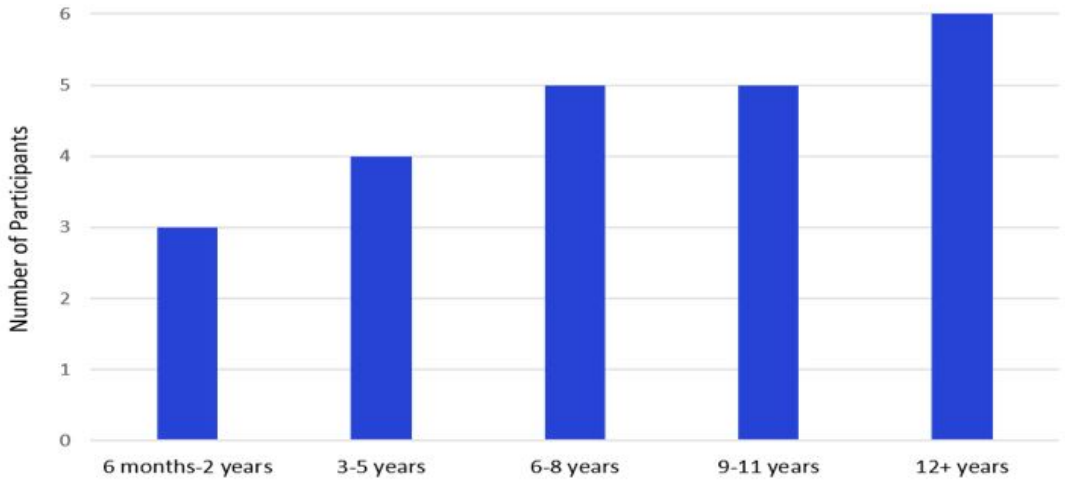
Participants

IDs (N = 48) at three large, urban, public, Carnegie Research I-classified institutions in the US were identified as potential participants in the study, with 26 meeting the criteria of being involved in course design and having been in their position at least six months. Of those, 23 (88% response rate) participated in this study, with 17 identifying as female and six as male. Participants were overall highly educated with the following degrees: 17% bachelor, 61% master, and

22% doctorate. Participants reported varied formal education-related training, with about 25% having completed Quality Matters™ training, and others having certifications in learning management system course review, user experience design, and various areas of expertise (e.g., counseling, human resources, library and information sciences). Participants were overall experienced instructional designers, with about 70% having been in their position six years or more (See Figure 3). Participants designed curriculum and supported instruction in an array of subject matter areas (e.g., architecture, arts, business) and workforce development.

Figure 3

Participant Years of Experience as an Instructional Designer



Instruments

The researchers developed a survey instrument, *Universal Design for Learning-Online Active Learning (UDL-OAL)*, for gathering ID experiences and perceptions regarding the utilization of approaches in online synchronous and asynchronous course design. The UDL-OAL (See Appendix A) consists of a demographic section (four closed-response and one open-response items), an active learning section (five closed-response and three open-response items), and a UDL section (two closed-response and two open-ended items). The survey was reviewed by an external ID expert and revised based on recommendations that surfaced through this expert review. The researchers also developed a semi-structured focus group (FG) session protocol, consisting of nine main items and follow-up questions (See Appendix B). Four of the items incorporated initial FG participant polling and then provided opportunities for further elaboration on observed themes.

Data Collection Procedures

Approved participants were sent the consent information and the *UDL-OAL* survey via Qualtrics XM™ online survey software. Respondents were then invited to participate in a virtual FG session with other IDs across the three sites, of which 13 elected to participate. One FG session consisted of seven participants, and the remaining six were in a second session. The sessions were hosted in Microsoft Teams, recorded, and transcribed. During the sessions, aggregated survey data were presented and discussed using real-time voice discussion, chat, and Google Forms polls. Participants rank ordered emerging findings by importance and elaborated on open-ended question prompts. Study recruitment, data collection, and management procedures were approved by the second author's Institutional Review Board.

Data Analysis

Descriptive statistics were computed for the closed-response survey items. Responses to the open-ended items and virtual FG recording notes and transcriptions were dual coded by both authors (who have practical ID experience and

advanced research degrees), and emerging themes were identified and discussed. Initial findings from the survey data were shared with FGs as a reference point for discussion to gather further explanatory data to strengthen the interpretations, employing the emic approach (i.e., illuminating the voices/perspectives of participants). Initial in vivo coding was used to determine emergent themes through interim data analysis via a secondary focused coding on related language (Glaser, 1978). We used reflexivity to entertain potential personal biases. Key informants from each site were consulted to review and confirm themes. We conducted mixed methods that pragmatically considered the means of data collection and analysis that included participants' voices, addressed researchers' bias, and considered member checking (Johnson & Christensen, 2014).

Findings

RQ1: How Do IDs Perceive Connections Between UDL and Active Learning in Online Course Designs?

Most participants expressed confidence in their facility with designing accessible courses and learning materials, with over 80% fairly to completely confident. The main ways that they reported learning about accessible educational practices were reading on their own, learning from colleagues, participating in workshops, and watching videos. Accessibility was viewed by many as core to UDL. For example, one participant defined UDL as, "an expansion of the concept of accessibility, where courses are designed with all users considered, not just those with a registered disability." IDs expressed how UDL supports expanded online access to learning and plans for barriers that students are likely to experience. Some of their characterizations of UDL included the following:

- "Designing to the Margins. Designing Courses That Are Inherently Accessible and Culturally Responsive."
- " . . . Improving Learning Experiences by Reducing Obstacles and Eliminating "Othering" of Non-Traditional Students."
- "Designing Courses with the End User at the Forefront, Creating Online Spaces That Emphasize Aesthetic Consistency and Foster Opportunities for All Learning Types and Abilities to Participate in the Learning Experience."

Participants mentioned how UDL centers student needs and engagement, which is a key component of active learning. UDL and active learning approaches support each other. In fact, one designer said, "we cannot do active learning without UDL." They viewed the overlap between UDL and active learning in online course designs as dependent in part on the technology, as accessibility challenges can inhibit broad student participation. Another designer said, "since both UDL and active learning support designing student-centered, and more interactive course content and activities, I think the application of the dual framework would be an effective strategy to promote and improve course design." Other shared attributes, in vivo, of this dual framework included *equity, choice, inclusivity, participatory, personalized*, *responsive,* and *varied modalities*.

RQ2: How Do IDs Apply UDL to Active Learning Approaches in Their Online Course Designs?

Centering students in the learning process emerged as a theme for IDs' application of UDL to active learning approaches in their online course designs. Upon viewing this visual from the survey data, one designer expanded upon their view of UDL application:

> *By selecting the appropriate active learning tools, techniques, and strategies, the instructor will engage students in a participatory learning environment. When students are participating in active learning activities, they are doing so in a way that forces the instructor to be responsive. Learning then becomes more fluid and personal, bringing the students' experience to the fore. By engaging in active learning, the experience becomes more student centered.*

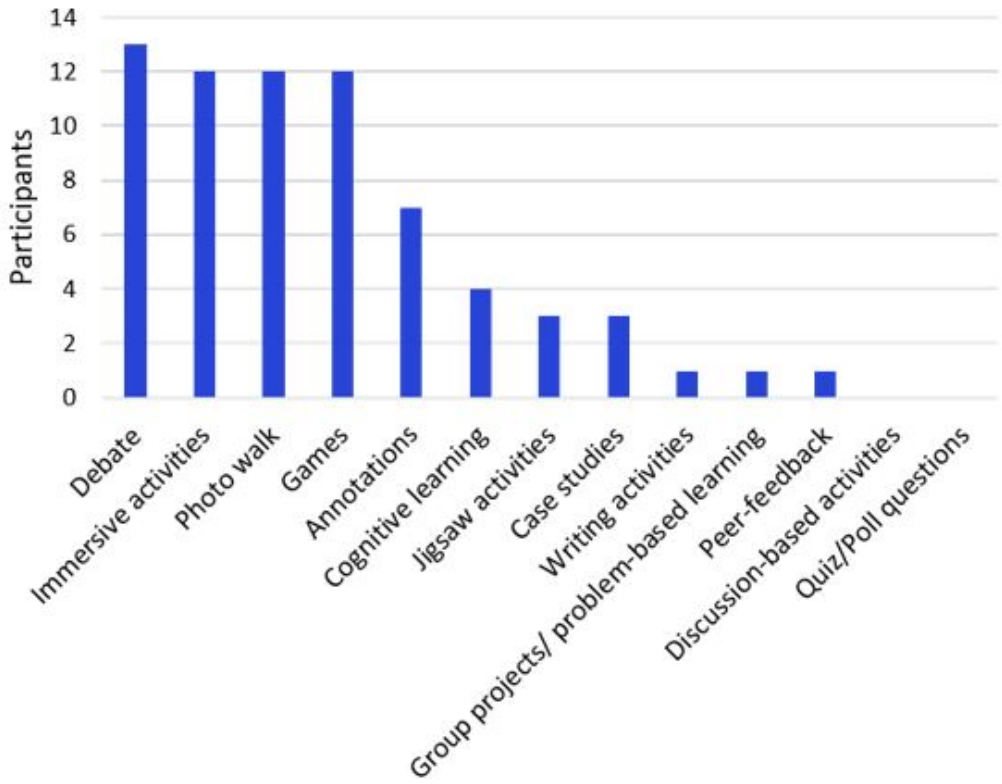
Participants in the FGs expressed terms such as "belongingness" and "social learning space" concerning student-centered learning.

The most reported active learning techniques from the survey were discussion-based activities (91%), writing activities (83%), quiz/poll questions (74%), group projects/problem-based learning (57%), case studies (57%), peer feedback (48%), and presentations (41%). The application of UDL was apparent in participants' reported use of frequent low-stakes formative assessments, guided worksheets, journal clubs for small group discussion before large group share out, notice/wonder, self-reflection, and stump-the-expert questions from students.

There were some active-learning techniques that IDs indicated knowing about but tended not to use (see Figure 4). In discussing this finding further within the FGs, major themes of external constraints (i.e., *time, training, setup, tool dependability*) and non-relevance to the designer's subject matter area were identified.

Figure 4

Known Active Learning Techniques Generally Not Used in Online Course Design



When surveyed about active learning in synchronous sessions specifically, IDs reported commonly using techniques of breakout groups, polls, "popcorn" share (posing a question and then gathering ideas from everyone), and question-and-answer review. Within breakout group structures, IDs discussed activities of small group case study discussions, PBL, student-led reading discussions, think-pair-share, and other types of projects that position students as teachers. Tools utilized to support these activities include discussion, polling, and collaborative desktop publishing. During an FG session, one ID mentioned using the virtual backgrounds feature to support the simulated experience as part of synchronous role play conversations. Of note, graphic organizers and social media were not popular tools for synchronous formats.

For added flexibility for learners, IDs indicated alternatives to live virtual classroom lectures that they often use, including pre-recorded narrated presentations/screencasts (91%), guest speakers/expert interviews (87%), written lectures (65%), inquiry-based activities (57%; e.g., series of tasks, scavenger hunt), podcasts (52%), and community-based activities (52%;See Figure 5). Their choice of approach for any course design often depends on the subject matter. One participant, for instance, provided an additional technique in the "other" response option for this survey item

in which they described how PBL works well in their medical education content. This idea of matching technique to subject matter context was similarly discussed in the FGs.. One designer, for instance, described how active learning techniques supported diverse learners in their workforce development context:

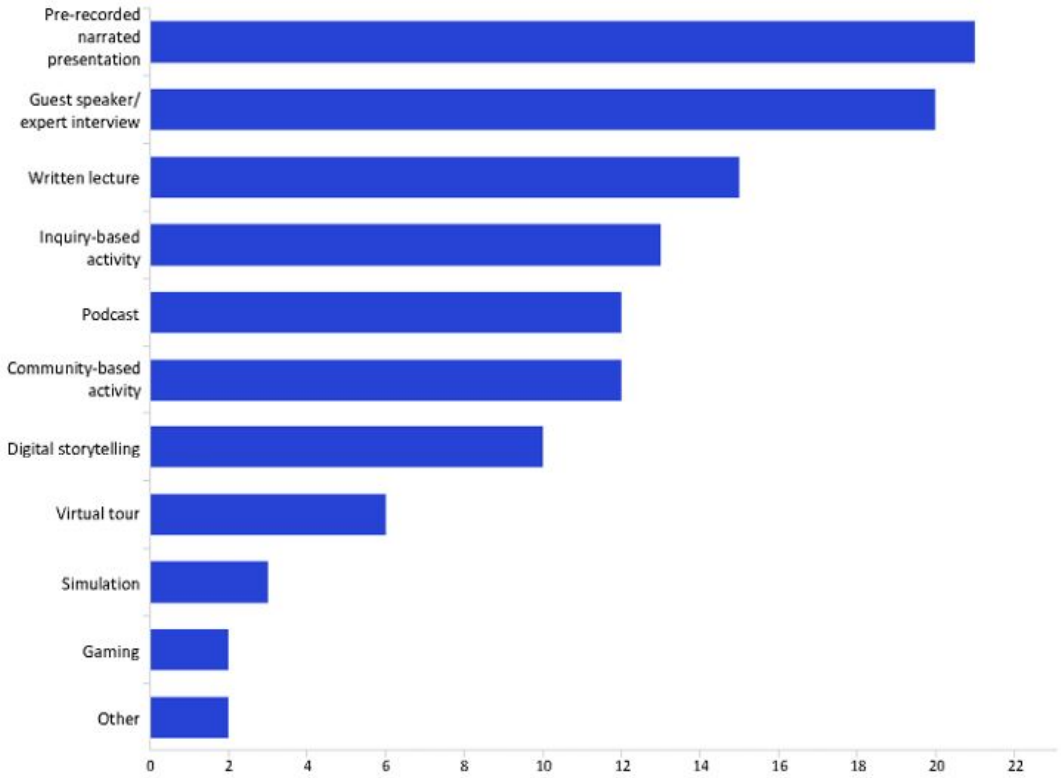
> *We cut out a lot of the 'lecture-ette' pieces and built a lot of micro-learning for- you've got to look at this beforehand, because when we're together, we're going to be engaging in talking with one another and making this a social learning space and time for reflection and ask me anything and debrief and skills practice, polls, Mentimeter, working on different visualizations together and making posters in an electronic fashion . . . It's forcing adults, at least in our space, to engage in ways that they might have just been able to be quiet in the classroom. . . . So, creating that space for the different types of learners and communicators to come through and share their perspective in the wisdom in the room.*

Another designer described how some of the lecture alternative techniques serve dual purposes for both creating spaces for learner engagement but also supporting accessibility and multiple means of representation of content in the course:

> *We bundle all of our transcripts, all of our slide-based lectures and transcripts every week, into a weekly reader, along with the required articles. And, while that did initially begin as an accessibility approach, we find that in terms of reaching a broad spectrum of learner needs, having all of the content in the course in about three different formats means that if people need something to read while they're commuting, if people need or if people are out in the field and have very limited Internet, that there's a lot of different ways that people have needs for different formats.*

Figure 5

Instructional Alternatives to Live Classroom Lectures



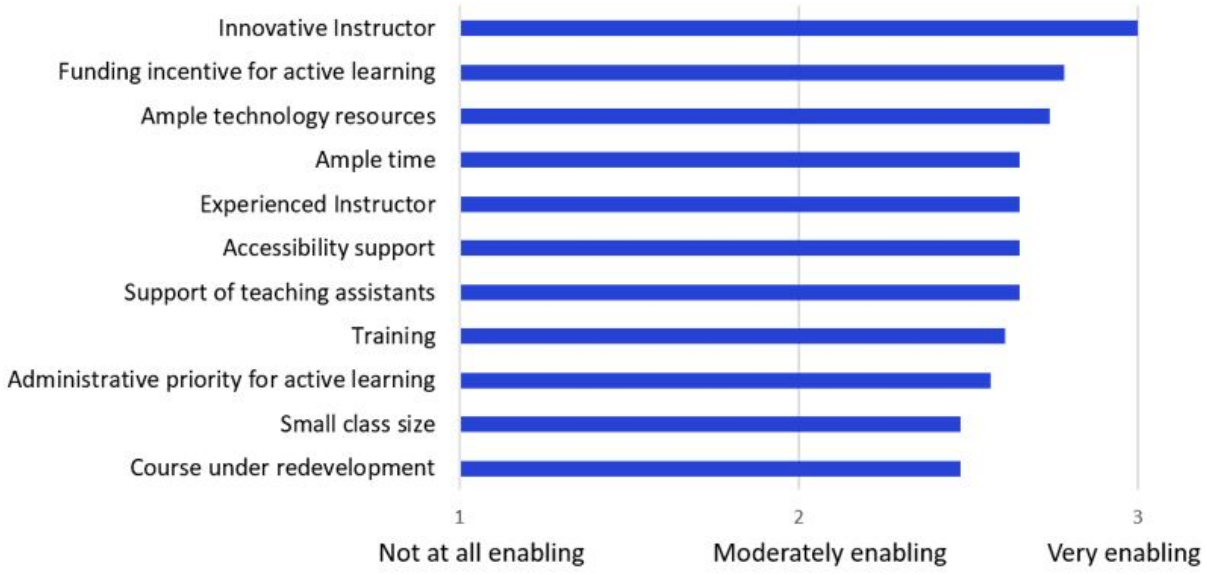
RQ3: What Do IDs Perceive as Enablers to the Application of UDL to Active Learning Approaches in Their Online Course Designs?

Regarding characteristics that contribute to the use of active learning techniques in their online course designs, all participants indicated an "Innovative Instructor" as being key. Other leading contributors to active learning from the survey data included funding incentives for active learning, ample time, ample technology resources, experienced instructors, accessibility support, and support of teaching assistants (See Figure 6). In discussing instructor innovativeness in the FGs, one designer elaborated on their perspective regarding the relationship between instructor prior experience and their willingness to innovate their teaching with active learning techniques alongside the support of an ID:

> *I think it's all about having the time to work on their course, and I find that "experienced" can be bad if they're like really experienced in that they've been teaching a lecture- traditional lecture format for a long time, then it can be hard to shift versus somebody who might be a new instructor teaching the course for the very first time. They're kind of a blank slate and open to do whatever. And then I think the training, like if they have somebody like an instructional designer, giving them ideas and showing them examples that that can really go a long way versus somebody being expected to do it on their own and not quite knowing what to do or what to try or what tool might work best or that sort of thing.*

Figure 6

Average Rating of Enablers to the Application of UDL to Active Learning in Online Course Design



Additional enablers noted in the follow-up open-ended survey response included student buy-in, user-friendly technology, and "success stories." One respondent suggested the utility of "dissemination of current examples in use: case studies of tool-in-use for instructors to observe and consider." Application of active learning techniques is also supported when there is a " . . . shared vision and direction between subject matter expert and course designer." For leadership and IDs, they felt it was important to have " . . . a disciplined background: education, training, and experience. If you do not have those, the results will be middling and mostly miss the mark."

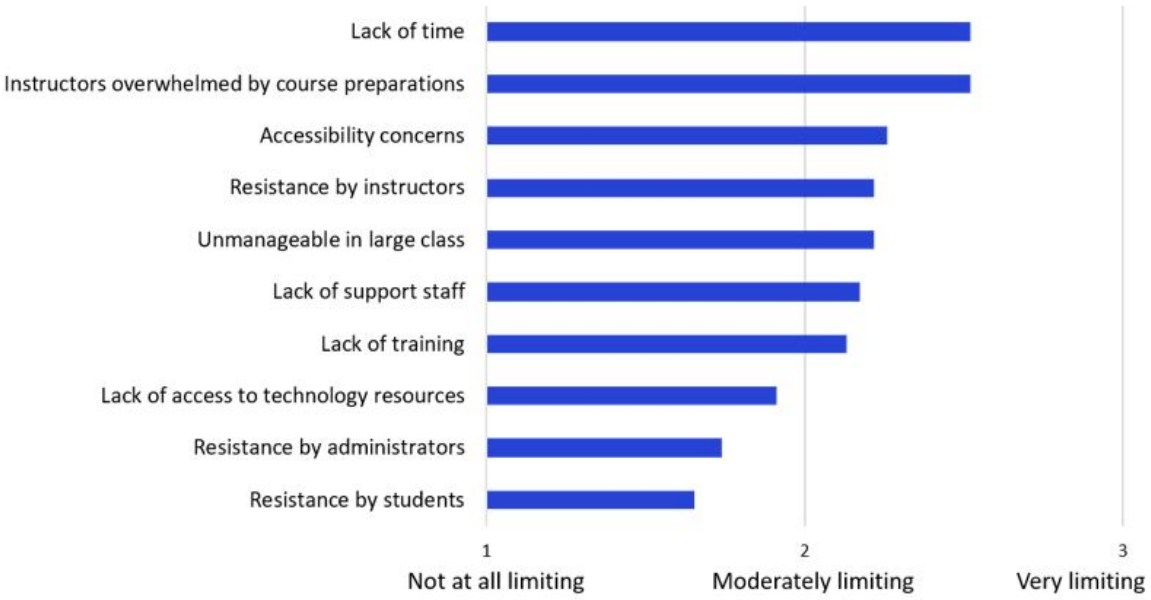
RQ4: How Do IDs Address Barriers to the Application of UDL to Active Learning Approaches in Their Online Course Designs?

IDs' perceived lack of time and instructors overwhelmed by their course preparation workload emerge as the greatest challenges to the implementation of active learning techniques in online course designs (See Figure 7). Other leading barriers from the survey data included accessibility concerns, resistance by instructors, unmanageability in large classes, lack of support staff, and lack of training. Respondents also noted some additional limiters to active learning implementation in the open-ended survey item, including poorly designed technology tools, slow Internet speeds, and the need to constantly update curriculum based on innovations and other changes.

Challenges related to the present COVID-19 pandemic were also expressed. One participant described feeling compelled to develop "easy-to-execute course designs" in seeing how overwhelmed faculty and students seemed during this challenging time. They remarked, "In general, professors and students have a hard time focusing on academics given our circumstances making it difficult for me as an ID to incorporate effective techniques that require more preparation." Another ID expressed the pandemic's impact on their role as, "This context [pandemic, wildfires, and witnessing how these catastrophes are aggravating racial injustices] is definitely limiting my ability to incorporate innovative learning techniques into course design."

Figure 7

Average Rating of Barriers to the Application of UDL to Active Learning in Online Course Design



In the FGs and survey, IDs expressed barriers and possible solutions regarding leadership, institutionalized policies, and pedagogy, such as the following remarks:

- " . . . time-based and achievement/grading-oriented system of higher education, rather than a competency-based model."
- " . . . understanding the pedagogy and the best practices that drives the design decision is not prioritized."
- "When there is a dearth of knowledge in leadership, then intentional and principled instructional design will not be considered."
- "An individual may be very invested in and successful at implementing active learning and others in the department could view their teaching practices negatively, which impacts their motivation to continue to do active learning or do it more visibly."

While many of these barriers may be beyond the control of the ID, some conceded that resolutions might be reached through training and non-training solutions.

Emergent Themes

The data were dual coded for themes by the authors, and then codes were synthesized into four main emerging themes. The themes and sample quotations from the data that corresponded to each theme were shared with four key informants from across the three universities. The key informants confirmed that the emerging themes seemed reasonable and accurate. The four main emerging themes, with in vivo codes, and quoted examples provided in parenthesis are as follows:

1. belongingness (i.e., *autonomy, enhance community building, inclusion, journal clubs, student lounge*);
2. social learning space (i.e., *authentic learning experiences, bounce ideas first, group teach, interviews, microlearning, peer moderation, popcorn share, student-centeredness);*
3. structuredness (i.e., *guided exercises, just-in time video, polls for pre-work, predetermined criteria, strategic design of UDL*); and
4. universality (i.e., *adaptive learning, bundled transcripts, share notes with students in slides, strategically designed for the margins*).

In sum, the designers sought to foster a student presence in the social learning space, and they did so through certain structures (planned interactions) in coordination with universal access. They saw UDL and active learning both as having student-centeredness at their core.

Discussion

This study highlights ID perspectives on the application of UDL and active learning in online course designs, as well as facilitation and hindrances encountered. Our goals were to contextualize their processes, innovations, and concerns. Overall, participants were highly educated, trained, and experienced in creating accessible online courses. The importance of UDL and its correlation to online active learning was evident in their contributions to this study, given the multiplicity of crises faced in their respective locations.

The emergent themes parallel Palmer and colleagues' (2003) principles for universal instructional design (UID) and the foundations of the UDL framework (CAST, 2018). Table 1 presents a comparison of the key themes alongside dimensions of UID and UDL. *Belongingness* and *social learning space* primarily address UDL's affective networks and corresponding principle of providing multiple means of engagement, while *structuredness* and *universality* may be associated with all three principles.

Table 1

Comparison of Emergent Themes with UID and UDL

Key themes	UID (Palmer & Caputo, 2003)	UDL (CAST, 2018)
Belongingness	Accommodating learning spaces	Optimize individual choice & autonomy (7.1), minimize threats & distractions (7.3), facilitate personal coping skills & strategies (8.2), and activate . . . background knowledge (3.1), as means of engagement and representation.
Social learning space	Supportive learning environment	Foster collaboration & community (8.3), as a means of engagement.
Structuredness	Consistency, explicitness,	All the principles

Key themes	UID (Palmer & Caputo, 2003)	UDL (CAST, 2018)
	minimization of effort	
Universality	Accessibility, flexibility	All the principles

Application of Instructional Strategies

In Table 2, a summary of the online active learning-oriented instructional strategies used by participants is categorized by the typology of Ragan et al. (2008) with implications for practical application. In this typology, interactive tasks that involve collaborative tools and student groupings are characterized as *activity-centered lessons*. *Content-centered lesson*s contain passive tasks wherein students mainly interact with the content, with the exception being class discussions of the content. *Experience-centered activities* incorporate hands-on approaches to developing artifacts or serving/co-working with others. *Learner-centered activities* offer learners opportunities to enact self-directedness regarding their pursuit of knowledge, including metacognitive actions for self-regulated learning. There are affordances and constraints for each of these activity classifications, as are noted in the table, though these may vary depending on any given learning task or content focus.

Table 2

Instructional Strategies Utilized by Instructional Designers

Types	Strategies mentioned	Implications for online course design
Activity-centered	Case studies, debates, games, group projects, roleplay, students crowd-source information/resources using criteria	Affordances include ease of setup in web conferencing breakout rooms, virtual backgrounds, Internet search engines, and collaborative publishing tools.Barriers include large class size, non-innovative instructors, and setup for games.
Content-centered	Discussions, presentations, writing activities	Affordances include familiarity of tasks and ease of management.Barriers include large class sizes for discussions and presentations.
Experience-centered	None provided	Constraints are inhibiting IDs from considering these.
Learner-centered	Polls/Quizzes, peer feedback	Affordances for polls include just-in-time feedback, the opportunity to share and discuss students' input, and feasibility in large classes.Barriers include non-innovative instructors.

In applying the variety of instructional strategies, we recommend that learner preferences be supported through multimodal opportunities for learning. For example, alternatives to live virtual lectures are important because of the brain's inability to pay attention, process, and store lengthy amounts of information (Baddeley et al., 1974; Bruning et al., 2011; Miller, 1956; Sweller et al., 1998). Further guidance, exemplars, and training are needed for designers and instructors regarding *experience-centered* instructional strategies to overcome present constraints for this modality. Experience-centered techniques in the online environment offer great potential for online licensure/professional courses such as teacher education, nursing, health sciences, and instructional design.

Enablers and Barriers

In collaboration with experienced innovative instructors, IDs felt they could successfully design active online courses as per the UDL framework, if given sufficient resources (e.g., time, funding, technology) and accessibility support. According to the Association for Talent Development's categorization of root causes (Wilmore, 2004), the barriers expressed in this study fall into the performance improvement factors of information, knowledge/skills, resources, and

structure/process. Instructors' lack of time to develop active learning material has been identified in prior research, including Miller and Metz (2014). Challenges faced by IDs collaborating with instructors have also been identified in prior research such as Bain (2020), though the barriers of instructors' lack of innovation or online teaching experience were not mentioned.

In remote teaching situations prompted by various crises, instructors (regardless of experience) may be called upon to teach online. Emergency remote teaching online may be different than traditionally designed online coursework, wherein specific criteria and guidelines may be more thoroughly incorporated (Hodges et al., 2020). More investigations are needed to decipher the complexities of collaborating with instructors ranging in experience and openness to innovation to provide online accessible education irrespective of the situation.

Study Limitations

This study was exploratory, and as such, limited in scope. Findings represent the perspectives of the participant sample and are not intended to be generalized. Further iterations of the UDL-OAL instrument could be expanded to include the additional suggested contributions from participants in this pilot study. Further, the study is situated within the context of challenges related to the COVID-19 pandemic, which involves a large-scale application of online learning at present in US higher education institutions to mitigate viral spread. The pressures to reinvent approaches to deliver content in this remote format have necessitated a rapid redesign of coursework and other learning experiences. Future research could address this gap by exploring success case scenarios particular to the barriers identified in this study. Additionally, scholarly inquiry into the collaborative aspects of ID in coordination with instructor openness to innovation may yield valuable insights into the expanded application of active-learning techniques to support varied learner needs.

Conclusion

With the input from IDs, we explored approaches to designing online active learning techniques from a UDL stance. The ideas and concerns raised can be used to inform our practice and the stakeholders involved in instructional design in higher education. We hope that our case study is replicated through both innovative and necessary modifications to other contexts (e.g., rural, private, international) and that the study instruments will be utilized and expanded. We are thankful to our participants who most enthusiastically shared their compassion for making online education accessible to all.

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Appendix A

Universal Design for Learning - Online Active Learning (UDL-OAL) Survey Demographics Section

1. What is your gender?
    1. Female
    2. Male
    3. Non-binary
    4. Prefer not to disclose

2. How long have you been an instructional designer?
    1. 6 months-2 years
    2. 3-5 years
    3. 6-8 years
    4. 9-11 years
    5. 12+ years

3. What is your highest level of education?
    1. Associate's degree
    2. Bachelor's degree
    3. Graduate certificate
    4. Master's degree
    5. Doctoral degree

4. To gain a sense of the range of study participant experiences, describe any formal training you have completed related to instructional design. [free text]

5. What content area(s) do you tend to support or design for? Check all that apply.
    1. Architecture
    2. Arts
    3. Business
    4. Education
    5. Engineering
    6. Health Sciences
    7. Hotel, Restaurant Management, Hospitality
    8. Languages
    9. Law
    10. Liberal Arts
    11. Library and Information Sciences
    12. Mathematics
    13. Natural Sciences
    14. Social Sciences
    15. Social Work
    16. Technology (e.g., computer information systems, construction management)
    17. Other [Free text]

Active Learning Section

The next section of questions related to active learning techniques. Active learning engages students directly in the learning process through instructional activities with differing degrees of interaction that are student-centered. This is contrasted with passive learning, which tends to occur indirectly and without interaction.

1. How often do you incorporate the following active learning techniques in online course designs?

	Use regularly	**Use occasionally**	**Have tried once**	**Know the technique but have not incorporated**	**Unfamiliar with the technique**
Cognitive learning activities (e.g., brainstorming, concept mapping, graphic organizers)					
Discussion-based (e.g., think-pair-share, threaded discussions, synchronous breakout groups)					
Presentations / Jigsaw activities					
Debate					
Case studies					
Writing activities (e.g., one-minute papers, journaling/ blogging/podcasting, student publishing, end of a unit reflections)					
Annotations					
Photo walk (i.e., taking and sharing pictures of key concepts, topics, etc.)					
Group projects/ problem-based learning					
Peer-feedback					
Games					
Quiz/poll questions					
Immersive activities (e.g., simulations, role play, Virtual Reality, Augmented Reality)					

1. Describe any other active learning techniques that you typically incorporate into your online course designs. [Free text]

1. Describe your favorite techniques to incorporate active learning in synchronous learning sessions. [Free text]

1. Which of the following alternatives to live virtual classroom lectures do you design/recommend? Check all that apply.

- Pre-recorded narrated presentation/screencast
- Written lecture
- Podcast
- Virtual tour (e.g., museum, SecondLife, Google Earth TourBuilder)
- Digital storytelling
- Inquiry-based activity (e.g., series of tasks, scavenger hunt)
- Community-based activity (e.g., attending local civic leader presentation)
- Gaming
- Simulation
- Guest speaker/expert interview
- Other _____

1. What tools do you typically incorporate into the design of synchronous session activities for teaching assistants or instructors? Check all that apply.

- Web-conferencing tool (e.g., Microsoft Teams, Zoom, WebEx, Adobe Connect, Big Blue Button)
- Collaborative desktop publishing tools (e.g., Google Suite, Microsoft Office 365, Dropbox)
- Polling tools (e.g., Poll Everywhere, Mentimeter, Google Forms, Microsoft Form)
- Quizzing tools (e.g., Kahoot, Quizizz, Quizlet)
- Graphic organizer tools (e.g., Coggle, Lucidchart, Popplet, Google Drawing)
- Social media (e.g., Twitter, Facebook, Snapchat)
- Other [Free text]

1. To what extent do you think each of the following limit use of active learning techniques in online course designs at your University?

	Very limiting	**Moderately limiting**	**Not at all limiting**
Resistance by instructors			
Resistance by students			
Resistance by administration			
Instructors overwhelmed by course preparations			
Unmanageable in large class			
Lack of access to technology resources			
Lack of training			
Lack of support staff (e.g., teaching assistants, graders, course administrators)			
Accessibility concerns			
Lack of time			

1. Describe any other barriers not in the list above that you see as limiting your use of active learning techniques in online course designs at your University. [Free text]
2. To what extent do you think each of the following enable use of active learning techniques in online course designs at your University?

	Very enabling	Moderately enabling	Not at all enabling
Innovative instructor			
Experienced instructor			
Course under redevelopment			
Small class size			
Administrative priority for active learning			
Support of teaching assistants			
Ample technology resources			
Funding incentive for active learning			
Ample time			
Accessibility support (e.g., staff, LMS plugins such as Ally)			
Training			

1. Describe any other enablers not listed above that facilitate use of active learning techniques in online course designs at your University. [Free text]

Udl Section

1. To what extent do you feel confident in your knowledge about designing accessible courses and learning materials?

Completely confident	Fairly confident	Somewhat confident	Slightly confident	Not confident at all

1. How have you learned about accessible educational practices? Check all that apply.

- Workshop
- Course
- Reading on my own
- Watching videos
- Meeting one-on-one with a mentor/expert
- Professional learning network
- Learning from my colleagues
- Other [free text]

1. What does Universal Design for Learning (UDL) mean to you? [free text]

How do you think Universal Design for Learning applies to active learning? [free text

Appendix B

Semi-Structured Focus Group Protocol

1. Describe some ways that you promote using active learning techniques in synchronous sessions for courses or learning experiences that you design or support.
2. [Show survey data word cloud of active learning techniques.] In the poll, select what you think are the top three most important active learning techniques that you tend to promote for use in synchronous sessions.
    1. Why do these techniques seem to be most favored?
    2. Do you have an example related to one of these techniques that you'd want to share?
3. [Show survey data bar graph of alternatives to live virtual classroom lectures.] In the poll, select what you think are the top three most important alternatives to live lecture format that you tend to promote in your designs and instructional support.
    1. Why do these alternatives seem to be most favored?
    2. Do you have an example related to one of these alternatives that you'd want to share?
4. [Show survey data bar graph of active learning techniques that designers knew about but tended to not incorporate in their designs.] Tell us more on why designers tend not to use these in course designs.
5. [Show survey data word cloud of active learning and UDL overlap.] Tell us more about your thoughts on how you see Universal Design for Learning and active learning techniques overlap.
6. Tell us more about how you strategically design from the outset for diverse learners in online learning environments.
    1. Can you share any examples of ways that you have done this in your designs?
7. [Show survey data bar graph of barriers that hinder incorporation of active learning techniques in online course designs.] In the poll, select what you think are the three greatest barriers.
    1. How do you address barriers to applications of UDL to active learning activities in your online course designs?
8. [Show survey data bar graph of enhancers that enable active learning techniques in online course designs.] In the poll, select what you think are the three greatest enhancers.
    1. How do you enhance applications of UDL in active online learning activities?
    2. Could you share some examples?
9. Any final thoughts that you would like to share?

Sandra A. Rogers

University of California - Berkeley

Sandra Annette Rogers is a Digital Learning Specialist with the Research, Teaching, and Learning Services at the University of California - Berkeley. She specializes in the instructional design of active learning, community of inquiry, and the universal design for learning (UDL) for online and blended courses in higher education.

Susie L. Gronseth

University of Houston

Dr. Susie Gronseth is a Clinical Associate Professor in the Learning, Design, and Technology program area in the College of Education at the University of Houston (Houston, Texas, USA). She specializes in learning technologies, teaching strategies, instructional design, health sciences education, and applications of Universal Design for Learning (UDL) to address diverse learner needs in online, face-to-face, and blended contexts. Her research interests involve learner engagement, accessibility, inclusive instructional design, distance education, and self-directed learning. She has a background in primary education, specializing in supporting students with disabilities, and coordinated educational technology programs at middle school and college levels. She completed her Ph.D. in instructional systems technology at Indiana University, honored with the Distinguished Alumni Award. She has received recognition for her course design and university teaching, including the International Society for Technology in Education (ISTE) Online Learning Network Award and the University of Houston College of Education Teaching Excellence Award. Her recent book, *Universal Access Through Inclusive Instructional Design: International Perspectives on UDL* (Routledge, 2020), addresses inclusive instructional foundations, policies, design approaches, technology applications, accessibility challenges, curricular quality issues, research, and case studies from around the world. More information is available at https://bit.ly/SGronseth.