Signs of Serendipitous Universal Design for Learning in Online Courses

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Abstract

Although instructors in higher education are oftentimes content matter experts, they may not have received training on instructional design or inclusive practices, such as Universal Design for Learning. However, instructors may serendipitously implement aspects of UDL without full knowledge of the framework. This qualitative study used sensemaking theory to explore interview data from 33 online instructors with ten or more years of experience in online education to explore (1) what aspects of UDL online instructors serendipitously used when designing and teaching online courses and (2) what aspects of sensemaking online instructors used when describing their serendipitous use of UDL. Analysis used an adapted phronetic iterative approach and revealed several themes. First, analysis indicated that instructors used aspects of all three principles of UDL when designing and teaching their courses: Engagement, Representation, and Action & Expression. Second, analysis found aspects of sensemaking—Noticing, Bracketing, Labeling, and Acting—with 11 full exemplars, demonstrating instructors cognitively working through the full sensemaking framework in speaking about their serendipitous use of UDL. We suggest that sensemaking explains how instructors might incorporate parts of UDL into their course design without knowing about the framework. Further, we suggest that sensemaking could ease instructor transitions from serendipitously implementing strategies aligned with UDL to deliberately designing a course using a robust understanding of UDL as a framework.

Keywords: Universal Design for Learning, sensemaking, instructor perspectives, higher education, online learning

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In the 1990s, the nonprofit organization CAST developed the Universal Design for Learning (UDL) framework so instructional design could account for learner variability. UDL was developed to accommodate the needs and abilities of all learners through (a) Multiple Means of Representation, (b) Multiple Means of Action & Expression, and (c) Multiple Means of Engagement (Meyer et al., 2014). Evidence shows UDL and related frameworks to be effective at reducing barriers in higher education contexts, particularly for students with disabilities (Burgstahler, 2011; Gradel & Edson, 2009; McGuire & Scott, 2006; McGuire et al, 2003). Additionally, research has shown students (Schelly et al., 2011; Simoncelli & Hinson, 2008; Watt et al., 2014) and staff (Catalano, 2014; Grabinger et al., 2008; Rao & Tanners, 2011; Seok et al., 2010) hold positive sentiments about UDL.

Supporting learner variability is especially salient for online instructors in higher education as their online learners are, on average, older than 24-years-old (Venable, 2022a), enrolled full-time in their coursework (Aslanian et al., 2022; Venable, 2022b) while also working either part- or full-time (Aslanian & Fischer, 2023; Venable, 2023). Online students are not only working and taking classes but are often raising children and are married or partnered (Aslanian & Fischer, 2023; Venable, 2023). Additionally, online students regularly access their course content using mobile devices (Dello Stritto & Linder, 2018; Pew Research, 2024), which may complicate their experiences further.

UDL is one strategy that helps institutions uphold their commitment to accessibility and to support federal protections for students with disabilities. However, few have adopted the concept as an entire institution, instead relying on disability services to provide expertise to students or instructors on an individual basis (Tobin, 2021). Instructors are often tasked with ensuring their courses are fully accessible without institutional support (Linder et al., 2015) or necessary training (Xie & Rice, 2021). Different policies, time constraints, staff/faculty turnover, technological learning curves, inadequate resources, and academic background all impact whether an instructor can integrate UDL principles into a course (Gradel & Edson, 2009; A et al., 2022). Instructor knowledge is also a potential contributor: instructors may simply be unaware of UDL, how it might benefit their students, and how they might implement UDL in their course designs. Instructors are often content matter experts and may not have received training on instructional design or adult learning theory (Hromalik et al., 2020; Lieberman, 2005). Indeed, Westine and colleagues (2019) found that 62% of faculty respondents reported they were familiar with UDL, but their implementation of UDL strategies in their online courses was uneven. Many instructors receive little guidance about inclusive practices and few opportunities to collaborate with others as they work to integrate UDL in their courses (Hromalik et al., 2020).

However, Behling (2020) suggested instances in which instructors "accidentally" used strategies aligned with the UDL framework without knowledge of UDL (Nave, 2021). The current study suggests that sensemaking theory—the communicative process of making sense of our experiences—helps to bridge these divergent views by allowing instructors to notice, label, and act upon their previous teaching decisions (Weick et al., 2005). Further, we build upon Beling's (2020) observations and suggest an updated term, "serendipitous," to describe these unintentional yet beneficial occurrences. Using sensemaking, the current study explored how online instructors could serendipitously implement parts of UDL without communicating prior knowledge of the framework using the following research questions:

- What aspects of UDL do online instructors use when designing and teaching online courses?

- What aspects of sensemaking do online instructors use when describing their serendipitous use of UDL?

Literature Review

Universal Design for Learning

Scholars suggest that UDL works to accommodate the needs and abilities of all learners and eliminates unnecessary barriers in the learning process (Meyer et al., 2014). Meyer et al. (2014) contend that it offers flexibility in the ways students can access material and demonstrate what they have learned through (a) Multiple Means of Representation, (b) Multiple Means of Action & Expression, and (c) Multiple Means of Engagement. The first principle delivers Multiple Means of Engagement to recruit student interest, sustain effort and persistence, and to develop self-regulation skills. The second principle, Representation, considers the application of collecting and presenting information to students in a way that can be understood effectively given learner variability. The last principle, Action & Expression, focuses on offering learners diverse ways to express their understanding and skill development (Meyer et al., 2014). Together, these principles provide a broad range of coverage for learner variability which impacts their ability to engage with and succeed in the learning environment. The principles benefit learners of all levels, including those in online higher education.

UDL in Online Higher Education Contexts

Despite the growing interest in UDL, evidence-based literature on its effectiveness is sparse (Bray et al., 2024; Rao, 2014). However, some past research has demonstrated the effectiveness of UDL and related universal design frameworks in improving access (Burgstahler, 2011; Gradel & Edson, 2009; McGuire & Scott, 2006; Scott, et al, 2003). Students have positive perceptions of UDL in online contexts as well (Catalano, 2014; Levicky-Townley et al., 2021; Rao & Tanners, 2011; Seok et al., 2010; Scott, et al., 2015; Yang et al., 2011). In an online teacher preparation program, Scott et al., (2015) found that graduate students perceived that UDL design infused throughout their course improved their preparation for teaching. Rao and Tanners (2011) found that, in courses that used Universal Design and UDL principles, students appreciated various options provided and the ways in which the course was scaffolded to maximize their success. Levicky-Townley et al. (2021) found evidence of UDL's capacity to help students become "expert learners" as students agreed UDL integration helped improve their attention, cut down on distractions, and changed their beliefs about attention, memory and multitasking.

Instructor Knowledge and Implementation of UDL

Tobin and Behling (2018) have argued UDL is well situated to support online learners, who are increasingly mobile learners, as the technology inherent in online education makes UDL easier to achieve. However, instructors may be reasonably resistant to UDL if they believe it is the same as offering accommodations or differentiated instruction for each student (Tobin & Behling, 2018). An instructor teaching multiple courses with 25+ students in each course who believes that UDL means offering accommodations to over 100 students could be understandably overwhelmed by such a request. Even if instructors fully understand UDL, they may be reasonably concerned about the time and work required to (re)design a course or course load with UDL if it is not presented in the context of institutional support

(Tobin & Behling, 2018). Institutional factors such as different expectations, time constraints, staff/faculty turnover, technological learning curves, inadequate resources, and personal factors such as UDL knowledge, age, ethnicity, academic rank, and gender all impact whether an instructor can integrate UDL principles into a course (Altowairiki, 2023; Gradel & Edson, 2009; Li et al., 2020). Linder et al. (2015) found that even when universities are aware of strategies for building accessible online programs, of which UDL may be a part, lack of time, expertise, and resources prevented institutions from realizing fully accessible online programs. And even with positive perceptions of the framework, discrepancies can arise between how instructors define UDL and how they implement it in their courses (Lombardi et al., 2011).

Previous disability-related training can shape instructors' attitudes toward and integration of inclusive practices (Li et al., 2020). But when supported, instructors show motivation to incorporate inclusive strategies, like UDL, into their courses. Xie and Rice's (2021) analysis found that instructors' investment in UDL stemmed from their desire to improve student engagement and collegiality. Many factors may prevent instructors from using UDL in their courses and previous theorizing precludes the possibility that faculty might implement UDL "accidentally."

Accidental UDL

Tobin and Behling (2018) argued that instructors cannot "accidentally" implement UDL strategies because UDL must be tied to course goals and outcomes They argued that for the most effective results, instructors must deliberately design using UDL from the start. Similarly, Kinash (2011) argued that UDL does not naturally arise and instead must be intentional, researched, and rigorous. And we agree that intentionally designing within the framework of UDL yields the most benefit for students; however, we also assert that there may remain instances in which instructors use strategies aligned with the UDL framework while not having the language of UDL through which to describe and understand their experiences.

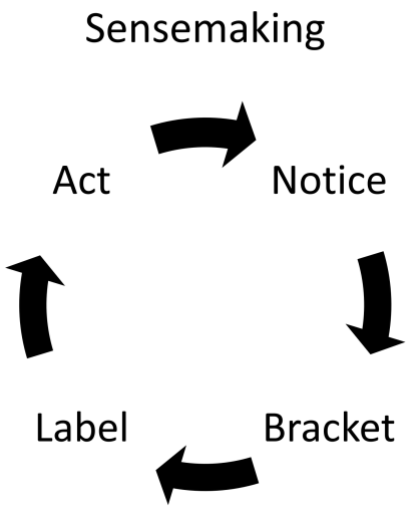
Behling (2020) investigated instances of "accidental UDL" in higher education as instructors rapidly shifted to emergency remote instruction during the COVID-19 pandemic, stating, that many instructors stumbled into a new way of teaching that aligned with UDL. Behling (2020) and Nave (2021) described these instances as being positive despite the negative connotations associated with the word "accidental." These positive outcomes, while inadvertent, do not conjure the same negative connotations that the term "accidental" does. Instead, we propose the term "serendipitous." Serendipity is defined as "the faculty or phenomenon of finding valuable or agreeable things not sought for" (Merriam-Webster, n.d.) and "the fact of finding interesting or valuable things by chance" (Cambridge Dictionary, n.d.). Serendipity seems to more accurately describe what instructors experienced: discovering inclusive strategies that work for their students by chance, through trial and error.

However, these experiences contradict the belief that courses must be intentionally designed using UDL and cannot naturally arise without concerted effort and planning. Next, we suggest that sensemaking bridges these divergent viewpoints, not only allowing scholars to honor both positions, but also aiding practitioners, such as instructional designers (IDs) or disability specialists, by easing instructor transitions from serendipitously implementing strategies aligned with UDL to purposefully designing a course using a robust understanding of UDL as a design framework.

Sensemaking

Sensemaking is a communicative activity that enables people to turn the "undifferentiated flux of raw experience" (Chia, 2000, p. 513) into comprehensible language, to organize experiences (Starbuck & Milliken, 1988). Sensemaking starts when people (a) notice that an event or phenomenon has occurred in their experience (Weick et al., 2005). Once noticed, individuals (b) bracket the event or phenomenon, like "put[ting] brackets around or highlight[ing] particular, puzzling issues" (Rutledge, 2009, p. 21). After bracketing, individuals can (c) label or categorize their experience within a mental model or framework in ways that suggest (d) plausible action (Weick et al., 2005). Action within sensemaking, does not mean searching for the correct answer, but rather, finding plausible explanations for experiences, enough to enable action. By acting, a person can assess the effectiveness of that action through gathering new observable data (experiences, outcomes, thoughts, etc.) and making sense of that data to inform future action. Figure 1 shows the sensemaking process.

Figure 1
The Process of Sensemaking



Importantly, sensemaking is manifested through communication with others. Communication is the way by which we notice, label, codify, understand, and ultimately articulate our experiences, making it applicable to the problem of serendipitous UDL. Within sensemaking, it is reasonable for student-centered instructors to try a new strategy (Action), receive feedback from students (Notice, Bracket), categorize feedback (Label), then alter their course moving forward (Action). For example, it would be reasonable for an instructor to receive an accommodation request to caption videos in an online course (Notice, Bracket), categorize that request as a good idea (Label), create captions for videos (Action), receive positive feedback from students who did not request captions (Notice, Bracket), categorize that feedback (Label), and implement captioning in all their other courses (Action). This instructor might never hear the phrase "Universal Design for Learning," but because they work to center student perspectives in their teaching practices, they may inadvertently use a strategy that aligns with UDL. This also aligns with the "trial and error" process that Behling (Nave, 2021, 22:32) described: term-by-term, student-centered instructors may refine their teaching practices.

As such, the current study seeks to understand how long-term online instructors could serendipitously implement strategies aligned with UDL without prior knowledge of the framework. We suggest that sensemaking can help instructors and practitioners like IDs and disability services personnel, understand how this could take place. Furthermore, we suggest that this analysis could aid practitioners by easing instructor transitions from serendipitously implementing strategies aligned with UDL to purposefully designing a course using a robust understanding of UDL as a design framework.

Methods

Using sensemaking, the current study explored how online instructors could serendipitously implement parts of UDL without communicating prior knowledge of the framework using the following research questions:

- What aspects of UDL do online instructors use when designing and teaching online courses?
- What aspects of sensemaking do online instructors use when describing their serendipitous use of UDL?

Data Collection

This study used secondary data that was originally collected in the Fall and Winter of the 2018 and 2019 academic years. The original study explored online instructors' experiences and motivations for teaching online and a portion of the data was analyzed for this project. The study involved interviews with 33 "long-term instructors" who had taught online for 10 years or more. Recruitment emails were sent with a link to an anonymous Qualtrics pre-survey that measured instructors' demographic information and general information about online teaching experience. Of the 39 that completed the pre-survey, 33 participants were interviewed.

Participants completed three, 60-minute structured interviews. Interview questions did not focus explicitly on UDL but instead, broad topics to explore online instructors' experiences and motivations for teaching online. The first interview focused on participants' origins of online teaching and professional development, the second on participants' teaching and course development practices, and the third on participants' attitudes toward and beliefs about online teaching. We analyzed questions from the second interview, specifically the section focused on course development.

Participants

Since pre-survey data were collected anonymously, the results have been reported in aggregate only. Participants (N = 39) reported teaching online from 10 to 31 years, with start dates ranging from 1990 to 2010. On average, participants reported 14 years of online teaching experience, and started teaching online in 2004. Just over half identified as female (59%; N = 19), with 41% identifying as male (N = 14). While most reported full-time employment (67%; N = 22), 33% (N = 11) of participants reported either "part-time" employment, or "other." Participants were recruited from a range of disciplines and represent diverse experiences teaching online in a variety of content areas.

Table 1

Demographic Data Based on Pre-Survey Responses (N = 39)

Employment status	Position	Gender	Age range	Highest Level of Education
Part-time/other: 11 (33%)	Non-tenure track: 30 (77%)	Female: 19 (59%)	34-44%: 7 (18%)	Doctoral: 33 (85%)
Full-time: 22 (67%)	Tenure-track: 9 (23%)	Male: 14 (41%)	45-54%: 5 (13%)	Master's or other: 6 (15%)
			55-64%: 17 (45%)	
			65+: 9 (24%)	

Interview Questions Analyzed

We analyzed the following selection of questions from the second interview:

- Do you design your online courses differently than face-to-face courses? If yes, how is it different?
- How have your course materials changed over time?
- How have your views or practices related to required course materials changed over time?

Although interview questions did not specifically ask about UDL, these questions held the best potential for content about UDL and sensemaking because they ask participants to think retrospectively about their course design and asked specifically about the actions instructors took to change their courses (Weick et al., 2005). While imperfect, this served as a proxy for evaluating serendipitous use of UDL as direct questions would be counterproductive.

Researchers' Positionalities

Greta (she/her): I am a postdoctoral scholar at Oregon State University Ecampus. I taught online communication courses at two different universities and learned about UDL later in my PhD studies. Upon learning about UDL, I recognized some practices that I had already been using in my online courses, even though I had not heard of UDL before. From then on, I worked to intentionally implement UDL in my in-person and online courses and became convinced of its utility for my students. In this study, I consider my background as an instructor and my knowledge of UDL as assets in the analysis and interpretation of data.

Cat (they/them): I am an undergraduate research assistant at Oregon State University Ecampus and I am majoring in psychology. My K–12 education was unique in that the majority of my schooling experience was spent studying at home or online, which gave me an appreciation for the flexibility and self-motivation required for successful online learning. My experience as an Ecampus student at OSU has further enhanced my understanding of the specific needs that online students. This experience has given me a unique perspective on the challenges and opportunities that online learning can present. As a researcher, I recognize that my role in this project is that of an instrument of analysis. I aim to bring my personal

experiences and unique perspective to the table to contribute a more comprehensive understanding of the factors that contribute to the academic success of online learners.

Data Analysis

We used Tracy's (2020) pragmatic iterative approach for data analysis which alternates between emergent analysis of the data and use of existing models or theories throughout the analysis process. The first author extracted data from the full interviews resulting in 59 pages of single-spaced text. We searched all participant interviews for any instance of "UDL" and "Universal Design" and found no mention of either. We used a Microsoft Word Macro (Peach, 2014, n.d.) to code the data in separate Word document files. We approached the data with a rough codebook based on the UDL framework and sensemaking theory. In our first round of coding, we looked for broad examples of the three principles of UDL and the four parts of sensemaking theory, as illustrated in Table 2. We used the CAST graphic organizer (version 2.2) of The Universal Design for Learning Guidelines as a reference while we coded (CAST, 2018). We also coded other themes that might crop up during our coding based on our knowledge of UDL and sensemaking theory. We eventually collapsed coding of Noticing and Bracketing as these are not only intertwined, but Bracketing is not always explicitly explained (i.e., "I remembered a situation in class and bracketed or separated it from other classes in my mind so I could think about it more deeply."). We met multiple times to discuss and negotiate codes and their meanings. Many examples could be coded within multiple categories and we determined final codes based upon the salient context of the data and the purposes described by instructors.

Table 2
First Cycle Codebook

Code	Definition	Example
UDL: Engagement	Methods to recruit interest, sustain effort/persistence, or help students to self-regulate	"…the assignments are put on the discussion board. And then they're required to interact with each other…"
UDL: Representation	Methods to create options for perceiving auditory or visual information, to clarify language, or to increase comprehension	"there's definitely video now…infographics…more images. There's tables and charts…multimedia."
UDL: Action & Expression	Methods to provide options for students to display knowledge through physical action, expression & communication, or to develop executive functions	"…they'll do a virtual lab… want the same learning objectives met, but we can't always do it the same way…"
Sensemaking: Noticing/Bracketing	An instructor remembering, commenting on, realizing something about a teaching situation	"I use more video than I did in the beginning…. when I started doing videos…"

Sensemaking: Labeling	An instructor providing an explanation or emotion for something they noticed/bracketed about a teaching situation	"It's really hard to do 10 weeks, especially in some of these big topics."
Sensemaking: Acting	An instructor describing action they took after labeling a teaching situation	"I cut out two more of the cases that I added in recent years…"

Note. UDL definitions developed by CAST (2018) and sensemaking definitions developed by Weick (2005).

After first round coding, the first author consulted the literature again to verify understandings of the frameworks and broadly coded the data a second time. Next, the first author merged both Word documents and extracted all codes into an Excel book for axial coding. Axial coding consisted of breaking large UDL codes into the component parts to create code hierarchies (Tracy, 2020), for example, breaking an "Engagement" code down into "Recruiting Interest: Optimize individual choice and autonomy" or "Self Regulation: Develop self-assessment and reflection" as illustrated in Table 3. This phase of coding also consisted of distinguishing inclusion and exclusion criteria for codes.

Table 3
Second Cycle Codebook

Code	Definition
All UDL codes	Inclusion: UDL codes about online teaching and learning Exclusion: UDL codes about in-person teaching and learning
All Sensemaking codes	Inclusion: Codes referencing sensemaking about UDL specific to online teaching and learning
	Exclusion: Codes referencing sensemaking about teaching other than UDL; codes about in-person teaching and learning
Engagement: Recruiting Interest	Methods that optimize individual choice and autonomy; optimize relevance, value, and authenticity; minimize threats and distractions
Engagement: Sustaining Effort & Persistence	Methods that heighten salience of goals and objectives; vary demands and resources to optimize challenge; foster collaboration and community; increase mastery-oriented feedback
Engagement: Self Regulation	Methods that promote expectations and beliefs that optimize motivation; facilitate personal coping skills and strategies; develop self-assessment and reflection
Representation: Perception	Methods that offer ways of customizing the display of information; offer alternatives for auditory information; offer alternatives for visual information
Representation: Language & Symbols	Methods that clarify vocabulary and symbols; clarify syntax and structure; support decoding of text, mathematical notation, and symbols; promote understanding across languages; illustrate through multiple media

Representation: Comprehension	Methods that activate or supply background knowledge; highlight patterns, critical features, big ideas, and relationships; guide information processing and visualization; maximize transfer and generalization
Action & Expression: Physical Action	Methods that vary strategies for response and navigation; optimize access to tools and assistive technologies
Action & Expression: Expression & Communication	Methods that use multiple media for communication; use multiple tools for construction and composition; build fluencies with graduated levels of support for practice and performance
Action & Expression: Executive Functions	Methods that guide appropriate goal-setting; support planning and strategy development; facilitate managing information and resources; enhance capacity for monitoring progress

Note. UDL definitions developed by CAST (2018).

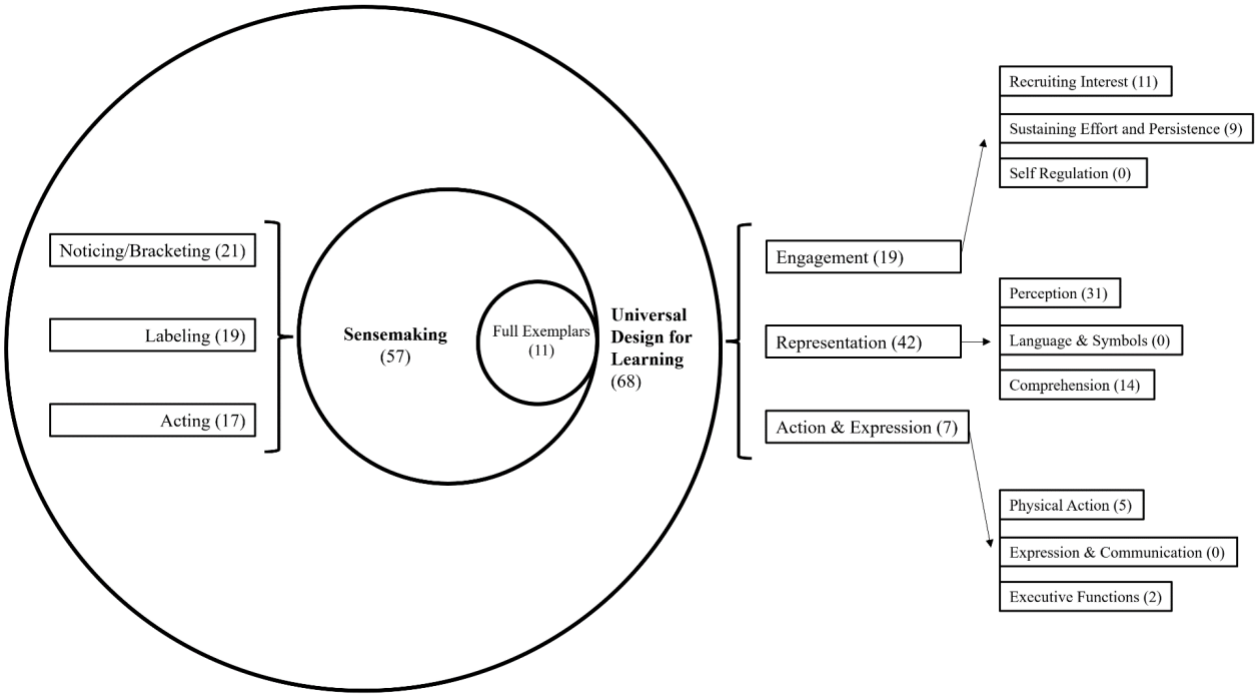
The last phase of data analysis consisted of cross-referencing UDL and sensemaking codes to identify exemplars of both frameworks. Typically, we would whittle codes down to one code that is most salient to the piece of text being coded; however, the goal of this project was to identify if instructors are sensemaking about UDL, making this layering of codes useful in analysis.

We used multiple methods to ensure rigor in our analysis. First, we use Tracy's (2020) eight "big tent" criteria as a loose rubric to assess the quality of our project. Next, our writing includes thick description (Geertz, 1973) and multiple exemplars so the reader can confirm the resonance of our findings (Tracy, 2020). Third, our writing works to transparently communicate the decisions and analytical steps we have made so other scholars can replicate the study and verify our findings by closely following our analysis (Tracy, 2020). Fourth, our analysis included constant discussion and negotiation between the two researchers to ensure dependability as we coded the data (Exeter & Ashby, 2019). Last, our process included peer debriefing in which we conversed with other scholars and practitioners who provided support, challenged assumptions, and asked hard questions to push the analysis (Lincoln & Guba, 1985).

Results

Qualitative analysis revealed several themes to answer the research questions. First, analysis indicated that instructors used aspects of all three principles of UDL when designing and teaching their courses: Engagement, Representation, and Action & Expression. Second, analysis found all aspects of sensemaking—Noticing, Bracketing, Labeling, and Acting—with 11 full exemplars, demonstrating an instructor cognitively working through the full sensemaking framework in speaking about their inadvertent use of UDL. The analysis is captured in the below data structure, which illustrates codes and their frequencies in the data.

Figure 2
Sensemaking and UDL Data Structure



Note. Codes and themes are listed with frequencies.

Universal Design for Learning

Engagement

We found 19 instances of Engagement in the data. Of those 19 instances, 11 involved Recruiting Interest, nine involved Sustaining Effort & Persistence, and none were found pertaining to Self Regulation. First, regarding Recruiting Interest, Instructor 18 spoke of altering a class field trip for their online course, saying:

> In one of the courses, the students do a self-directed field trip online… students choose a place to visit and it's a staged assignment. They go through several steps where they choose a place, they get some feedback from me on that choice, they develop a plan, they get feedback from that, they then go, and they present on their field site. And so that's how they get the field trip experience online…

This instructor describes recruiting student interest by letting students direct their own field trips based on their geographic locations and interests, building options into their course for individual choice and autonomy and optimizing relevance for students.

Related to Sustaining Effort & Persistence, Instructor 16 created opportunities for students to receive peer feedback on a large project every week, saying, "I change the groups every week…. and it's hard keeping track of it, but…. for me, that's important, because by the end of the course, I want the students to have had the maximum interaction."
This instructor provided weekly opportunities for engagement by working to foster collaboration and community throughout the course.

We found no instances of Self Regulation, the last element of Engagement, in the data.

Representation

We found 41 instances of Representation in the data; 31 instances related to Perception, 13 related to Comprehension, and none related to Language & Symbols. First, regarding Perception Instructor 18 described their process, saying,

> I added first audio to my PowerPoint lectures, I then added written transcripts to my PowerPoint lectures… they had some written narration associated with that. I then went and did voiceovers on those PowerPoints that they could then listen to, I then created transcripts for those voiceovers. So basically, the way they're getting the content has diversified over time.

This instructor "diversified" their content and offered alternatives for auditory and visual information throughout their course, providing options for Perception.

For Comprehension, Instructor 31 spoke of using a template for modules in their online course, saying,

> Like there's a template and it's formulated so you've got, "You're getting to learn this this week," and, "You did it. You learned these things," you know? Like how basically the instructional design is kind of holding the whole thing together each week… the architecture of the instructional design is just much more learner friendly. I was like, "Wow, this is so fun to go through this class," because it's all there. I don't have to guess what the heck I'm supposed to try to do.

This instructor discovered the template for online modules provided by the online division offered clarity by guiding their students' information processing through the modules.

We found no instances of instructors describing opportunities Language and Symbols.

Action & Expression

We also found seven instances of Action & Expression in the data; five instances of Physical Action, two of Executive Functions, and none related to Expression & Communication. First, regarding Physical Action, Instructor 2 spoke of generating multiple types of assignments for their online students to reach the same goals as their in-person students:

> So, a discussion board number… there's at least two… can be up to like 10 forums in a given week and so I feel like with each of those forums that they participate… They need to be in there thinking about some part of it and that's in addition to whatever quiz or paper whatever is due. So, yes, it's the same basic philosophy, but it's a different way of reaching that goal.

This instructor generated multiple discussion boards in which students could engage, as well as quizzes and papers, varying the methods students might use to respond to their course content.

In the last piece of Action & Expression, Executive Functions, Instructor 29 spoke of developing a pre-evaluation to help students gauge their readiness for an upcoming exam:

> …we now require pre-evaluations… about a week before the students are scheduled to take a midterm and a final… they take a 20 question, it's set up as a quiz… one quiz question that says, "You're about to take a pre-evaluation… how many are you going to get correct?" And then they take the assessment. Then they are told how many they got correct… So we have a little rubric. If you scored between an 18 and a 20, 20 being the maximum, it's like, and you predicted that you were going to get 18 to 20, it's like, "Nice work. You're all set to take the exam, you got this." If a student

> predicts that they're going to get 18 and they have four correct, the message comes up and says, "Ah, you might want to go ahead and review these topics." And all of this comes from the Dunning-Kruger effect of students that don't know what they don't know…

This instructor used the pre-evaluation to guide appropriate goal setting and to support planning and study strategy development for their students before an exam.

We found no descriptions of Expression & Communication in the data.

Analysis revealed that instructors used aspects of all three principles of UDL when designing and teaching their courses, summarized in Table 4 below.

Table 4

Exemplar Excerpts for UDL Codes

UDL Principle	UDL Sub Principle	Exemplar Excerpts
Engagement	**Recruiting Interest**	Instructor 18: In one of the courses, the students do a self-directed field trip online… students choose a place to visit…
	Sustaining Effort & Persistence	Instructor 16: I change the groups every week…. that's important, because by the end of the course, I want the students to have had the maximum interaction.
	Self Regulation	No instances coded
Representation	**Perception**	Instructor 18: I added first… I then added written transcripts to my PowerPoint lectures… then…voiceovers on those PowerPoints… then created transcripts for those voiceovers.
	Language & Symbols	No instances coded
	Comprehension	Instructor 31: Like there's a template… the architecture of the instructional design is just much more learner friendly.
Action & Expression	**Physical Action**	Instructor 2: So, a discussion board number… there's at least two… can be up to like 10 forums in a given week
	Expression & Communication	No instances coded
	Executive Functions	Instructor 29: …we now require pre-evaluations… about a week before the students are scheduled to take a midterm and a final

Overall, we found 67 instances of UDL even though no participants explicitly cited UDL as a guiding force in their course design or teaching. Some instructors discussed the reasoning behind their use of aspects of UDL, providing a glimpse into potential sensemaking processes, explored next.

Sensemaking

We found 57 instances of sensemaking directly related to aspects of UDL in online learning contexts. Instances of sensemaking not related to UDL or online learning were not included in analysis. First, we found 21 instances of Noticing/Bracketing, 19 instances of Labeling, and 17 instances of Acting, all pertaining specifically to strategies aligned with UDL. Instances of Noticing/Bracketing often centered on contrasting current online courses with previous online or in-person courses. Instructor 14 described teaching face to face, saying, "I started in '87 as an adjunct instructor… The department had textbooks chosen for it, so it was like you'd walk into the class and get this textbook." They demonstrated Noticing and Bracketing by remembering their start at the institution and separating it from other instances in their mind. Instructor 21, who was featured in the UDL section above, spoke of recording videos for their course, saying, "…when I started doing videos, I'd record a 40-minute video for a class." This instructor demonstrated Noticing and Bracketing by remembering how they recorded their lecture videos in the past.

Second, we found 19 instances of instructors Labeling their experiences with course design and teaching. Instructor 14, who was given a textbook by their department, realized "[t]he uniformity of the content was actually adverse to the student learning." This instructor Labeled the given textbook as inadequate for their students. Similarly, Instructor 21 Labeled their video lectures as too long by describing the communication with a course design professional, who said, "'You cannot do that. Students aren't going to watch,' I think he said more than a nine-minute video." This instructor Labeled their videos as too long, indicating a change needed to be made in the curriculum to better support students.

Third, we found 17 instances of instructors Acting based on their sensemaking of a situation. Instructor 14 altered their curriculum, saying, "Then I started seeking out to create my own packets in those courses, and changed the materials that I was choosing. Now I became like a curator of classic texts and bringing them to my students." This instructor Acted by altering their course curriculum based on their sensemaking of the current textbook and their students' needs. Instructor 21 altered their videos, saying "That was a big change, was every week just giving them little snippets, instead of the entire lecture that they would get in person. That's a significant change." This instructor Acted based upon their sensemaking of their video lectures and altered them to be more accessible to students.

Although we found 57 instances related to sensemaking, we only found 11 complete exemplars in which participants described the sensemaking process as resulting in a change to their course aligned with UDL. We have discussed two already: Instructor 14 who created their own materials and therefore provided alternative visual materials for their students (Representation: Perception) and Instructor 21 who shortened their videos and helped guide their students' information processing (Representation: Comprehension). In Table 5 below is a third example of an instructor who worked through the sensemaking process to make a change in alignment with UDL.

Table 5

Example 1 of Full Sensemaking Process regarding UDL

Text	Code: Evidence
Well with the hip-hop [course], at first, I had a textbook that wasn't a textbook. It	**Noticing/Bracketing:** noticing and bracketing a specific course and textbook

was basically an account of early hip-hop music. It was cool and like it was good. It was a cheaper one too. It's like [brand] so it was $10.	
But then I was like, "You know, I put together basically this course with so much research. There's no real reason to have a required book anymore because it's just seeming to be adding onto the fact that I've done all this research and it's in the PowerPoint. The PowerPoint is sort of the document. It's the book kind of now."	**Labeling:** labeling the research they have done for their course as sufficient for students, making the textbook unnecessary **Representation: Comprehension:** Guide information processing and visualization: instructor guides information processes through the PowerPoint and by removing extraneous content from course (removing the textbook below)
So, I finally got rid of that [textbook].	**Acting:** removing the textbook from their course
Now I'm in the Women in Music class and there is a required textbook	**Noticing/Bracketing:** noticing and bracketing a specific course and textbook
and it's kind of probably expensive, like $55. So, I'm going, "Okay. I'm probably going to need to write these lectures up and find articles and not have this expense on the students."	**Labeling:** labeling the textbook as expensive

In the above example, we observe Instructor 31 Noticing a specific course and textbook and Labeling that the research they curated for their course is sufficient to meet the needs of the course, allowing them to remove the required textbook from the class and use their own materials. Their actions align with aspects of UDL in that they work to guide information processing by removing extraneous materials and focusing student attention on meaningful materials. We also observe the instructor beginning another sensemaking cycle, Noticing the textbook in their current course, and Labeling it as expensive for students. They do not describe Acting, but instead they describe a plan for future action to "write these lectures up and find articles" to remove the textbook from the course.

Another example of this sensemaking process, in Table 6 below, comes from Instructor 2 who explained the difficulty in equitably grading group work in an online course.

Table 6
Example 2 of Full Sensemaking Process regarding UDL

Text	**Code: Evidence**
I've always made them work in groups because I think that's useful…	**Noticing/Bracketing:** noticing/bracketing the consistent use of group projects
the [online division] said … "It's just really hard for them to coordinate" or you know, "There is [a] student who leaves partway through" … so I stopped doing group work	**Labeling:** labeling their current group assignment as not student-centered given the variability of online students' lives and the unequitable grading practice of

with [online] students just because it can be so, so much more variable…	assigning them all the same grade for a project (explained below)
So, I've moved away from group work… peer reviews make up for that forcing them to interact in some way but not say, "This is a group project that you will all be graded on" and so forth. They still all do their own but they have to interact with each other on the same type of topic so you can get some of the same benefits, but without doing that group grading…	**Acting:** dropping the group assignment and offering a peer review assignment instead **UDL Engagement: Sustain Effort and Persistence: Foster collaboration and community:** by integrating peer reviews into their course providing opportunities for students to interact and build community

This instructor Noticed and Bracketed the group assignment before Labeling it by observing students were not being graded equitably. They describe Acting by dropping the group assignment and instead using a peer review assignment, which provides opportunities for students to interact and build community, in alignment with the UDL Engagement principle. These and other instances demonstrate instructors making sense of their courses and changing their course development or teaching in ways that align with UDL, even though instructors do not mention UDL explicitly.

Discussion

This qualitative study explored how online instructors who had taught online for 10+ years could serendipitously implement UDL without communicating prior knowledge of the framework by asking a) what aspects of UDL online instructors used when designing and teaching online courses and b) what aspects of sensemaking online instructors used when describing their serendipitous use of UDL. Analysis revealed that instructors described making course design and teaching decisions that inadvertently align with aspects of UDL, providing support to Behling's (2020) notion of "accidental UDL" and demonstrating instructors' impulse toward inclusive practices (Altowairiki 2023; Li et al., 2020). These decisions spanned all three principles of UDL (CAST, 2018; Meyer, 2014). Representation accounted for the largest UDL theme, perhaps because the wealth of diverse audio and visual resources available to instructors allowed them to easily provide multiple options for alternative displays of information. The third principle, Action & Expression, made up the smallest UDL theme, perhaps due to the standardized nature of online course deployment, restrictions on media or tools instructors could use in online courses, or the level of planning needed to implement innovative options for Action & Expression in the online environment. This finding is in line with Xie and Rice (2021), who found that instructors considered technology to be a double-edged sword and expressed interest in professional learning to combat feelings of discomfort when integrating technology for UDL. Cross-referencing the UDL and sensemaking themes produced 11 full exemplars, showing instructors moving through the sensemaking process (Noticing/Bracketing, Labeling, and Acting) when explaining decisions related to UDL. Participants' discourse produced cohesive, complete sensemaking processes, demonstrating deep reflection resulting in changes in their courses. Further, these exemplars demonstrate how the process of sensemaking might help instructors made decisions in line with aspects of UDL, even if instructors do not know about the UDL framework, extending Behling's (2020) work on "accidental UDL."

Behling (2020) observed that during the COVID-19 pandemic, instructors at their institution began making decisions in line with UDL "without deliberate instruction" and instead with "a lot of trial and error." Such trial and error make sense within the context of the rapid shift to online emergency instruction; many instructors were forced to evaluate their course goals, cut extraneous content, and implement strategies to support success in the virtual space, creating opportunities for instructors to try new technologies and approaches to teaching. Similarly, such trial and error may have worked pre-pandemic for the long-term online instructors in this study who may have tried new or innovative strategies throughout their careers, refining their approaches to be inadvertently aligned with UDL. Tobin and Behling (2018) recommended the UDL plus-one approach: identify one potential barrier in your course and provide a different way for learners to succeed. Instructors in the current study did not describe overhauling their entire courses but described making small changes to their courses, to better serve and engage students, in line with the plus-one approach (Tobin & Behling, 2018).

At its core, UDL is about access: creating learning environments that allow all types of students to learn in ways most helpful to them. Although we agree with Tobin and Behling (2018) that a true and robust implementation of UDL cannot be produced accidentally, the instructors in our study demonstrated a commitment to student-centered teaching and an impulse toward inclusivity, even without explicitly citing UDL. Instructional designers and disability specialists can increase access to UDL by capitalizing on instructors' inclusive inclinations, identifying parts of UDL that are already serendipitously incorporated into course design, and guiding instructors to a deeper understanding of the UDL framework for robust incorporation. Such an orientation does not dilute the power of UDL but instead aligns with its core commitment to access and would seem to ease instructor transitions from serendipitously using parts of UDL to robustly incorporating the full UDL framework into their teaching practices.

This project contributes to scholarly literature by building upon the concept of "accidental UDL," demonstrating how instructors might inadvertently use inclusive strategies aligned with UDL without prior knowledge of the framework. We extend Behling's (2020) work by offering the term "serendipitous UDL" instead of accidental to denote the unintentional yet beneficial occurrences of instructors inadvertently using aspects of UDL without prior knowledge. Second, this study draws on the rich experiences of accomplished instructors, in contrast to those instructors engaged in the recent emergency remote teaching amidst the COVID-19 pandemic. The seasoned instructors in this study evolved their online pedagogy over time by adjusting their practices to best support students; similarly, participants experienced significant changes in technology that necessarily impacted their pedagogy (Thomas & Dello Stritto, 2021). Their experiences can illuminate the benefits of UDL by demonstrating that instructors may already be serendipitously implementing UDL in their course design and instruction. Third, practitioners like instructional designers, disability advocates, and administrators might have an easier time convincing instructors to utilize UDL if they could help instructors make sense of their previous unknown use of UDL, thereby easing transitions from serendipitously implementing strategies aligned with UDL to purposefully designing a course using a robust understanding of UDL as a design framework.

Practically, UDL specialists, such as instructional designers or disability specialists, might guide instructors through such a transition in multiple ways, demonstrating the practical applications of this study. First, they can identify instances of serendipitous UDL already being implemented in courses. Once identified, practitioners can use these examples

to anchor conversations about inclusive teaching broadly and UDL specifically. Throughout these conversations, if instructors express hesitation, practitioners can return to the parts of UDL already serendipitously incorporated into their courses, building the argument that instructors have already demonstrated their commitment to inclusive teaching practices. Previous work has demonstrated instructional designers' ability to guide instructors toward inclusive practices (Singleton et al., 2019). In the same vein, practitioners would essentially be helping instructors through the sensemaking process to improve course designs. In this way, instructional designers, disability specialists, or others could shepherd instructors toward more robust implementation of UDL in their courses.

Limitations and Future Directions

This study is limited in that it is difficult to determine instructors' prior knowledge from secondary data. We searched all participant interviews for the entire project (3 interviews per participant) for any instance of "UDL" and "Universal Design" and found no mention of either. Although this does not definitively prove that instructors in this study had no prior knowledge of UDL, it does serve as a helpful proxy for those who truly have never heard of this approach. Direct questions about UDL would be counterproductive, as instructors would then have a familiarity with the framework. A second limitation is the generalizability of this study. Although these results are not generalizable, they are transferable (Lincoln & Guba, 1985) to other similar populations, such as online or in-person instructors at other institutions. Future studies could examine less experienced instructors who were included in the larger study, specifically, graduate students and instructors with less than 9 years of experience who may be more familiar with UDL as the framework. This study focused on online learning environments at an institution of higher education. Future work might examine experiences of instructors working in in-person or hybrid courses in higher education, K-12 educators, or instructors in non-credit/alternative credit educational opportunities.

Declarations

This study was approved by the Institutional Review Board (IRB) of the Oregon State University, and the protocols used in the study were approved by the Human Research Protection Program.

Generative AI tools were not used at any stage of this research project.

Authors declare no conflict of interest.

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