Theories to Influence the Future of Learning Design and Technology

2021 AECT RTD Theory Spotlight Competition

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Heather Leary is an Associate Professor of Instructional Psychology & Technology at Brigham Young University. Her research focuses on tackling problems of practice in K12 and higher education using innovative approaches and technologies. Her research bridges research and practice in science, technology, engineering, arts, math, and 21st-century skills, using design-based research, problem-based learning, and research-practice partnerships. She focuses on building K12 teachers' knowledge, capacity, and design capabilities through professional learning opportunities and how that translates to classroom enactment.

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Spencer P. Greenhalgh is an interdisciplinary digital methods researcher studying meaning-making practices on online platforms. He holds a BA in French Teaching from Brigham Young University and a PhD in Educational Psychology and Educational Technology from Michigan State University. He is currently an assistant professor of information communication technology in the School of Information Science at the University of Kentucky, where he teaches courses on games and literacies, information technology, web content management, and data science. You can learn more about Spencer and his work at https://spencergreenhalgh.com/work/

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I am an Assistant Professor of Instructional Systems & Learning Technologies at Florida State University. My research investigates self-directed learning, especially by teachers. I'm most interested in what happens when our students, learners, and trainees finish the instruction and training we design for them. What do they do after they walk out the door or log off? How do they continue to develop the knowledge, skills, and abilities they need? Where do they look for resources? Who do they talk to? I have several ongoing projects on self-directed learning. First, I examine networked learning in online communities, such as those hosted by Twitter and Reddit. Second, I study how new teachers expand their professional support systems during their induction transition. Third, I seek to understand educators' experiences as data scientists. Fourth, I interrogate educators' informal learning as a form of invisible labor.

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Moon-Heum Cho earned his Ph.D. in the School of Information Science & Learning Technologies at the University of Missouri-Columbia. Prior to joining Syracuse University, he was at Sungkyunkwan University, a private research university in Seoul, South Korea where he taught instructional design, technology, and program evaluation. In addition, he taught classes on technology integration in K-12, learning theories, and educational psychology to preservice teachers at Kent State University in Ohio.

Introduction

Heather Leary, Spencer P. Greenhalgh, K. Bret Staudt Willet, & Moon-Heum Cho

In 2020, *Educational Technology Research and Development* published a special issue titled, "The Role of Theory in Learning Design and Technology Research and Practice" (Volume 68, Issue 2). The guest editors began the issue by writing:

The field of learning design and technology... aims to accomplish both research and practical goals. In short, our discipline exists equally in both the worlds of design and practice, and in research and scholarship. Undergirding and driving our work in both of these areas is good theory. Solid theoretical foundations about learning, teaching, design, and technology separate instructional designers from website developers, teachers from presenters, and academics from commentators (West et al., 2020, p. 593).

The importance of theory in Learning Design and Technology (LDT) research is to go beyond identifying variables and questions by providing context, explanation, and critique to those variables and questions (see Whetten, 1989). Furthermore, theory is then useful to the extent that it can lead to impact on the world (West et al., 2020). Although essential for LDT research, developing and applying theories is not easy. Warr and colleagues (2020) argued that two LDT factors make theorizing especially difficult. First, the work of LDT is complex and uncertain. Second, theory and practice must be closely connected in LDT to make claims and provide practical direction for design. With these constraints in mind and to further the conversation and highlight the importance of theory in LDT research, a *Theory Spotlight Competition* was proposed as part of the 2021 annual convention of the Association for Educational Communications and Technology (AECT). The focus of the competition was to answer the question: What theories should LDT researchers consider to provide context, explanation, and critique to the field?

The Research and Theory Division hosted and organized the competition. After a peer review process of the initial proposals, six papers were selected and then virtually presented at the convention to be considered by three judges: a) Dr. Xun Ge, b) Dr. Enilda Romero-Hall, and c) Dr. George Veletsianos. The whole AECT community was also invited to watch and review the proposals. Each paper was presented as a short video (also attached here in this volume with each paper). The six finalists were:

1. *Gagne's Nine Events of Instruction as a Conceptual Framework for Interpreting the Diverse Facets of Learning Observable,* by Nantha Kumar Subramaniam
2. *Theory-Driven Research in Learning Design and Technology Discipline: Toward More Rigorous and Richer LDT Inquiry,* by Ahmed Lachheb and Victoria Abramenka [First Place]
3. *Personalized Learning Design Framework: A Theoretical Framework for Defining, Implementing, and Evaluating Personalized Learning,* by Cecil R. Short
4. *A Framework for Phronetic LDT Theory*, by Jason McDonald [Second Place]
5. *Toward a Theory of Learning Experience Design (LXD)*, by Isa Jahnke, Yvonne Earnshaw, Matthew Schmidt, and Andrew Tawfik [People's Choice Award]
6. *Maturation of Universal Design for Learning: From Design Framework to Theory,* by Susie L. Gronseth, Jill E. Stefaniak, and Elizabeth M. Dalton [Third Place]

These six papers spotlight the variety of theory in LDT research but are only a handful of theories and frameworks available. This book provides the authors writing and recorded presentation of their work for your consideration.

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Theory-Driven Research in Instructional/Learning Design and Technology Discipline (I/LDT)

Toward More Rigorous and Richer Inquiry

Ahmed Lachheb & Victoria Abramenka-Lachheb

Instructional Design | Learning Design | Design Theory

In this paper, we argue that the Instructional/Learning Design and Technology Discipline (I/LDT) is a design discipline that belongs to the larger human tradition of design. Based on this premise, we recommend that I/LDT researchers: (a) Take advantage of the broader descriptive design theory and (b) rely on critical theory in order to provide context, explanation, and critique to the I/LDT discipline altogether. Drawing on specific examples from these theories, we provide specific recommendations for I/LDT researchers based on examples from precedent and high-quality I/LDT research.

The Instructional/Learning Design and Technology (I/LDT) discipline is primarily concerned with the subject of *design*—process and outcome (Goel, 1995, Smith & Boling, 2009; Tracey & Boling, 2014). When I/LDT researchers investigate technology integration (e.g., Clark, 1994; Kopcha et al., 2020; Kozma, 1994), study instructional behaviors/interventions and how they affect learning (e.g., Ertmer, 2005; Hmelo-Silver & Barrows, 2006), or focus on instructional/learning designers/technologists work (e.g., Gray et al., 2015; Ritzhaupt & Kumar, 2015; Rowland, 1992), the subject of design appears to be the unifying element in I/LDT inquiry, implicitly, or explicitly. In fact, it is reasonable to argue that I/LDT is a design discipline that belongs to the larger human tradition of design (Nelson & Stolterman, 2012).

Design is a human tradition—arguably the oldest human tradition—because it involves an aspect of an intentional creation (Nelson & Stolterman, 2012; Schön, 1983, 1987). Humans are engaged in design when they create “new things—tools, organizations, processes, symbols, and systems” (Nelson & Stolterman, 2012, p. 1). Designers, in this sense, are the individuals who have this ability for creation through coming up with an idea and bringing this idea into life; an idea by itself is not a design. Design is not an art nor a science but a distinct tradition by itself (Nelson & Stolterman, 2012). The science tradition, and therefore the scientist, focuses on the process; the primary emphasis is on the scientific method, not on its outcome. The art tradition, and therefore the artist, focuses on the outcome; the primary emphasis is on the artifact and not on how it was created. The design tradition, and therefore the designer, focuses on both process and outcome; the emphasis is equally placed on both the process of design and the outcome of such a process. In this regard, when a scientist places emphasis on the outcome and an artist places emphasis on the process, they have shifted from their original tradition to the design tradition. Of course, artists, scientists, and designers can move between these traditions in a conscious or unconscious manner to achieve their goals.

Furthermore, through listening to the formal or informal discourse of scholars, educators, and practitioners in I/LDT, it is evident that everyone is engaged in design activities for multiple purposes and through varying degrees of professional commitment. Scholars design studies to answer research questions. Faculty, trainers, and teachers design lessons/curricula to teach learners. Instructional/Learning Designers design diverse solutions that aim to improve human learning and performance in diverse contexts. Although we find it disagreeable to a great extent, some might argue that every member of the I/LDT community is an 'instructional/learning designer'.

Because the subject of design appears to be the unifying element in I/LDT inquiry, implicitly or explicitly, and because I/LDT is a design discipline, we recommend that I/LDT researchers (a) take advantage of the broader *descriptive* design theory, and (b) rely on critical theory to provide context, explanation, and critique to the I/LDT discipline altogether. Our recommendations are based on specific examples from these two diverse families of theories and on specific examples from precedent and high-quality I/LDT research.

Authors' Positionality

We, the authors, believe that it is important to disclose and share our positionality through a process known as bracketing before we put forward our intellectual recommendation. Creswell and Poth (2018) define bracketing as […] "a matter not of forgetting what has been experienced but of not letting past knowledge be engaged while determining experiences" (p. 77). Acknowledging our own values and biases is important to establish transparency and trustworthiness between us and you, the reader.

We both define ourselves professionally as learning designers, early-career scholars, and educators. We have the privilege and are fortunate to simultaneously practice design, conduct research on design, and educate future designers in diverse settings. This affords us a position and empowers us to focus our professional efforts toward creating a dialogue between the communities of design practitioners, educators, and researchers, in order to develop a beneficial exchange of ideas and recommendations. In this view, we think that each design community learns from the practice of the other. We strongly believe that design practice, research, and education should always be tied together to prevent gaps in knowledge that could be problematic to design practice and education. We have been hearing about the 'gap between research and practice' since our early days in undergraduate education. When we decided to study, research, and work in the I/LDT discipline, we focused our diligent efforts on this gap as we found it hugely problematic. This is what drives and motivates us.

Additionally, since we believe that design is the unifying element of I/LDT inquiry, we believe that we, as researchers, should be thoughtful of our research work as a design work that has an impact on the world. Thus, we should think of ourselves as the *guarantors of our design work* (Nelson & Stolterman, 2012), not the methods or processes we follow. In that regard, we think that theories, no matter how solid they are or where they are coming from, should be used in a "designerly" way (Lachheb & Boling, 2018; Stolterman et al., 2009). That is to say, we as researchers and designers place the theories at our service and do not let theories strictly dictate how to do our work in a limiting manner.

First Recommendation: Taking Advantage of Design Theory

Broad and descriptive design theories—developed outside of the I/LDT discipline—are grounded in situ design practice—situated in the original, natural, or existing place or position of design, not situated in what scholars think practice ought to be like. In turn, these theories offer rich and authentic explanations of what design is, how it occurs, and why elements in the design process/space fail and/or work well, depending on certain circumstances. Unlike well-established instructional/learning design theories (e.g., Keller, 1987; Merrill, 2002), design theories that describe design in situ, are sensitive to the unique aspects of contexts and do not *prescribe* design in a generalizable manner. We highlight two major design theories as examples (a) The Design Way theory by Nelson and Stolterman (2012) and (a) Schön's (1983) theory of reflective practice.

First Example: The Design Way Theory by Nelson and Stolterman (2012)

Nelson and Stolterman (2012) proposed a holistic design theory based on the following main arguments: (a) Design is a natural human activity: "Humans did not discover fire—they designed it" (p. 11)—what we think of traditionally as discoveries or inventions, are actually designs; (b) Design is a unique approach to life and different than other human approaches, such as science and art; (c) Design culture has important principles, such as creating an "ultimate particular" (i.e., real things based on what is ideal within the limits of the world), design is in service to others, and design is a way of inquiry since it requires various inputs and a grasp of the complex relationships in the environment; (d) Desiderata (desires) is what sparks design and makes it happen; (e) Designers employ 11 types of judgments to allow them to make design decisions; (f) Design exists in the absence of absolute certainty and perfect knowledge about the future; (g) The designer's character is the guarantor of the design, not the process or the model followed by the designer; and (h) Designers should consider their work of design in its own culture and build their design character with sets of knowledge, sets of tools, and sets of personal skills.

In elaborating on the idea of the guarantor of the design, Nelson and Stolterman (2012) discussed that the responsibility for the success and/or failure could not be placed elsewhere; it must be placed within the designer. The designer's character, judgment, and their abilities to design, separately and combined, can lead to a successful (splendor) design or a failed (evil) design. When design failure occurs, it is the responsibility of the designer:

Designers must accept responsibility for all they design. This accountability must be an integral part of their character. Designers should be relied on to fulfill obligations, not only to their clients, but also to a higher authority, one that is concerned for the sake of others and the environment in which we all live. (p. 211)

Nelson and Stolterman (2012) acknowledge that designers attempt to not assume responsibility for design failure. Designers can rely on "the logic of harsh, everyday reality as an argument for not assuming responsibility. 'I can only do so much!'" (p. 208). However, this argument is refutable as it allows fate to be the guarantor of design—it foregrounds the fact that designers play a significant part in our designed world. Additionally, Nelson and Stolterman (2012) argued that a comprehensive needs analysis—grounded in technical rationality—does not prevent design failure and leads to what is known as "analysis paralysis and value paralysis" (p. 32).

Placing the responsibility of success and/or failure of design outside of the designer and within the design process will lead to the assumption that there is a "right" process that can lead to the right design, irrespective of who the designer is. This view entails that a failure in the design is a result of a misuse of the right process and/or missing/overlooking a step in 'that right process.' In fact, the view of a 'right process' of design is strongly implied in the foundational I/LDT literature (Boling & Gray 2014; 2015; Smith, 2008), among design practitioners and educators, as evident in the ID CaseBook (Ertmer & Quinn, 2007; Ertmer et al., 2017; 2019), and in studies that seek to find best practices that every designer should do to prevent design failure. As Boling and Gray (2015) aptly remarked, the I/LDT discipline in general "view[s] the responsibility for appropriate design as residing outside the designer" (p. 111).

Second Example: Schön's (1983) Theory of Reflective Practice

Schön's (1983) theory of reflective practice describes designers' ways of thinking about their design work, how they make design decisions, and in turn, how they design through reflection-in-action and on-action. Such theory was a counterargument to "technical rationality"—a prevalent idea in the design methods movement that aimed to scientize design, advocated by Simon (1969) in his book *The Sciences of the Artificial*. Schön presented a conception of the design process as a *reflection-in-action*, such as design students in an architecture studio designing through active conversations about their design moves throughout the design process. Schön does not conceptualize reflection as a "time out" from practice but rather a continuous application of designers' tacit knowledge-in-action. This type of knowledge is not "knowledge in action" but "reflection-in-action"—new design "moves have to be tried out and assessed, and thus thought about and talked about" (Waks, 2001, p. 42).

One of the underlying processes of the design process as a reflection-in-action is the process of "rigor in on-the-spot experiment[ation]" (Schön, 1987, p. 68). In this process, Schön describes designers as engaged in experimenting with

different design solutions to respond to the framed design problem. Such an experimentation process allows designers to reframe the problem and/or test the adequacy of their hypotheses about the design problem at hand.

Similar to Nelson and Stolterman (2012), Schön (1987) discussed that the responsibility for the success and/or failure could not be placed elsewhere; it must be placed within the designer. Schön (1987) did not use the term 'failure' or 'guarantor of design' per se, but it does appear that the reflection-in-action process lends itself to the concept of design failure and designer's responsibility; designers experience mini design process-failures that play a generative role in their design process as a reflection-in-action. As Schön (1983) states:

The experimentation he [the male design student referred to earlier in the text] has conducted prior to the design review has made him aware of a conflict of appreciations. But he does not yet perceive it as a fundamental dilemma demanding for its resolution a significant change in one or both sets of values. In order for this to happen, he would have to carry out another sort of inquiry, one that would reveal both the intractability of his dilemma and an alternative approach to overall organization of the building. (p. 136)

How to Provide Context, Explanation, and Critique to I/LDT Using Design Theory?

The above two examples of descriptive design theories stress the importance of design context and how design work is situational. Thus, they call for situated explanations of design, and not making generalizable claims. Hence, they are design theories, not 'laws' that govern design. That is why these theories are 'drawn using a thick brush' and have been relied on by researchers investigating design topics in multiple disciplines, from business to education, to architecture and human-computer interaction (Beck & Chiapello, 2016). For that reason, these theories afforded scholars to provide context, explanation, and critiques in diverse design disciplines.

1. To Provide Context

For example, to provide context when studying teachers' teaching practices and/or teacher's perspectives/beliefs, we recommend that I/LDT researchers take advantage of Nelson and Stolterman's (2012) design theory to bring a rich description of teachers' design practice in diverse contexts. In this respect, I/LDT researchers will be able to make a convincing case of why teachers are in fact designers and be sensitive to their unique contexts. For example, precedent scholarship by Dr. Khendum Gyabak shows it is possible to appreciate teachers as designers, in their unique and diverse contexts, by taking advantage of Nelson and Stolterman's (2012) design theory. Such design theory supported Dr. Gyabak's (2018) inquiry work in a rigorous and ethical manner. As such, Dr. Gyabak (2018) was able to arrive at a rigorous understanding of teachers' thinking and actions carried out by primary school teachers in under-resourced schools. Although the studied teachers were found to not follow a formalized or systematic way of engaging in design, the study' findings suggest that studied teachers are engaged in design activities, such as planning, reflection, analysis, visualization, framing, schematizing, collaboration, and brainstorming, recollecting, predicting, theorizing, making, and tinkering. Through these findings and more, Dr. Gyabak's (2018) inquiry work offered several implications for teacher professional development, design theory, and non-governmental organizations (NGO) that work with teachers who are positioned in under-resourced classroom contexts around the world:

In the cases of these seven teachers, they are constantly making instrumental, appreciative, and compositional judgments (Nelson & Stolterman, 2012) in the planning process of their lesson plan to the point of delivering the lesson in class. Making do indicates the degree of innovative thinking applied by teachers to bring meaning and value in the learning experiences of their students. The cases offer insight into how primary school teachers are skillfully able to navigate around their constraints and manipulate the material world (Cross, 2010; Nelson & Stolterman, 2012). (Gyabak, 2018, p.105)

2. To Provide Explanation

For example, to provide an explanation when studying design pedagogy in I/LDT programs, we recommend that I/LDT researchers take advantage of Schön's (1983) theory of reflective practice to explain how design students think and what pedagogies they can develop on to support their students' design decisions. For example, precedent scholarship by Dr. Monica Tracey (2014) shows how the theory of reflective practice was crucial to understanding the thinking of design students and afforded Dr. Tracey to explain it in a rich way. As such, Tracey et al. (2014) found that graduate learning design students can respond to prompts on design concepts, experiences, and identity attributes. This ability demonstrates how designers-in-training can examine, integrate, and analyze their beliefs, knowledge, and experiences through the use of reflective writing assignments that support their development of a professional designer identity:

We believe that it is essential to develop designers as reflective practitioners in an effort to support their professional identity development and their ability to solve complex design problems. Our research findings indicate that reflective writing assignments are an avenue for supporting students as they explore their concepts, experiences, and beliefs related to design, which serve as the foundation for their emerging professional identities as instructional designers. Furthermore, reflection itself is a crucial task in the design space, one that allows designers to connect their personal design precedents with the unique issues and constraints of a particular design problem to develop an innovative solution. Thus, it is also the responsibility of ID programs to provide students with the opportunity to develop reflective skills; doing so in tandem with professional identity development is a natural pairing and can serve as an important component of ID curriculums. Tools such as the REFLECT tool can promote effective instructor and peer formative feedback, the design of meaningful reflection scaffold questions, and rigorous analysis of qualitative research on reflection (Tracey et al., 2014, p. 333).

3. To Provide Critique

For example, to provide a critique to I/LTD when studying 'all things related to instructional/learning designers in practice, we recommend that I/LDT researchers take advantage of Nelson and Stolterman (2012) design theory and other works from broader design theory (Bryan Lawson, Kees Dorst, Nigel Cross) to provide a substantive critique of I/LTD research. For example, precedent scholarships by Professor Elizabeth Boling and Indiana University Design Research Group (Boling et al., 2017; Gray et al., 2015; Lachheb & Boling, 2018; Smith & Boling, 2009) relied on multiple works from design theory to provide a substantive critique to I/LDT research that historically focused exclusively on design models, not on design professionals and their thinking/judgments. As such, Boling et al. (2017) were able to critique how design tools developed by scholars for instructional/learning designers are being underutilized or ignored altogether, because they fail to account for a crucial element—designers' own thinking and core beliefs:

It is surprising, therefore, to note the lack of scholarship in the field that addresses design judgment directly, rather than simply noting that it is a requirement for effective instructional design. One detailed theoretical treatment of how instructional designers exercise judgment (although this term is not used) is presented by Yanchar and Gabbitas (2011). They discuss the unexamined eclecticism (pragmatically using what works) or theoretical orthodoxy (using one single, rigidly applied method of designing) that many designers fall back on when the tools of the field fail them (Rowland, 1992). They argue that "eclectic" designers are actually using "conceptual design sense, [which] entails a designer's assumptions and values—often unarticulated and unexamined—about diverse aspects of the enterprise of instructional design" (p. 385) and recommend critical flexibility, a process whereby designers engage in critical reflection to explicate their underlying assumptions and values. Other studies have shown that instructional designers appear to refer to tacit philosophies in their design work (Rowland, 1992; Cox & Osguthorpe, 2003), but overall, efforts to describe these tacit philosophies have been minimal (Boling et al., 2017, p. 201).

Second Recommendation: Relying on Critical Theory

Our second recommendation is that I/LDT researchers rely on critical theory to provide context, explanation, and critique to the I/LDT discipline altogether. Critical theory is essentially a lens that emphasizes power differentials and

allows scholars to view power as “embodied in [human] cognition, speech, and action” (Habermas et al., 1984). Through a critical theory lens, scholars ought to foreground who has power over others, what is the power differentials between actors engaged in basic human competencies, such as speaking and understanding, judging, and acting (Bohman, 2003). Similarly, one of the main tenets of critical race theory (CRT) is challenging dominant ideology (Solórzano & Yosso, 2002) in order to value the voices, standpoints, phenomenology, and/or stories of marginalized groups of people. Critical theory and CRT are relevant to every inquiry work where humans are involved (Payne & Hamdi, 2009), and I/LDT inquiry is no exception.

In the I/LDT discipline, research provides implications for future scholarly work and, more importantly, for learning design/educational practice. Implications for practice usually include certain recommendations or considerations for designing learning experiences for a diverse group of learners. Yet, it is evident that each learner brings in their unique background and experiences into the learning space, hence the recognition of learners’ variability in instructional design models, such as Universal Design for Learning (UDL) (Lachheb et al., 2021).

1. To Provide Context and Critique

For example, to provide context and a critique when designing, implementing, and studying educational/learning interventions, we recommend that I/LDT researchers rely on critical theory and/or CRT to discuss power and positionality in/of their work. Such discussion can provide a multidimensional context of the study and provide a general critique to the I/LDT discipline that generally lacks thoughtful attention to the dimensions of diversity, equity, inclusion, and justice (DEIJ). For example, precedent scholarships by Dr. Deepak Subramony (2018, 2016, 2004) have highlighted the importance of power and positionality in I/LDT educational/learning interventions, and how it is important to provide a rich description of the power balance between the different groups in the contexts of such I/LDT studies. As such, Dr. Subramony (2018)—ahead of many scholars who started to advocate for DEIJ matters in I/LDT after the start of the COVID-19 pandemic—was able to provide a rigorous critique to I/LDT research by highlighting its lack of attention to DEIJ dimensions. Dr. Subramony (2018) articulated a strong rationale for why I/LDT needs to pay more attention to the LGBTQI community, basing his arguments on demographics, intersectionality, and systems thinking:

Frankly, I am dismayed that I have reason to write an article like this in mid-2017; that we as a field managed to get through the eight-year-long age of relative social and cultural enlightenment that was the Obama presidency without reforming our scholarly practice to acknowledge and embrace the needs of all stakeholders, especially those from historically marginalized, underrepresented, and underserved communities. Critical, feminist, antiracist, and postmodernist analyses remind us that all social research and scholarship is intrinsically political – see Hammersley (2000) for a comprehensive examination of the politics of social research. We social scientists – with our respected academic/professional credentials and our prestigious institutional affiliations to back us up – have the agency to choose what and whom we wish to focus our efforts on; and that choice is a function and a manifestation of our privilege – of our social, economic, political and cultural power. It appears that we as a field have thus far collectively chosen to not exercise our agency – our power and privilege – to focus our scholarship on the issues and needs of LGBTQI stakeholders (Subramony, 2018, p. 360).

2. To Provide Explanation

For example, to provide an explanation when aiming to understand the phenomenon of learning (or what ‘best’ learning design ought to be), we recommend that I/LDT researchers rely on critical theory and/or Critical Race Theory (CRT) to openly explain their values, biases, and experiences with the subject of their inquiry. Such explanations are crucial in drawing conclusions and, most importantly, explaining the position/world-view of the I/LDT researcher, without attempting to hide behind ‘objective-like’ language in the methods section of the manuscript. Through a process called bracketing, I/LDT researchers can speak to their position and their social location in order to address “issues of power and seek to reveal these relationships hidden within the research process” (Mao et al., 2016, p. 6). For example, precedent scholarship by Dr. Craig (Howard & Das, 2019) has highlighted how their values, biases, and experiences influenced what they designed and what kind of conclusions they drew on the subject of learning. As such, Dr. Craig

Howard was able to not only to understand his own values/perspectives on the subject of learning but also to share how this understanding impacted his views and collaborations with another scholar (Dr. Anupam Das):

Cultural perspectives between [co-author] and I became starkly obvious, but difficult to articulate. This design originated in an Indian context, but to write the case I needed to come to terms with the cultural assumptions behind design decisions, and behind potential interpretations of design decisions. The voice in my head was saying they are going to think he did this because of that, but that's not really true. Essentially, I was viewing the design from both the side of the reader and of the designer. It struck me that there were moments in the case where an understanding of Indian culture would greatly improve a reader's ability to understand the designers' rationale (Howard & Das, 2019, p.6).

Conclusion

A central argument of our recommendations is that the subject of design is the unifying element of I/LDT inquiry. Thus, I/LDT is a design discipline *par excellence* that belongs to the larger human tradition of design. Yet, it is reasonable to ask why we have not recommended that I/LDT researchers rely on well-established instructional design theories (those we know from the 'green books' of Dr. Charles Reigeluth and other notable AECT I/LDT scholars) or major/trending learning theories (e.g, connectivism, Siemens, 2005). That was by design. We believe that I/LDT researchers rely on these in-house theories for their work, already and substantively. However, because the I/LDT discipline is facing grand challenges ahead—in the post-covid-19 world of learning design—we believe that I/LDT researchers need to step out of their intellectual comfort zone and reach out to neighboring design disciplines. Without doing so, we believe I/LDT research will leave out crucial dimensions in discussing design for learning and will have a negative impact on our educational practices and on the whole discipline overall. As a solution, we recommend I/LDT researchers take advantage of the broader descriptive design theory, and rely on critical theory, in order to provide context, explanation, and critique to the I/LDT discipline altogether.

Certainly, merely taking advantage of the broader descriptive design theory, and relying on critical theory, in order to provide context, explanation, and critique to the I/LDT discipline altogether will not be *the solution*. We do not think such a problem lends itself to a simple process to be chosen/designed in order for the problem to be solved. The 'X' factor that we should not forget is our human agency. As we have mentioned earlier, we, as I/LDT scholars, should think of ourselves as the guarantors of our design work (Nelson & Stolterman, 2012), not the methods or processes we follow. In that regard, we think that theories, including the theories that we referenced in this paper, no matter how solid they are or where they are coming from, should be used in a *designerly* way (Lachheb & Boling, 2018; Stolterman et al., 2009). That is to say, we as researchers and designers place the theories at our service and do not let theories strictly dictate how to do our work in a limiting manner.

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Personalized Learning Design Framework

A Theoretical Framework for Defining, Implementing, and Evaluating Personalized Learning

Cecil R. Short

K-12 | Learner Agency | Personalized Learning | Data-Driven Instruction

For over a decade, the United States National Educational Technology Plan has called for an increase in personalized learning across P–12 contexts in response to the increasing diversity of learners' backgrounds, abilities, needs, and interests. Following emergency remote teaching due to the COVID-19 pandemic, the diversity of learners' abilities and needs may become even more extreme as many learners were ill-prepared for the self-regulation and increased agency of distance learning. As learners become increasingly diverse, it seems clear that a "one-size-fits-all" approach to learning will not work effectively. Based on the need for personalized learning across P–12 contexts, interviews about personalization practices with 62 P–12 teachers, and in response to broad perceptions of personalization across educational fields, the Personalized Learning Design Framework was created to describe elements of instruction that can be personalized, dimensions along which such elements can be personalized, the role technology may play in personalization, and a taxonomy of learner agency to guide a transition from instructor-centered to learner-centered practices.

Personalized learning (PL) has gained nearly unprecedented attention as an educational practice. The United States Department of Education's (2010, 2017) National Educational Technology Plan and non-profit organizations such as the Bill and Melinda Gates Foundation (2014) and Chan Zuckerberg Initiative (Boninger et al., 2019) have called for increased attention toward preparing P–12 teachers to personalize instruction. Generally speaking, PL involves tailoring instruction to meet individual learners' needs, abilities, and/or interests. However, the definition of PL has often been broad and ambiguous, making implementation difficult. As expressed by Fisher (2019), "personalized learning" has been used to refer to a "host of efforts and models" (para. 4). The U.S. Department of Education (2010) described PL as any adaptation of instruction based on learners' needs, interests, or abilities. Other resources have additionally described it as instruction that is tailored to ensure mastery (Patrick et al., 2013); enables students to control instructional choices (Bill & Melinda Gates Foundation et al., 2014; National Center for Learning Disabilities, 2017; LEAP Innovations, 2021), creates strong connections between learners and others (National Center for Learning Disabilities, 2017), adapts the pace of learning (U.S. Department of Education, 2017), makes learning more relevant or individually meaningful (LEAP Learning Framework, 2021; U.S. Department of Education, 2017), engages learners (Knowledge Works, 2022), and/or presents learning plans for each individual learner (Morin, 2021). When definitions of an instructional practice vary so widely, implementation and design of that practice becomes difficult. A design-oriented definition of PL is needed to guide the implementation of instruction that is effectively tailored to learners' needs, abilities, and/or interests.

There are several reasons tailoring instruction is important to educational contexts. Wells (2020) noted that more than 50% of school-age children in the United States are now students of color, but relatively little has been done to address the increasing cultural diversity in P–12 classrooms – a diversity that students will carry into higher education and the workforce. In addition to increased cultural diversity, educators also face increasing academic diversity. While some academic diversity may be expected, the ongoing problem regarding the existence of achievement gaps has been well documented (see Dover, 2009). We can expect even wider achievement gaps when learners face large-scale disruptions such as the COVID-19 pandemic (Pokhrel & Chhetri, 2021). A 2022 School Pulse Panel study from the National Center for Education Statistics found that 89% of public-school staff and 82% of public-school parents were concerned about learners' ability to meet academic standards during the 2021–2022 school year.

As the field of education adjusts to increased cultural and academic diversity, educators will need to understand how to provide instruction tailored to learners' diverse backgrounds, abilities, needs, and interests to provide targeted and meaningful learning interventions. Additionally, PL needs to provide a scaffold for increasing learner agency to develop learners who are better prepared to increase their ownership over their learning. Increased learner ownership has the potential to promote learning during emergency learning situations, self-directed learning, and/or life-long learning. A framework for designing PL is essential to twenty-first century learning because educators will need to create instructional activities and use instructional modalities that break away from one-size-fits-all and teacher-centered approaches to learning.

A Vision for Personalized Learning

A clear vision is needed to determine how instruction can be personalized, what personalization is based on, and who or what personalizes instruction. Shemshack and Spector (2020) explained that "personalized learning cannot be a solution to learning until it is defined better and developed more thoroughly," adding that "personalized learning for everyone looks different according to the needs and goals of the individual" (p. 17). Educators should not be surprised by the multitude of approaches to describing PL. Gibbons (2013) suggested that "theorists who have strategy concepts to promote often use the [strategy's] term[inology] opportunistically to refer to their particular interests without cross-referencing their ideas with those of others" (p. 33). The Personalized Learning Design Framework (PLDF) presents a framework that is based on the cross-refencing of approaches to PL and provides descriptions of what Graham et al. (2013) referred to as the "core attributes" of the pedagogical layer of instruction. As such, the framework accounts for the relationship between personalized learning and learner agency to scaffold learners to appropriate ownership over their learning. The PLDF provides a vision for defining, designing, and evaluating PL by addressing the following questions:

1. What aspect of instruction is being tailored to the learner – learning objectives, assessments of learning, or learning activities?
2. Along which dimensions of PL is instruction being tailored to the learner – time, place, pace, path, and/or goals of learning?
3. Who or what is tailoring the instruction – the educator, the learner, or an instructional application/system?
4. At what level of the Taxonomy of Learner Agency is instruction being tailored to the learner – is the instructor differentiating instruction (Level 2), providing learning options for the learner to select from (Level 3), or guiding learners in creating their own learning options (Level 4)?
5. What kind of data is used to inform the tailoring of instruction – performance, activity, and/or learner profile data?

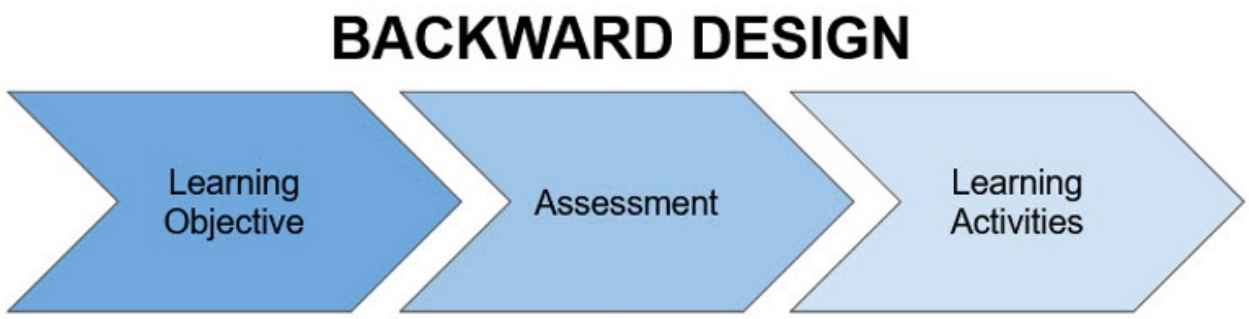
Instructional Elements and Dimensions of Personalized Learning

Short and Graham (in review) interviewed 62 P–12 teachers about their personalized learning implementation. These interviews provided rich data about the transforming potential of blended learning (Graham et al., 2022; Hanny et al.,

2021). Regarding PL, teachers were asked to describe how their learners were given voice and choice over their learning. Short and Graham (in review) uncovered that, regardless of context, teachers offered personalization of instruction across three elements of instruction (see Figure 1) and five dimensions of personalization (see Figure 2). These elements of instruction and dimensions of PL provide two of the core attributes of PL.

Figure 1

Personalized Learning Instructional Elements



All 62 teachers interviewed by Short and Graham (in review) allowed for personalization of learning activities, 51 for personalization of assessments, and 24 for personalization of learning objectives. Learning objectives were mostly personalized within contexts that don't have state-mandated learning objectives (e.g., technology, arts, and support staff), but at least one teacher within each context offered personalization of learning objectives. Multiple teachers from each context personalized assessments and activities. The researchers found that these elements were personalized along the PL dimensions presented by Graham, Borup, Short, and Archambault (2019).

Graham, Borup, Short, and Archambault (2019) described personalized learning as one of the four research-based competency areas of blended teaching (Archibald et al., 2021; Graham et al., 2017; Graham et al., 2018; Graham, Borup, Pulham, & Larsen, 2019; Pulham et al., 2018; Pulham & Graham, 2018). They described PL based on the definition of blended learning from Horn and Staker (2017), which describes a pedagogy that provides students with some control over the time, place, pace, and/or path of learning. Graham, Borup, Short, and Archambault (2019) added a fifth dimension to personalized learning: goals. Practical implications for PL across instructional elements and dimensions of PL are provided in the implementation section of this paper.

Figure 2

Dimensions of Personalized Learning from Graham, Borup, Short, and Archambault (2019)

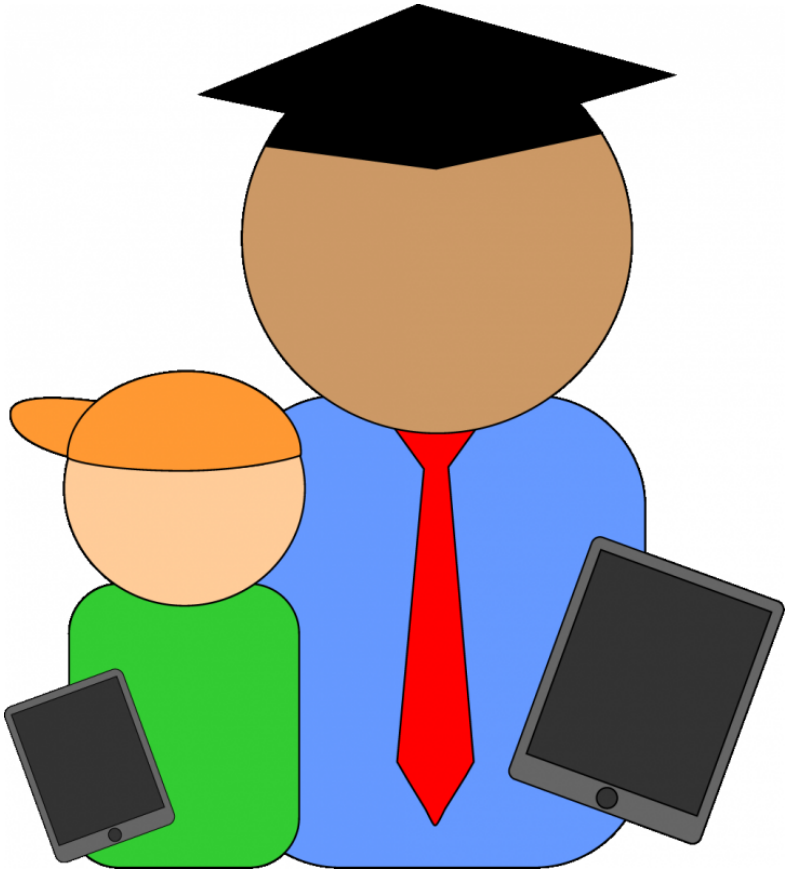
Who or What Provides Tailored Instruction

While some descriptions of PL require that instruction be learner-driven, this requirement is not ubiquitous. Even definitions that agree PL should be learner-driven, disagree on how much of it should be learner-driven. For example, the National Educational Technology Plan (U.S. Department of Education, 2017) states that PL is "often self-initiated" (p.9), while the LEAP Learning Framework requires that PL be "led with and demonstrated by the learner" (2021, para. 2).

Because PL is perceived to be either teacher-driven or learner-driven, the PLDF establishes a description of who or what is tailoring instruction. Instruction can be tailored by educators, learners, or adaptive learning applications (see Figure 3). An adaptive learning application uses performance data to determine whether a learner needs to review previous materials or if a learner is ready to advance. The application then provides learners with instruction it deems appropriate.

Figure 3

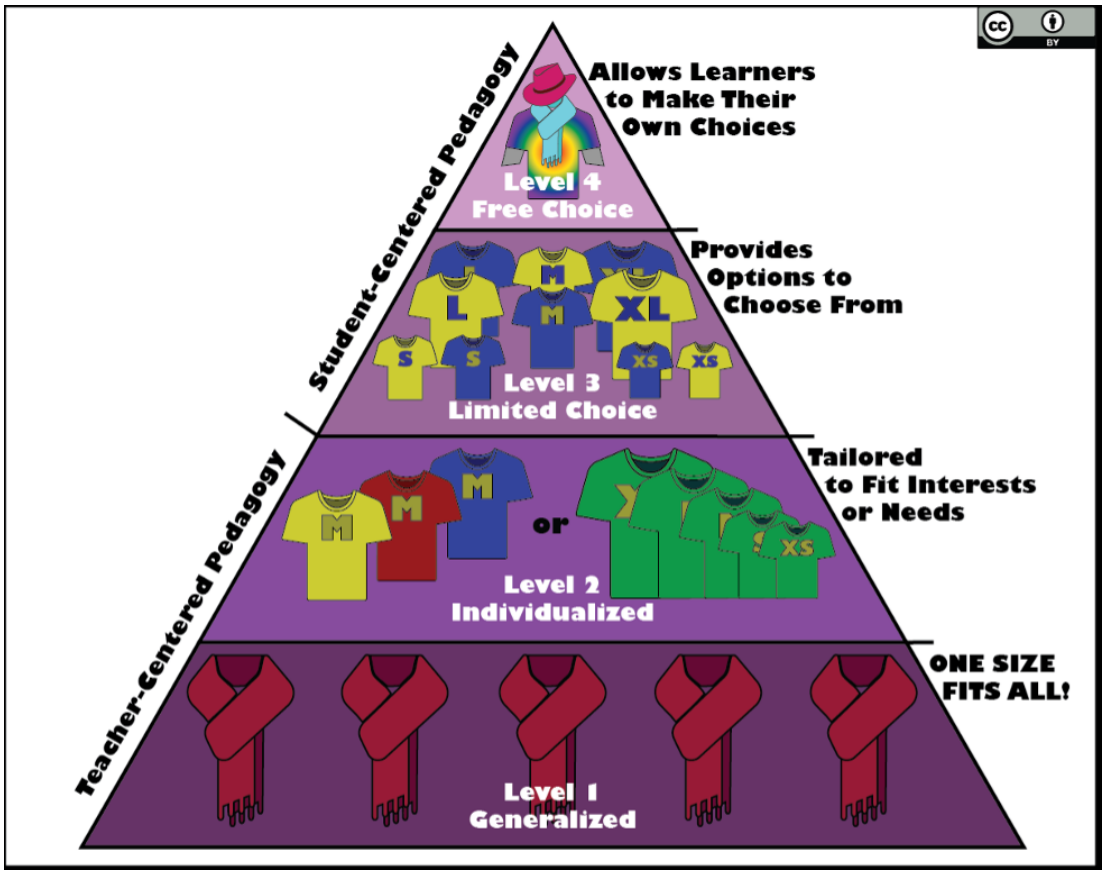
Possible sources of tailored instruction – the educator, the learner, and technology.



It is important for educators to consider the role of the learner in tailoring instruction. Many descriptions of PL include an increase in learner agency; however, in many cases, it may be irresponsible to ask some learners to make learning decisions without helping them develop the skills required for doing so. I developed the Taxonomy of Learner Agency (see Figure 4) to help learners navigate the choices that come with increased agency over their learning.

Figure 4

The Taxonomy of Learner Agency



The Taxonomy of Learner Agency provides four levels for scaffolding and transitioning from teacher-centered pedagogy that presents a one-size-fits-all approach to a personalized approach where the learner makes informed decisions regarding the time, place, pace, path, and/or goals of their learning objectives, assessments, or learning activities. The Taxonomy of Learner Agency can be compared to Moore's (1993) transactional distance theory which provided degrees of autonomous learning along the elements of goals, evaluation, and execution – what the PLDF identifies as learning outcomes, assessment, and learning activities. The PLDF builds on Moore's (1993) theory by identifying the dimensions (time, place, pace, path, and/or goals) in which autonomy can be created within instructional elements. Table 1 provides a description of each level of the Taxonomy of Learner Agency.

Table 1

Levels of Personalization Autonomy

Level of Personalization	Description
Level 1	No adaptation of instruction – instruction is uniform for all students.
Level 2	Instruction is individualized or differentiated – the instructor tailors instruction for some students based on students' needs, abilities, or interests.
Level 3	Students have some choice – they are given some control over their learning by selecting from options or working within parameters across learning goals, time, place, pace, and/or path.
Level 4	Students have guided autonomy – students create their own goals, time, place, pace, and/or path of learning with minimal instructor guidance or oversight.

Using Data to Create Informed Personalized Learning

Another important aspect of defining, designing, and evaluating PL is creating data-driven instruction. Instruction can be tailored in many ways for many reasons. Educators should use performance data, activity data, and learner profile data to validate and inform their PL opportunities. I collectively refer to these types of data as PAL data (see Figure 5). Performance data consists of knowledge or ability measurements. Activity data represents a learner's learning behaviors and habits. Learner profile data is usually qualitative data used to understand a learner's interests and background. Educators need to know which kind of PAL data is the most appropriate to answer various instructional questions. They also need to be equipped with the ability to effectively analyze PAL data, looking for patterns that inform PL opportunities.

Figure 5

A representation of the data types that can be used to tailor instruction.

Implementation of the Personalized Learning Design Framework

The PLDF brings together instructional elements of PL with the dimensions of PL to create data-driven instruction that can address individual learners' needs, abilities, and interests while promoting learner agency. PL is not a new approach to instruction, but technology provides educators with the resources needed to implement it more easily. Examples of the PLDF in practice are provided below.

Personalized Learning in Practice

A clearer vision of what constitutes PL is a necessary foundation for designing and implementing PL; however, examples of PL in practice can further solidify this foundation. The following sections build on the descriptions of PL above by providing real-world examples of PL in various contexts, separated by various implementations of PL. The first section describes the intersection between tailoring instructional elements and dimensions of personalization to learners' backgrounds, abilities, needs, and interests. The second section provides examples of using PAL data in PL. The last section describes PL at various levels of learner agency.

Personalizing Instructional Elements and Dimensions in Practice

Educators can tailor the time, place, pace, path, and/or goals of learning objectives, assessments, and/or learning activities. Table 2 presents some practical examples of PL across instructional elements and dimensions of PL. An important distinction between goals and learning objectives is that learning objectives almost always focus on demonstrating knowledge or ability, while goals often focus more on learning habits and behaviors. The personalization of goals may also direct the other four dimensions of PL.

Table 2

Personalization of Instructional Elements Across Personalization Dimensions

Personalization Dimension	Instructional Elements		
Learning Objective	Assessment	Instructional Activities	
Goals	Learners determine strategies for setting objectives, or design parameters to guide other personalization dimensions.	Learners set achievement goals (e.g., earning an 80%), make a plan for implementing testing strategies, or design parameters to guide other personalization dimensions.	Learners choose how they will stay on task while completing activities, or design parameters to guide other personalization dimensions.
Time	Learners choose when an objective will be met or started.	Learners choose when to demonstrate learning.	Learners choose when to complete activities.
Place	Learners determine where or with whom learning will occur.	Learners choose where or with whom to demonstrate learning.	Learners choose where or with whom to complete activities.
Pace	Learners choose how quickly learning objectives will be met.	Learners choose how quickly to complete a demonstration of learning. This can include multiple attempts.	Learners choose how quickly to complete activities.
Path	Learners choose between multiple learning objectives or the order of completing learning objectives.	Learners choose how to demonstrate learning, such as what tools to use or the methods of demonstration.	Learners choose between different learning activities and resources, or create their own.

PAL Data in Practice

Educators have long used performance data to inform instruction. However, the introduction of adaptive learning software has made data literacy necessary for twenty-first century teaching. Adaptive learning software is a great instructional resource, but educators must understand how to use performance data from software to connect digital learning and in-person learning. Performance data alone, however, is seldomly enough to determine a learner's background, needs, abilities, and interests.

Activity data can be gathered through educators' observations of a learner's time on task, distractions, or preferences. Activity data can also be gathered from electronic sources. Most learning management systems provide data concerning a learner's time on activities, attempts on assessments, missing assignments, etc. Activity data can indicate that something other than a lack of understanding or ability affected a learner's performance, such as rushing through an assessment or being absent during a particular lesson.

Learner profile data can be gathered using learner profile surveys and various learner-educator interactions. Educators may use a learner profile survey at the beginning of a semester to get a sense of a learner's hobbies, interests, friends, aspirations, background, or preferred learning activities and environment. More frequent learner profile surveys can track learners' social-emotional status, physical needs (shelter, food, etc.), or goals for an instructional period. Using a learner profile as a goal-setting activity can allow learners to state what they want to accomplish during an instructional activity. Learners can reflect on their goal and what helped or harmed their learning progress. Such a reflection can be an important step in increasing learner ownership and agency.

Learner Agency in Personalized Learning

The Taxonomy of Learner Agency provides a focus on the learner's role in PL. If schools want to create life-long learners, they need to provide learning opportunities that are learner-driven. However, asking learners to make instructional decisions without providing adequate support can be detrimental to their academic progress (see Brockett, 2006; Iyengar & Lepper, 2000; Schwartz, 2004; Schwartz & Ward, 2004; Waterschoot et al., 2019). Yet, with appropriate levels of support and a gradual increase in agency across the dimensions described above, learners can become more motivated and self-aware, and display higher levels of achievement (see Assor, 2012; Bergdahl & Bond, 2021; Fraumeni-McBride, 2017; Schneider et al., 2022). Implementation examples for the Taxonomy of Learner Agency are described below.

- Level 1 - Generalized Instruction. There are times when whole-group instruction can be important, even during PL. As learners gain more agency, instruction at Level 1 may become more managerial than informational. Instruction at this level could include group lectures or presentations, or modeling of correct procedures.
- Level 2 - Individualized Instruction. Using IEP or 504 plans, creating personalized playlists, or using adaptive software provides learners with an understanding that they have individual needs, abilities, and interests that can direct learning. Some examples of instruction at this level include assigning specific training modules to different learners who need to improve upon their unique weaknesses or tailoring instruction based on physical, social, or psychological needs.
- Level 3 - Limited Choice. Providing students with options, such as various levels of mastery to work toward, various forms of assessment, or various videos to watch as part of their learning activities, allows learners to practice their agency in appropriate ways. This lays the groundwork for the learning they will do when an educator may not be in front of them to provide instruction. Instruction at this level includes providing learners with a list of modules or resources to choose from in order to prepare for an upcoming assessment, allowing learners to choose how they can demonstrate their learning, etc.
- Level 4 - Free (but guided) Choice. It may be uncommon in P–12 contexts for students to reach this level all the time, but there are many opportunities for P–12 learners to practice this level of agency. For example, students may freely choose the topic of an essay, whom to partner with for a project, or the format and function of a project as part of a senior project or independent learning time. Some learners may need more guidance at this level than others. It may also be appropriate to take some learners back to Level 3 of the taxonomy if they face choice paralysis. In higher education and corporate settings, instruction at this level may include allowing learners to set their own goals within a period of instruction or development, and then supporting them in meeting those goals by providing adequate and appropriate instructional resources.

Implications for Teaching, Training, and Teacher Education

Instructors and designers often want to create instruction that encourages learning beyond the bounds of instruction. P–12 teachers seek to inspire life-long learning. College instructors seek to nourish an academic curiosity. Human resources and professional development trainers seek to promote on-the-job learning beyond initial training. If designers of such instruction want learners to develop learner-driven habits, it would follow that learners need experience with autonomous, self-directed learning. The PLDF provides a theoretical foundation for creating and scaffolding instruction that nourishes student autonomy within various instructional elements across various dimensions of personalization. According to this framework, the following questions must be addressed when creating PL.

1. What aspect of instruction is being tailored to the learner –learning objectives, assessments of learning, or learning activities?
2. Along which dimensions of PL is instruction being tailored to the learner – time, place, pace, path, and/or goals of learning?
3. Who or what is tailoring the instruction – the educator, the learner, or an instructional application/system?
4. At what level of the Taxonomy of Learner Agency is instruction being tailored to the learner – is the instructor differentiating instruction (Level 2), providing learning options for the learner to select from (Level 3), or guiding learners in creating their own learning options (Level 4)?
5. What kind of data is used to inform the tailoring of instruction – performance, activity, and/or learner profile data?

Learners are growing more diverse. Twenty-first century educators need to be equipped to provide instruction that can meet diverse backgrounds, abilities, needs, and interests. Educators will need to have the knowledge and ability to develop data-driven instruction that allows learners to experience ownership over their learning. The PLDF creates a shared understanding of PL in practice and provides a foundation for creating and scaffolding instruction that nourishes learner autonomy within various instructional elements, across various dimensions of personalization, and based on various data sources. Future work in this area should focus on using the PLDF to implement PL in various

educational contexts, identifying the core attributes of the PLDF that have the greatest impact on learning and development, variation of the PLDF across educational contexts, and creating evaluation matrices that can better guide the development and description of PL practices based on the core attributes of the PLDF.

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A Framework for Phronetic LDT Theory

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Learning Design | Theory | Phronesis

My purpose in this chapter is to offer a reimagined view of theory in the field of learning design and technology (LDT). Instead of viewing theory as an external storehouse of knowledge, or a rule-like system for professionals to apply, in this framework theory is viewed as an orienting aid that supports practitioners as they refine their personal capacities for perception, discrimination, and judgment. Theory plays this orienting role as it offers insights into LDT-relevant practical knowledge, productive heuristics, points professionals towards opportunities to act, or identifies significant patterns and forms of excellence to which they can pay attention as they attempt to improve their craft. The chapter concludes with some implications for this framework for future research and practice in the field.

My purpose in this chapter is to offer a reimagined view of theory in the field of learning design and technology (LDT). I will call this the phronetic framework for LDT theory, taken from the Greek term for the capabilities exemplified by those considered excellent in a given domain (Dunne, 1997). To lay the ground for this, I first summarize historically dominant views of LDT theory and discuss challenges such views have presented to researchers attempting to develop theory that is useful to practice. I will argue that historical views are limited by their assumption that a theory's purpose is to generate a body of objective, technical knowledge that, when properly applied, produces at least probable results (Reigeluth & Carr-Chellman, 2009b). Second, I outline a reconsidered perspective for how LDT theory can support practice, informed by a philosophy of practical action as articulated by thinkers such as Dunne (1997), Dreyfus (2014), Schön (1983), and Wrathall (2011). Central to this perspective is coming to see skillful performance within a field as a type of sensitivity one develops to affordances in one's environment, along with the ability to respond to those affordances in an intuitive way. This contrasts with viewing expertise as being built on one's intellectual mastery of discipline-specific information. Third, I sketch the framework itself. It describes types of theories that can help practitioners discern and respond to salient, situational affordances instead of relying upon rule-like systems of knowledge. Finally, I discuss implications of the framework for research and practice within the field.

For the purposes of this chapter, I use the term *theory* in the same way as I did in McDonald and Yanchar (2020):

> *The term theory, as we use it here, is rather broad in meaning and scope. While theory in the social sciences and education often refers to formalisms that provide some kind of explanation—for example, causal accounts of the relation among variables—it is also generally used to refer to ideas that bring certain kinds of order and direction to practices, as in theories of instruction, theories of teaching, theories of design, and so on . . . . Literature within the social sciences and education commonly make reference to related terms, such as "conceptual frameworks," "perspectives," "models," or "constructs," all of which refer in some way to theoretical abstractions that clarify what a phenomenon might be, how it might be caused, or how it might be dealt with in practical ways to solve problems . . . . In the analysis we offer here, theory*

> *is used to refer to all of these varied formalisms, and possibly others, that are assumed to perform these kinds of functions. Thus, our use of the term theory is purposefully broad and inclusive. (pp. 633-634)*

Historical Views of LDT Theory

The Strong View of LDT Theory

An influential position among certain LDT theorists has been that the field is a science, built on a systematic theory base technically rational enough to allow for prediction and control of phenomena associated with learning (Clark & Estes, 1998; Gilbert, 1971; Gropper, 2017). The practitioner's primary role, therefore, is to properly apply the knowledge that researchers generate. This can be called the strong view of LDT theory. It was exemplified by Merrill et al. (1996), who claimed

> *Instructional science involves identifying the variables to consider (descriptive theory), identifying potential relationships between these variables (prescriptive theory), and then empirically testing these relationships in the laboratory and the field . . . Instructional design procedures . . . must incorporate those scientific principles involved in instructional strategies, just as the invention of the airplane had to incorporate the discovered principles of lift, drag, and flight. (p. 5)*

In the strong view, theory is maximally prescriptive, with some going so far as to claim it can "control and engineer quality and quantity of learning" if used correctly (Post, 1972, p. 14). Gilbert (1971) even asserted that if they are applying theory as they should, "two [practitioners] working independently on the same subject matter will produce lessons that are virtually identical in all essential respects" (p. 216). Although it may be tempting to consider statements like this to be historical relics, advocacy for the strong view is not exclusively found in the past; renewed calls for it, or similar positions, can be found in the writings of 21st century theorists as well (diSessa & Cobb, 2004; Gropper, 2017; Merrill et al., 2007).

The claims of the strong view have not gone unchallenged, however. Because the critiques have been well-articulated elsewhere, here I only summarize a few notable points. Yanchar and South (2008) argued that the pursuit of scientific and technical rigor has led to "research . . . that is detached from the concerns and dynamics of actual practice. . . . [It] often results in abstract models and statistical patterns . . . that offer little insight to the practicing designer" (p. 85). Jonassen et al. (1997) pointed to the uncertainty inherent in human situations, and so the fundamental inadequacy of attempting to reduce complex systems to cause-and-effect relationships (cf. Honebein & Reigeluth, 2020; Wilson, 2013). McDonald et al. (2005) echoed this concern, while also pointing out the tendency in prescriptive models to reduce instruction to the manipulation of learners' behavior while neglecting important "aspects of human action . . . such as creativity, freedom, and responsibility" (p. 92; cf. Gur & Wiley, 2007; Matthews & Yanchar, 2018a).

The Soft View of LDT Theory

For reasons such as these, many LDT theorists have come to regard the strong view as idealistic but overly simplistic. While often drawn towards the promise of prescriptive knowledge, they prefer to describe theory as either being "probabilistic . . . [since] the cause does not always result in the effect," or as "[identifying] good methods for accomplishing goals" (Reigeluth & Carr-Chellman, 2009b, p. 7). This can be called a soft view of LDT theory. Proponents still assume a formalized body of rational, instrumental knowledge is foundational to good practice, but maintain that its role is to increase the likelihood of an outcome instead of truly guaranteeing any results (Jonassen et al., 1997; Reigeluth, 1997, 1999; Winn, 1997).

The soft view offers a useful course correction to the extreme position taken by strong adherents. Nevertheless, it presents challenges of its own. Most significant for this chapter is that, as Wilson (1999) concluded, "too often . . . the knowledge and wisdom gained from years of practitioner experience is subordinated to the structured, formal knowledge of the university researcher or textbook." This is related to one of the soft view's central presumptions, shared with the strong view, that theory's primary purpose is to turn data, experience, and insight into an "object of

analysis" (Dunne, 1997, p. 5) that stands apart from any individual (cf. Bereiter, 2014). Knowledge is valued as it is transformed into an explicit, instrumental system that specifies context-independent properties of things, isolated apart from "the opportunities and possibilities for action that . . . . are relative to the perspective or stance one adopts on [a] situation" (Dreyfus, 2014, p. 8).

This is not a critique of the intended practicality of LDT theories. Clearly the field's theorizing is appropriately focused on addressing practical issues. Rather, it is a claim about the assumed nature of what theorists develop. Both strong and soft views presume that theories are artifacts that sit independent of any researcher or practitioner, serving as external storehouses of knowledge and containing the power to solve problems of practice (Reigeluth & Carr-Chellman, 2009b). They reduce the complexity of the world, condensing it into technical models or techniques that attempt to eliminate, or at least minimize, the possibility of a misstep (Bednar et al., 1991; Elen & Clarebout, 2007). Ideally, theories are objective and so can be picked up and used by anyone (possibly with some level of intellectual preparation); they are meant to be tools that assist one in controlling or optimizing situations with some degree of precision (Honebein & Reigeluth, 2020; Reigeluth, 1997). When one views theory this way, it is logical to prioritize it over the seemingly less-dependable, idiosyncratic practitioner know-how that is taken to be the alternative (Clark & Estes, 1998; Klauer, 1997).

A Critique of Historical Views

Both the strong and soft views share a central presumption that grounds expertise in mastery of a body of decontextualized information. Despite the seeming logic of this position, Dreyfus (2014) argued it is too limited to support truly skillful performance in any domain. This is not an indiscriminate argument against the value of theory *in toto*. Instead, it pertains to perspectives that define expertise as some form of matching features in a situation with instructions provided by rules or rule-like information. Applying theory in this sense is simply too blunt an instrument to help people navigate the fluidity and intricacies found in most situations (Dunne, 1997). This can be seen in some of the observed tensions between theory and practice. Rowland (2017) critiqued some LDT theorizing for being too obvious, resulting in supposedly research-based findings that "do not go beyond what experienced designers would consider common sense" (p. 196). At the other extreme sits abstract theories that are too vague or imprecise to offer practitioners the concrete insights they are typically looking for (Honebein, 2019; McIntyre, 2005; Reigeluth & Carr-Chellman, 2009a; cf. Wilson, 2013; Yanchar & South, 2008). Reigeluth (1997) further noted that "the more we attempt to account for diverse conditions," meaning the more researchers attempt to inject situational factors back into an abstract theory, "the more likely we are to be criticized for seeking to 'micro-manage instruction'" (p. 45). Such theories can become unmanageable, imposing so many conditions and constraints that they tend to collapse under their own weight (Wilson, 2005).

Dreyfus (2014) argued these types of challenges are inherent whenever knowledge is viewed as an external system for people to deliberately apply in a technical sense (cf. Dunne, 1997). More, or better, information will not fundamentally alter what practitioners are able to achieve when attempting to use it in rule-like ways. There "are just too many features [in any situation] . . . . to determine which rule or concept should be applied" (Dreyfus, 2014, pp. 231–232). As I have argued elsewhere, "skills . . . cannot rest on a foundation of technical rationality . . . any more than a conversation can be . . . carried out by using a flow-cart or decision tree" (McDonald & Michela, 2022, p. 63). So, if there is an alternative way to understand how theory can support practice, one that avoids the dilemmas of the strong and soft views, it begins by questioning this starting point about the role of decontextualized information in expert performance.

Reconsidering How Theory Supports Practice

The Nature of Expertise

If theory should not be thought of as an external, rule-like system that practitioners apply in an instrumental sense, what role should it play? Addressing this question begins by reconsidering the nature of disciplinary expertise. Thinkers like Dunne (1997), Schön (1983), Dreyfus (2014), and Wrathall (2011) have persuasively argued that grounding expertise in people's nonconceptual, embodied absorption in the world--and not their intellectual mastery of technical, procedural

information--best explains the nature of skillful performance. It also provides a means for understanding how information, like theory, can support practice in ways other than those laid out in the strong and soft views. Expertise is exemplified by:

> *discerning and responding appropriately to the subtle features and specific requirements of each situation. . . . without any explicit sense of effort, responding intuitively to the unfolding of circumstances without having to stop and think about what we are trying to accomplish – or otherwise needing to represent the conditions of satisfaction of our activity. (Wrathall & Londen, 2019, p. 651)*

Wrathall (2011) illustrated this by describing a person's skillful use of kitchen equipment. One's expertise with a knife is not based on knowing more facts about it than someone else. While explicit information about a knife may be useful for some purposes, anything an expert can say about it is secondary to the way he picks it up, wields it without thought towards certain ends, and uses it in relation to other kitchen equipment. He may or may not be able to articulate what he is doing at any moment, and, in fact, his thinking may be completely wrong in even important respects. Yet, proof of his expertise is still observable in his actions.

This skillful absorption is what Schön (1983) called "knowing-in-action" (p. 50), a practical know-how found in people's capabilities or dispositions that cannot be detached from themselves as knowers or the practical situations in which they act:

> *A tightrope walker's know-how . . . lies in, and is revealed by, the way he takes his trip across the wire . . . [and] a big-league pitcher's know-how is in his way of pitching to a batter's weakness, changing his pace, or distributing his energies over the course of a game. (pp. 50-51)*

Dunne (1997) offered further characteristics of knowing-in-action. It is an affective capacity, "available to one only as a person already committed to [an] activity – and never, therefore, as a detached ego" (pp. 358-359). It is characterized by "unpredictability, open-endedness, and frequent irreversibility," being "a form of influence" people bring to bear within situations rather than being based in technical control (p. 359). It is informed by people's pasts and their hopes for the future. It is also informed by the possibilities available through one's culture, as exemplified by the way language "already [has] all kinds of tugging effects" (p. 360) that limit thought, but how it also offers a "kind of *buoyancy*" upon which people can draw to disclose previously unseen ways of experiencing the world (p. 361, emphasis in original). As opposed to the strong and soft views' presumption that knowing-in-action is "primitive," and "encourages fads, gurus, and magical thinking" (Clark & Estes, 1998, p. 7), proponents of knowing-in-action argue for nearly the opposite; "research-based suggestions tend to be relatively simple, impersonal and generalized, whereas the classroom craft [i.e., knowing-in-action] on which teachers depend is complex, personal, and contextualized" (McIntyre, 2005, pp. 365–366). I add that this is true not only for teachers, but LDT professionals as well.

Of course, the primary way one develops knowing-in-action is through practice. People become skilled LDT practitioners by practicing LDT (assuming, of course, their practice is effective). Consistent practice over extended periods of time, supported by helpful feedback, leads to people developing capabilities (e.g., knowledge and skills) recognized by a community as expert performance in that domain (Ericsson et al., 1993).

Expert performance is more than correctly executing a series of process steps, however. In addition, Wrathall (2019) explained that developing expertise in any domain also "brings [an] individual into a changed or more refined form of responding to his or her environment" (p. 26). People "develop a new attunement to the world" (p. 21), consisting of three forms of sensitivity:

- *"Discriminatory Capacities*: the ability to discern meaningful situations in the environment;"
- *"Dispositions*: the inclination and skill to respond to solicitations to which one was previously not responsive—that is, one experiences situations as calling on her or him to act or respond in particular ways;"
- *"Taste*: the ability to decide what is to be preferred or disfavored in any given situation" (p. 25, emphasis in original).

For instance, expert LDT professionals recognize cues that distinguish a situation as a candidate for applying a learning technology (Hoard et al., 2019), feel empathy for learner groups that demands their action (Matthews et al., 2017), and are drawn into situationally appropriate phases of the design process without deliberating on a rule that tells them it is time to start (Kirschner et al., 2002). Together, these kinds of affective responses help define the particular "style" (Wrathall, 2017, p. 22) of responding to situations that are recognizable as being LDT practice.

In this model of expertise, deliberation and forms of cognitive problem solving typically become useful when something does not go as planned or when people are inexperienced in navigating an environment on their own (Dreyfus, 2014). When such moments occur, someone might find explicit information, like traditional forms of theory, to be useful. But using them as rules, principles, or any strong or soft term that essentially means directions to follow, keeps people from elevating their performance to expert levels. Dreyfus illustrated this through describing a relatively common breakdown in expertise:

> *Most [expert] drivers have experienced the disconcerting breakdown that occurs when suddenly one reflects on the gear shifting process and tries to decide what to do. Suddenly the smooth, almost automatic, sequence of actions that results from the performer's involved immersion in the world of his skill is disrupted. . . . He detachedly calculates his actions even more poorly than does the [less skilled driver] since he has forgotten many of the guiding rules that he knew and used when [learning], and his performance suddenly becomes halting, uncertain, and even inappropriate (p. 35).*

So, there may be a place for novices, who are still in the realm of basic competence that is largely rule governed, to apply theory in the sense of acting in accordance with a set of instructions. But experts rely on their "resourcefulness," and on forms of knowledge born out of their "character and dispositions"--none of which "can be made available in treatises or manuals" (Dunne, 1997, p. 228). Attempting to follow the rules often hinders instead of helps their ability to perform. It is not the right information that allows experts to successfully manage a situation, but their ability to perceive subtle details and grab ahold of relevant situational affordances (Wrathall & Londen, 2019).

Further, it is not warranted to describe experts as somehow unconsciously or tacitly applying theory, as some theorists have argued (Honebein & Honebein, 2014; Reigeluth, 1997). Assuming that because people *sometimes* deliberately and instrumentally apply information means that this is the paradigm of all performance is not only logically unjustified, it ignores considerable empirical evidence to the contrary (Dreyfus, 2014). It *a priori* presumes the primacy of theory over practice, and then tries to explain what professionals do in a manner that reinforces this priority (cf. Wilson, 1999). While it might be possible to restate what experts do so it retrospectively appears that they were applying a theory, doing so blinds one to most of what actually happens when skilled performers engage with a situation (McDonald, Bowman, et al., 2021).

The Role of Theory in Expertise

Recognizing that technical rules limit one's ability to rise to the level of expertise is not to argue that explicit information has no value. There is a way to conceptualize information use in a way that supports people in their attempts to improve performance after they have gained experience. But it requires theorists to understand the products of their work as being something other than "a static rule system that designers merely learn, then apply" (McDonald, Bowman, et al., 2021, p. 3). Instead, since what defines LDT as a field are disciplinary patterns that describe professionals' "skillful and improvisational engagement with each other and with the world" (p. 2), theory can be viewed as a partial and imperfect expression of what some experts have done, not a mandate about what all experts must do. In this view, theory does not govern good practice, but models some of the conditions under which it could occur. It is a facsimile of what skilled professionals (those who are attuned to their environment) are often able to achieve without formal, external supports. So, it can help draw practitioners' attention to what others have considered as part of their good practice (Dunne, 1997). It can also provide practitioners with a broadened perspective where researchers share the wisdom they have gained through their own engagement with educational issues. But it does this in the spirit of colleagues telling each other "war stories" (Orr, 1990, p. 175), instead of attempting to establish a comprehensive body of knowledge that sits underneath practice and forms "the intellectual foundations of [the field]" (Richey et al., 2011, p.

1). As Biesta (2022) stated, “the point of educational scholarship is not to tell educators what they should do, but to provide them with resources that may inform their . . . own educational judgment and inventiveness” (pp. vii-viii).

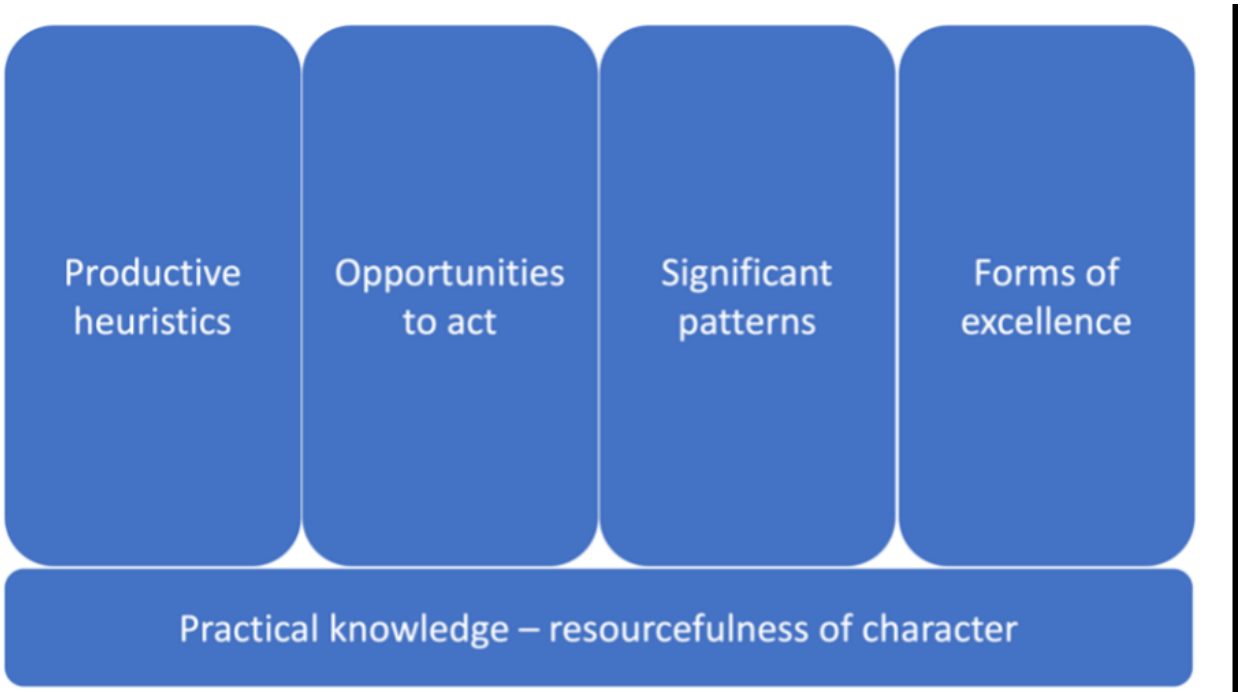
LDT theory can have this kind of impact if it is designed to help practitioners tune the discipline-specific, affective sensibilities that Wrathall (2019) described. Rather than having predictive or probabilistic power, and so being an instrument one can wield like any other, good theoretical accounts work on practitioners--catalyzing a change in how they experience situations--so they come to see and feel things the way experts do (Dunne, 1997; Wrathall, 2011). Theory can help practitioners discern fine-grained situational affordances and orient them towards previously unseen possibilities (Wrathall & Londen, 2019). It can also model the character of good practice (Yanchar & Faulconer, 2011). Finally, it can move practitioners’ feelings, desires, and values, drawing them in towards a full, wholehearted commitment to the field and its practices (Wrathall, 2019). Theory is meant to be educative, and as is true for so many educational aids it should build practitioners’ capacities so they can ultimately act independent of it (even though at one time it may have been an essential support). What LDT professionals practice seeing and feeling will, over time, become more see-able and feel-able to them on their own. Borrowing from Thomson’s (2019) discussion about how certain styles of philosophical writing can achieve similar aims, “rather than [being] complete, self-contained [reports] in which all the important conclusions have been explicitly drawn,” theory can “take . . . [practitioners] on a journey that helps [them] ‘learn to learn,’ that is, to learn how to see, encounter and understand the phenomena repeatedly at issue *for [themselves]*” (p. 186; emphasis in original).

The Phronetic Framework

For theory to have this impact, those who develop it must think differently about it. In his study of practical knowledge, Dunne (1997) articulated what's involved as one's knowing-in-action matures. His work can serve as a foundation for a framework for what LDT theory can be (Figure 1). Along with what Dunne provided, I further recognize the contributions of LDT theorists like Parrish (2014), Wilson (2013), and Yanchar (Yanchar & Faulconer, 2011; Yanchar & South, 2008). These scholars have also described ways to engage with theory that go beyond applying it in a limited sense, instead considering it to be a resource that practitioners actively interpret, revisit, extend, and remix to transform it into forms of knowledge or action the original researchers may have never anticipated. Their work helps clarify how theory can function like an orienting aid, supporting practitioners as they refine their personal capacities for perception, discrimination, and judgment, instead of being a set of rules that define good practice.

Figure 1

The Phronetic Framework for LDT Theory



As I describe the framework, I emphasize that while I will provide examples of prior LDT research that function as suggestive possibilities to illustrate each category, what follows should not be viewed as merely new labels for the same theory the field has always produced (neither do I claim the original researchers' intent was aligned with my purposes). The framework is meant to facilitate a reimagining of what LDT theory could become. It provides a view into what kinds of theoretical contributions might be a refining influence that works on practitioners' dispositions, and discloses new ways of seeing the world, so they become more responsive and flexible when experiencing both common and unfamiliar situations. The examples are therefore provided to clarify each category, and to suggest how each might be empirically investigated.

LDT-Relevant Practical Knowledge

At the base of the framework sits the nature of practical knowledge as it is relevant to LDT practice. As with others cited throughout this chapter, Dunne (1997) argued that the knowledge upon which experts rely is more akin to a "resourcefulness of mind and character" (p. 312), instead of a technical information system that exists independent of their actions. The kinds of experiences LDT professionals tend to have nurture their resourcefulness as members of the community of practice, resulting in a form of discipline-specific practical knowledge that cannot be wholly separated from the individual actor, nor from the field of practice out of which it was born (Lave & Wenger, 1991). This means that through their involvement with the field, practitioners come to see, feel, and discern things that are distinct to LDT as a domain, as "the result of the gradual refinement of responses that grows out of long experience acting within [their] shared cultural practices" (Dreyfus, 2017, p. 34).

LDT theory can draw attention to the types of dispositional resourcefulness relevant to disciplinary expertise. These theories act as a "kind of reinforcement" for practitioners, "contribut[ing] to a heightened awareness on [their] part" of attributes they can develop, and giving them insight into how to exercise and strengthen their own capabilities (Dunne, 1997, p. 160). Dunne further reasoned that offering practitioners this type of support can lead to levels of expert performance comparable to "the gifted carpenter who, when confronted with crooked walls and warped timber, contrives, nonetheless, to produce an excellent finished job" (p. 283). An equivalent situation in LDT might be a practitioner faced with out-of-date technology (a constraint that restricts her to shallow forms of interactivity), and limited time and budget, yet nonetheless is able to facilitate a memorable and effective learning experience. Placing the nature of practical knowledge at the framework's base is meant to reinforce that what is achievable as one's knowing-in-action develops is foundational to any other accomplishment practitioners might pursue with theory's assistance.

Two forms of LDT theory could potentially play this role. The first is theory that offers compelling accounts of the types of dispositions associated with resourceful LDT practice. For instance, Belland (1991) articulated a notion of connoisseurship in educational technology that "attends to the affective needs of the learners" (p. 26) and qualitatively changes how practitioners appreciate, evaluate, and design new learning systems (cf. Parrish, 2012). He included knowing students "as people and not just as the 'kid in station 86'" (p. 27), and recognizing where "kindness leaves off and obsequiousness or patronizing begin" in the tone of an instructional text (p. 30), as examples of the kinds of traits LDT connoisseurs might develop.

The second form of LDT theory is theory found in design precedent that models how other practitioners have engaged their practical knowledge towards a particular end. Through the reports of concrete actions taken by specific designers in specific cases, precedent offers practitioners a "vicarious" experience that prompts their reflection on how they could act in ways appropriate for their own situation (Howard et al., 2012, p. 35). It serves as an aid that helps them focus on, and attend to, salient issues with a richness that is usually not available through conventional research reports (Boling, 2021).

Productive Heuristics

The framework takes further shape with four forms of theory built on the foundation of practical knowledge and character. The first is theory that supports the productive activities associated with LDT, where one is engaged in creating products, systems, services, or environments that have learning value. Dunne (1997) described theories that support productive work as knowledge of the affordances possessed by different kinds of material (what they offer towards the pursuit of certain ends), along with what kinds of work can draw out potentials a material offers. Such theories are heuristics that sensitize practitioners to the relevant field of forces involved when making something meant to serve a particular purpose (Gibbons, 2013). Many of the models, principles, frameworks, or guidelines common in LDT already describe or explain these kinds of issues. Consider Mayer's (2014) multimedia principles of instruction that provide useful information about how one can take advantage of learning affordances offered by visual and aural media technology.

However, Dunne (1997) contended that such knowledge should not be treated as deterministic or probabilistic rules. Doing so lends the mistaken impression that productive heuristics have a fixed reliability on which practitioners can rely. It assumes a model of practice where one simply finds the right inputs associated with desired outputs--albeit inputs that may not be as dependable as one would want. But there is no static probability that a heuristic will work (see Wilson, 2013). Even if one were to account for situations and variables to a minute level of detail, as Reigeluth (1999) once speculated would be ideal if it were not impractical, learning environments are never stable. Arguing for a probabilistic model of theory assumes the value of a heuristic exists in the abstract, apart from practitioners' skills or the needs of a situation, so it's efficacy can be at least partially determined before one has experienced a circumstance firsthand (see Dunne, 1997, pp. 128–130). As Honebein and Reigeluth (2020) have more recently concluded, practitioners should consider "all instructional methods as having unknown . . . usefulness *until* the instructional situation is known" (p. 14; emphasis in original).

Further, the probabilistic model ignores that "affordances, the way things in the world offer themselves to be used by us, are contextually determined" (Wrathall, 2014, p. 210). For instance, to a hungry person, a table affords itself as something that facilitates his sitting and eating. But these affordances recede for a person looking for something to help them change a lightbulb. In their case, the table affords itself as a steady structure on which they can stand. Similarly, the learning affordances of materials LDT practitioners work with will shift and adjust depending on their current purposes. One implication of this is that some productive heuristics associated with a type of material may not be relevant to certain practitioners' aims (Dreyfus, 2017). For example, those whose purposes are similar to what Mayer (2014) assumed when he conducted his research could reasonably find his multimedia principles to offer valuable insight. But practitioners who use media technologies for different purposes might find them to be less germane (see Koumi, 2013, for a critique of Mayer along these lines). Further, attempting to attribute causal power to productive heuristics, such as assuming they describe invariant facts (or even probabilistic principles) about how learning must work, is also unwarranted. Doing so ignores the "concernful involvement" of learners in their own learning, meaning

certain heuristics could be more or less relevant in a given case depending on how learners themselves find artifacts they are interacting with to "matter" within their overall life story (Yanchar, 2021, p. 28; see also Yanchar et al., 2013).

This is not to argue that learners being designed for exist "in a special, privileged position outside the principles of [science]" (Benner, 1984, p. xix). Clearly, at least some productive heuristics are based on biological or similar constraints on human capacity, for instance how the physiology of the human eye has led to principles of contrast that allow visual elements on a computer screen to be as readable as possible (Mithun et al., 2019). But such scientific knowledge alone is insufficient to guide expert performance. There is no "fixed and identifiable behavior [that] constitutes the excellence in excellent practice" (Gottlieb, 2012, p. 505; emphasis removed), meaning that there is no decontextualized standard or outcome that exists isolated from situational realities that defines expertise. So when, how, or even if well-established scientific principles apply in a given situation are decisions that theorists cannot make for practitioners in advance (Dreyfus, 2017). Nor can the quality of an instructional system be determined in advance of its use based on how well it adheres to the specifications that productive heuristics provide (McDonald et al., 2005; McDonald & Gibbons, 2009). The practitioners themselves must weigh the considerations offered by productive heuristics (or any theoretical construct) with the indeterminate number of other situationally relevant issues that affect the aims they are pursuing; "to be [an expert] *now* calls for a unique modification [of relevant principles], unspecifiable in advance, and by no means easy to determine in the situation itself" (Dunne, 1997, p. 311; emphasis in original).

The alternative to a rule-based model, according to Dunne (1997), is for practitioners to enter into a "conversation" (p. 117) with forms of knowledge like productive heuristics (see also Schön, 1983). Since the world of practice is too complex to be managed through technical information alone, the value of heuristics is found in the dialogue in which one can engage with them, where they draw attention to relevant forces, help one question their assumptions, explore possibilities, reconsider their aims, or take a step towards something useful. In this view, a practitioner recognizes that productive heuristics often contain wise advice that can inform one's situational understanding, even if they do not represent universal mandates.

Many researchers in the field already have experience investigating and generating productive heuristics (with the qualifications just noted about how they should think about what they develop). Such heuristics are often what Reigeluth and Carr-Chellman (2009b) called "design theory," meaning theory that "identifies good methods for accomplishing goals" (p. 7). Along with the examples discussed earlier, another example is human factors research as related to LDT that describes how the form and substance of artifacts with learning purposes can align with the constraints and capacities of the human body (Gruber et al., 2019).

Opportunities to Act

Another form of theory draws practitioners' attention to opportunities for action, or openings in a situation, so they can take advantage of suitable moments when they appear. Dunne's (1997) argument for this type of knowledge began by recognizing that in many practical situations "success is . . . not so much . . . keeping one's gaze fixed on the preconceived form which one will impose on the material," as would typically be the case when one is building durable good (or when one is designing an instructional product for a predetermined outcome). Instead, success is "a flexible kind of responsiveness." It is being able to recognize situational factors one can take advantage of to move one closer to a desirable state (p. 256). A common analogy Dunne used was of a sailor who could recognize that when the waves break in a certain way it is his best chance to cut across them safely. In contrast to the forms of knowledge discussed to this point that drew attention to practitioners' dispositional traits, or to features of their materials that are useful for certain purposes, opportunities for action focus on the attributes of the circumstances in which practitioners find themselves. They sensitize people to those sometimes-momentary occasions that provide an advantage within "a continually changing complex of developing possibilities" (Liberman, 2013, p. 21). As with the other framework categories, opportunities to act are not formulas for practitioners to follow. They function more like a focusing device—sharpening one's view, and accentuating what it might look like when a useful opening appears.

Within the field of LDT, these types of theories are often an outgrowth of research focused on understanding the dynamics of the situations in which practitioners find themselves. For instance, Richardson et al. (2019) studied the

perceptions of university faculty and instructional designers on the nature of their working relationships. Their research uncovered several factors that indicate the faculty-designer collaboration was going well, such as when relationships are "egalitarian" (p. 862), and when the parties involved had clear expectations about what to expect from each other. Such conditions do not guarantee success in any collaborative effort. But where they exist (or when one can arrange a situation to bring them about), they can legitimately be viewed as creating a more fruitful opportunity in which to act, allowing practitioners a space in which they can attempt further actions that move them and their collaborators towards ends they find mutually desirable.

Significant Patterns

Theory can also describe patterns for how environments can be organized, or significant relationships and structures between situationally relevant people, resources, activities, and events. These describe another form of influence LDT practitioners can have, where they enable or facilitate certain kinds of activities based on how they arrange a setting (or, alternatively, prevent or discourage other kinds of activities). Dunne (1997) offered an example:

> *[A] teacher . . . will have a whole stock of largely unformulated knowledge about the kind of pedagogical aids . . . that, in general, tend to work well, the typical difficulties to be anticipated or pitfalls to be avoided, [and] the sorts of questions and promptings that in the past have tended to work. (p. 368)*

Many of these patterns also likely qualify as a type of design theory, as described by Reigeluth and Carr-Chellman (2009b).

Understanding significant patterns primes practitioners. Being prepared with a repertoire of patterns allows them to move swiftly and take advantage of opportunities to act as soon as the favorable circumstance is recognized. However, Dreyfus (2017) emphasized that even here, one is not relying on instructions for managing a situation. Doing so would suggest that the purpose of significant patterns is to provide intellectual content on which practitioners can deliberate when making decisions. Instead, this form of knowledge should develop people's capacity for intuitive action; it provides cues for how one might get started, with the presumption that the fully appropriate response will not emerge until the practitioner is fully engaged with the situation and is able to shape their actions to the needs and demands of what they find (Dreyfus, 2014; Dunne, 1997).

While there are some similarities between significant patterns and productive heuristics, there are important differences as well (but I also note there is no need to be overly prescriptive in how boundaries are drawn between framework categories). Productive heuristics focus on how to get the most out of the materials LDT practitioners use to develop artifacts with learning affordances. Significant patterns describe how those artifacts--along with other events, activities, and people--can be organized for a given purpose. Further, because other people are often involved when a pattern is used, practitioners have even fewer assurances that they will be able to manage, control, or optimize the situation according to a predetermined plan. As I have written elsewhere, "what an [LDT practitioner] begins is fragile . . . . Others may pick it up or not, and even if they accept it, they may divert it into directions the original actor did not anticipate or may not agree with" (McDonald, 2021, p. 48; see also Biesta, 2013; Dunne, 1997).

For example, consider the patterns definitive of problem-based learning. This approach is characterized by students who have responsibility for their learning, collaboration between participants, ill-structured problems as the basis of inquiry, a tutor (or facilitator) who guides students through the learning process, and informational, spatial, and/or technological resources that facilitate participants' free interactions (Savery, 2009). While LDT professionals can prepare a problem-based situation in such a way as to encourage the kinds of outcomes for which it is known, once a situation is given over to the participants, they will shape it to their own ends--which may or may not match those of other stakeholders (Hung, 2011).

Many of the instructional strategies or other techniques the field has developed throughout its history describe significant patterns in the sense outlined here. Design precedent can also play this role by providing concrete examples of how other designers have organized situations to facilitate certain aims (Howard et al., 2012). I offer a similar

qualification as I have previously made about avoiding the tendency to see significant patterns as having deterministic or probabilistic power in the abstract.

Forms of Excellence

Finally, theory can articulate forms of excellent practice that LDT as a field strives towards. Yanchar and Slife (2017) defined these as the sense practitioners have of "what is good or right to do in relevant situations, [and] what counts as satisfactory or unsatisfactory conduct" (p. 154). Forms of excellence are usually tacit. They are the values and related considerations that inform good practice, but that are often in the background and so one is only implicitly aware of their influence most of the time. But Dunne (1997) emphasized how much they matter, nonetheless. He noted that the excellences one pursues in a field refine and shape one's sensibilities, leading to a person being able to discriminate between options with more sensitivity and nuance. Because the person is so attuned to the outcomes both she and the field at large desire, they can discern how an alternative either does or does not move them towards those ends. Gray and Boling (2016) illustrated this through their study of design case reports, where they showed how the way both researchers and practitioners wrote about their work revealed their commitment to various field-specific ideals, such as a concern for equality of access, or promoting learners' agency and autonomy.

But articulating forms of excellence as one might do in a theory not only calls practitioners' attention to what matters to the field. It can also change the experience they have with those values:

> *Articulations are an attempt to formulate what is initially inchoate. . . . But this kind of formation or reformulation does not leave its object unchanged. To give a certain articulation is to shape our sense of what we desire or what we hold important. (Taylor, 1985, p. 36)*

Dunne (1997) indicated that one way articulating forms of excellence can change what someone desires is that doing so can help clarify the types of actions that can lead to valuable ends. This is more than only revealing an alternative means for achieving a goal. As part of articulating the connection, one can come to affectively appreciate the new method in a way one did not before. Practitioners can come to see the alternative as appealing and alluring, which will help them more skillfully put it to use (Wrathall, 2019).

Forms of excellence have not traditionally been a focused topic of inquiry within LDT research. While there are some exceptions, including the Gray and Boling (2016) study referred to above as well as others (Matthews & Yanchar, 2018b; McDonald, Jackson, et al., 2021), forms of excellence are often revealed as one pays attention to the standards, statements of value, or competencies championed either by individual researchers or by institutions within the field (for an example, see Yanchar, 2018). However, it would be to the field's advantage if researchers more intentionally studied such topics. Research approaches have recently been developed to facilitate this (Yanchar & Gong, 2019; Yanchar & Slife, 2017).

Implications and Concluding Thoughts

The phronetic framework offers several implications for LDT research and practice. First, the framework categories better describe theory's contribution to practice than those borrowed from other enterprises, such as the traditional classifications of descriptive and prescriptive (or design-oriented) theory (Reigeluth, 1999; Reigeluth & Carr-Chellman, 2009b). Traditional categories do not draw distinctions between the differing forms of knowledge involved in practice as in the phronetic framework. So, they are blunter instruments when it comes to guiding practitioners to select theory that is useful for a particular circumstance. Terms more tailored to the types of needs practitioners encounter can better inform them of the value a theoretical report is meant to provide. Knowing what to reasonably expect from it can help avoid a person becoming dissatisfied because they misunderstood what that theory offered.

Second, the framework can broaden LDT researchers' views about the types of research they can conduct. Instead of solely, or even primarily, focusing on instructional strategies, processes, and the like (which are only a subset of the needs of practice), the framework's categories draw researchers' attention to needs that may be more foundational, but

that are often neglected in the literature. I noted earlier this is the case with research focused on forms of excellence the field strives towards. The same is likely true for LDT-relevant practical knowledge and character.

A third implication is that the framework helps legitimize any communicative artifact that discloses opportunities or sensitizes practitioners to salient affordances. It does not prioritize the traditional research report, but allows for alternative forms of knowledge like that communicated through design precedent. Still, other forms of knowledge could be explored that can also play this role. For instance, consider Wrathall's (2011) explanation of the value of poetic language, that has a "productive ambiguity" (p. 139), meaning it can "oscillate productively between several different possible interpretations" (p. 140). Perhaps LDT theory could take inspiration from poetic forms of discourse. This does not mean it should be poetry in a formal sense, but that it might be designed so that it affords multiple interpretations based on practitioners' experience or need—even if one interpretation is in tension with, or creates an inconsistency when compared to, another. For instance, take the term *reflective practice*. In one sense reflective connotes how practitioners can "pause and examine (or reflect) on their options for moving forward." It also carries the sense of reflection akin to how "a [jazz] musician [is] reflective," where the term "does not mean they stop and think about what note to play next. It means they are in tune with the situation, reflecting back through their music the opportunities their collaborators offer" (McDonald, 2022). Both senses of *reflective* are true to how Schön (1983) described the term. Even though they do not perfectly align with each other, both can highlight how one might experience reflection in different circumstances.

As another example, Redström (2017) argued that designed artifacts can disclose new definitions for what counts as a defensible end for a discipline to pursue, or what counts as legitimate phenomena within a domain. In his view, artifacts often do this better than do expository descriptions, and so should be seen as a legitimate form of theorizing. Future research can explore how Redström's work might apply to LDT, perhaps using the affordances of newly designed objects to uncover innovative theoretical constructs related to what counts as a learning technology, instructional strategy, or even learning itself.

Fourth, the framework helps legitimize the value of alternative theoretical conceptions of the same phenomena. Since it is not theory's role to describe a set of rules that define what learning or instruction must be, but rather to disclose possibilities or to refine practitioners' palates, there is advantage to providing many views that highlight different aspects of the same issue (Wenger-Trayner, 2013). Different viewpoints support flexible expressions of practice useful for different situations. As Yanchar and Faulconer (2011) concluded, "there would always be more that could be said about the concepts involved, alternative interpretations to consider, further implications to explore, and new ideas to entertain" (p. 28). This implies that theorists should be responsive to the practical world as they encounter it in all its inherent paradoxes and inconsistencies, not attempting to artificially harmonize individual cases into generalizable laws, nor disregarding unusual or unique findings in a search for patterns and regularities (cf. Yanchar, 2015). What determines whether a theory is useful is not necessarily the degree to which it accords with [certain] facts. It is better because either (a) it makes the interpreter more flexible and open to dialogues with other interpretations . . . or (b) it focuses and make more sense of what is at issue in a current [situation]. (Dreyfus, 2014, p. 18)

Finally, the framework not only allows for theory that has affective impact on researchers and practitioners, but also values a theory's emotional component. Since theory has more purposes than only informing people about relevant information, its usefulness is partly found in how well it also moves their feelings and sensibilities. "One's perception of and response to situations is 'aesthetic' in that it is mediated through feelings" (Dunne, 1997, p. 358), and so this should be a legitimate component of how researchers draw attention to important possibilities they hope practitioners will consider. Dispassionate, technical reports will continue to have a place in LDT theorizing, but should exist alongside moving accounts that touch practitioners' emotions, as well.

In conclusion, the central message of the phronetic framework is that instead of reducing the world of practice into abstract models or techniques, theory takes its proper place when it supports practitioners as they learn how to cope with practice in all its color, vibrancy, and liveliness. As a field, LDT is in a strong position to produce this kind of theory, perhaps more so than other fields that are not as tightly connected to practice or that have more direct interest in scientific forms of theorizing (as is often the case in fields like psychology or the learning sciences; cf. Wilson, 2005).

The advantage of a practice-oriented discipline like LDT should be that it develops the theories that practitioners find most useful and applicable. I urge researchers within the field to consider how this framework for phronetic LDT theory can improve their work to support practitioners. By so doing, they are meaningfully contributing to the field's core purpose of creating excellent learning experiences—experiences that target "both intellectual and emotional" outcomes (Gibbons, 2016, p. 34), and that are unconstrained by time or place.

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Dr. Jason K. McDonald is a Professor of Instructional Psychology & Technology at Brigham Young University. He brings over twenty years of experience in industry and academia, with a career spanning a wide-variety of roles connected to instructional design: face-to-face training; faculty development; corporate eLearning; story development for instructional films; and museum/exhibit design. He gained this experience as a university instructional designer; an executive for a large, international non-profit; a digital product director for a publishing company; and as an independent consultant.

Dr. McDonald's research focuses around advancing design practice and design education. He studies design as an expression of certain types of relationships with others and with the world, how designers experience rich and authentic ways of being human, the contingent and changeable nature of design, and design as a human accomplishment (meaning how design is not a natural process but is created by designers and so is open to continually being recreated by designers).

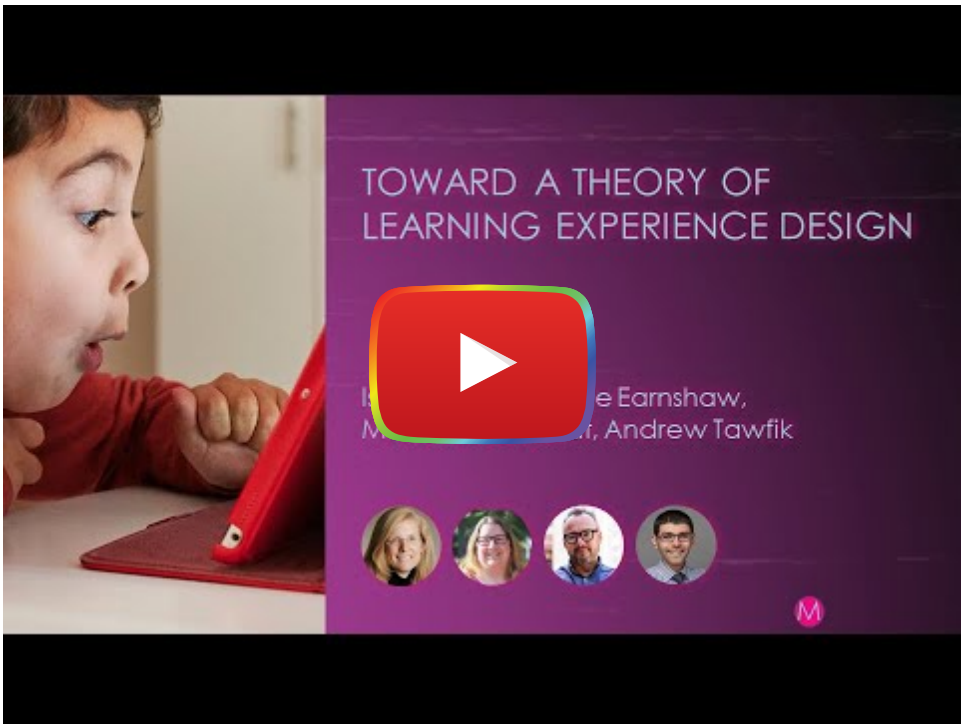
At BYU, Dr. McDonald has taught courses in instructional design, media and culture change, project management, learning psychology, and design theory. His work can be found at his website: http://jkmcdonald.com/

Theoretical Considerations of Learning Experience Design

Isa Jahnke, Matthew Schmidt, Yvonne Earnshaw, & Andrew A. Tawfik

Instructional Design | Learning Experience Design | User Experience Design | usability

Researchers of learning design and technology (LDT) adopt theories from outside the field to design and evaluate educational technologies in a human-centered manner. We therefore propose a theory of Learning Experience Design (LXD) that draws from multiple traditions (i.e., user experience, learning design, and educational technology). The suggested LXD theory has the aim to guide designers, researchers, and educators in crafting effective learning experiences while taking into account the sociocultural, pedagogical, and technological dimensions of technology-mediated learning.



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Learning a new skill is supposed to be hard, but it doesn't need to be complicated. The difference between the two is the design.

— Andre Plaut

The emerging field of LXD is located at the crossroads of user experience (UX), learning design, instructional design, and educational technology. In the past few years, studies and projects that call themselves learning experience design (LXD) or learning experience research have been increasing steadily. In terms of practice, positions that are looking to hire learning experience designers are increasing. Discussions about LXD further abound on social media and on educational technology blogs. This trend of increasing interest extends to the field of learning/instructional design and technology (LIDT). While LXD practices are increasing outside of academia (see Cheng, 2019; Dimitrijević & Devedžić, 2021; Jahnke et al., 2020; Matthews & Yanchar, 2018; Shernoff et al., 2020; Stefaniak & Sentz, 2020), there is little guidance within the field of LXD research (Schmidt & Huang, 2021; Schmidt & Tawfik, 2022). There is as yet no common or shared understanding of how learning experience (LX) or LXD should be defined (Tawfik et al., 2021), nor any consensus or methodological approaches or research design. Given increasing interest and a lack of guidance, better understanding what exactly LXD is and how learning designers go about engaging in LXD practice is needed.

Scholars agree that educational technologies should be effective, efficient, and appealing (Honebein & Honebein, 2015; Merrill, 2018; Merrill et al., 1996). Many researchers of LIDT adopt methods from outside the field to design and evaluate educational technologies along these dimensions and in a human-centered manner. For example, the LX of digital learning environments is often evaluated or analyzed using traditional, technological usability heuristics (e.g., Nielsen, 1994a, 1994b) to understand the usability, user-friendliness, perceived satisfaction, etc. of a given technology. In addition to this, learning technologists have found value in user-centered design (UCD) approaches from the field of human-computer interaction (HCI) (e.g., Quintana et al., 2000; Soloway et al., 1994) and applied them in learning design contexts (Baek et al., 2008; Barab et al., 2005; Ebner & Holzinger, 2007; Fernandez-Lopez et al., 2013). While these perspectives are undoubtedly useful for informing learning design, scholars have argued that relying on these perspectives alone to inform, evaluate, and assess learning technologies is inadequate (cf. Jahnke et al., 2020). This is especially highlighted in the work of Nokelainen (2006), who established the notion of *pedagogical usability*. Pedagogical usability extends the narrow frame of traditional usability evaluation to take into consideration not only the technological usability but also issues of pedagogical design, such as instructions and learning tasks.

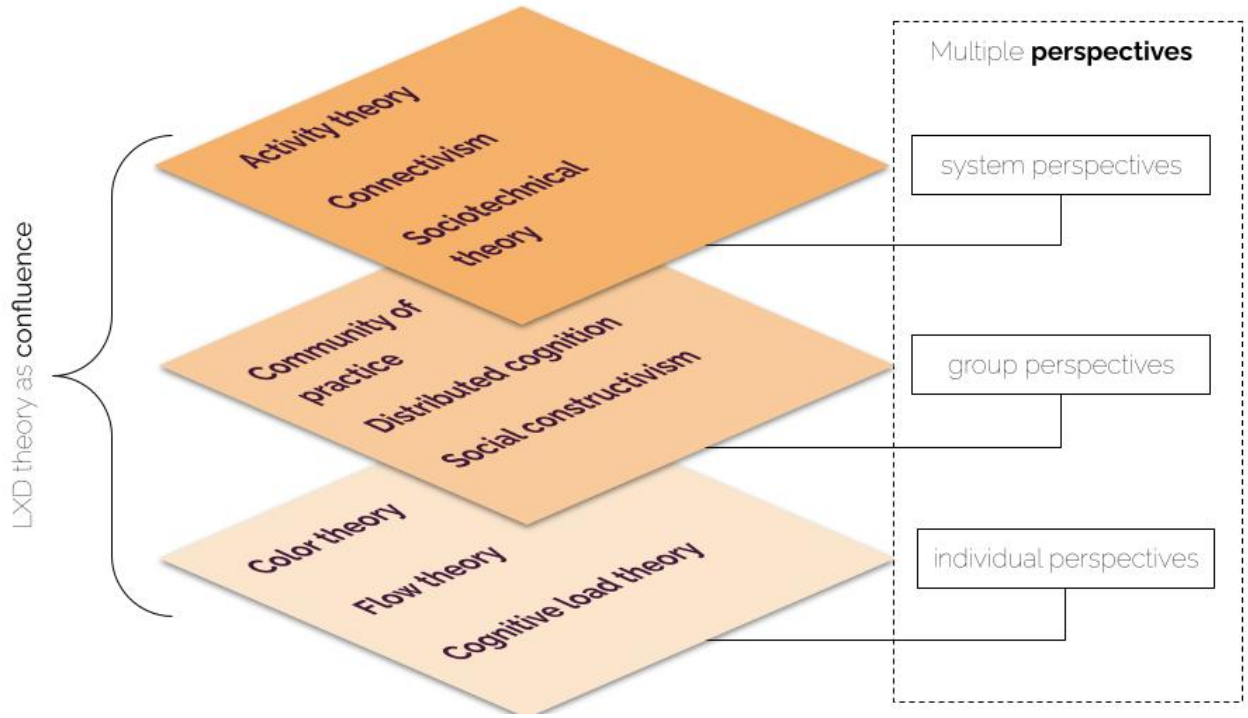
Although LXD is an important part of design, a theoretical foundation is needed to more explicitly elaborate and bound this phenomenon. We therefore suggest a timely and urgent need exists to develop a theory of LXD for framing research, informing design, and predicting experience.

Existing Theories in the Field of Learning Experience Design

Although LXD is a recent phenomenon, a range of theories has been used to inform the conceptualization and practice of LXD. To frame a discussion toward an emerging theory of LXD, we draw from the collaborative corpus of research that is presented in the book *Learner and User Experience Research: An Introduction to the Field of Learning and Instructional Design and Technology* (Schmidt et al., 2020). The chapters included theories that are often referenced in user-centered design (UCD), human-computer interaction (HCI), usability research, cognitive load theory (Sweller et al., 1998). Additional theories are drawn from sociotechnical disciplines, such as distributed cognition (Hollan et al., 2000) and activity theory (Engeström, 2000; Kaptelinin & Nardi, 2018). In addition, “theories of change” (Bowen et al., 2020), flow theory (Nakamura & Csikszentmihalyi, 2009), and color theory (Kimmons, 2020) were presented. Further, Gray (2020) suggests a “critical praxis” at the nexus of researcher positionality, learning theory, and HCI. When analyzing those theories, we see they address different levels of individual, group or broader (social) system perspectives (see Figure 1).

Figure 1

Learning experience design is a confluence of multiple theoretical perspectives



Groundwork for a Theory of LXD

In the following sections, we lay the groundwork for a LXD theory and start with defining the interrelated terms of experience, learning experience, and learning experience design. We then illustrate the multidimensionality of these components.

Clarifying experience vs. learning experience vs. learning experience design

The term LXD consists of related terminology: experience, learning experience, and learning experience design. In terms of the **experience**, it is the foundation from which meaning-making and understanding emerge (Kolb, 1984). Experiential learning theory proposed by David Kolb (1984) emphasizes how experiences, including cognition, environmental factors, and emotions, influence the learning process. Kolb developed a four-step learning cycle with a) concrete learning, b) reflective observation, c) abstract conceptualization, and d) active experimentation. Effective learning manifests when the learner progresses through the entire cycle. Experiential learning recognizes that not all experiences substantially enrich learning. Instead, meaningful learning occurs when a learner "touches all the bases—experiencing, reflecting, thinking, and acting—in a recursive process" (Schatz, 2019, p. 89). But what is an experience? Some have argued that learning experience consists of the following:

- Sense – Reactions to sensory stimuli within or around an experience
- Feel – Emotions and their intensity in response to an experience
- Think – Mental engagement, e.g., problem-solving or creative thinking
- Act – Personal identity and behaviors; a desire to engage or act
- Relate – Experiences that provoke a social identity; co-experiences (Schatz, p. 90).

Drawing from this, a **learning experience** is a class of experience that not only leaves an impression on someone, but also puts the person in a practical contact with something. This leads to that person to learn something through shared meaning making, reflective practice and intentional interaction in forms of human-computer interaction or human-human interaction as mediated through digital technologies. Learning experience refers to any interaction, course, program, or other experience in which learning takes place. This is true whether the learning experience occurs in formal

settings (schools, classrooms) or non-formal or informal settings (outside-of-school locations, outdoor environments), traditional educational interactions (students learning from teachers and professors) or nontraditional interactions (students learning through games and interactive software applications). In other words, learning experiences are not place-bound, nor are they bound to formal education.

Following this logic, **learning experience design** (i.e., LXD) is then an intentional design act to present the learner with a process of activities that is designed in a human-centered manner. LXD is impactful in that it leaves an impression on the learner, or puts them in practical contact with something, while the entire design is goal-oriented and informed with learning goals in mind (see Schmidt & Huang, 2021; Tawfik et al., 2021). As Schmidt and Huang (2021) describe, learning experience design is "a human-centric, theoretically-grounded, and socio-culturally sensitive approach to learning design, intended to propel learners towards identified learning goals, and informed by UXD methods" (p. 141).

Understanding How External Perspectives Contribute to and Differ from LXD

As noted above, LXD draws from multiple traditions. Depending on a person's background or context, LXD can be seen as a part of instructional design (ID), as a discipline informed by educational sciences, or as an extension of user experience design (UX) informed by the discipline of informatics, human-computer interaction (HCI), user-centered design (UCD), or software engineering (Schatz, 2019). To be sure, LXD encompasses many aspects of UX, UCD, and HCI, but also relies heavily on the traditions of instructional design and pedagogical methods. It can be tempting to consider LXD as distinct or separate from instructional design or user experience, but that is not our approach. Rather we argue that LXD sits alongside ID and UX as a complementary approach to design for learning. In a way, LXD is the logical evolution (or at least next step) of instructional design, combining ID and UX in a new form so as to design for digital learning experiences. As noted by Schatz (2019) in her discussion of interdisciplinary scholarship, "each of the disciplines [,...] can contribute to a maturing understanding of LXD" (p. 93).

LXD includes (a) capturing the quality of a learner's experience with learning technologies, (b) examining how easy or difficult it might be for learners to perform a task efficiently using a system, and (c) evaluating how appealing an educational technology might be. However, LXD encompasses more than these three foci. On the one hand, UX focuses on the user and how they interact with and experience a digital product, system or service. Simply extending the logic of UX, it seems obvious that the user would become the learner in LXD. However, this neglects fundamental differences of general product usage to accomplish a range of goals versus the specific use of learning technologies to accomplish learning-related goals. LXD does not focus on any user performing any task with any technology, but instead focuses on a specific class of user (the learner) who is engaged in a particular task (a learning task) while using a distinct type of technology (a technology tool designed for learning). This framing broadens the conceptual boundaries of LXD beyond those of sister disciplines (e.g., UX, HCI, UCD) to consider issues of how experiential elements might influence learning effectiveness and how perceptual factors might impact learner performance. For example, UX focuses on the user and how they interact with and experience a digital product, system or service. Applying the logic of UX to LXD, it is easy to replace the word *user* with the word learner. But *using* a product to accomplish a certain goal is much different than gaining knowledge or engaging in meaning-making while using a learning technology. The following examples illustrate our point:

1. In most K-12 schools and many postsecondary institutions, students do not have a choice of whether to use a technology or not, whereas in product design, users can abandon a poorly designed product in favor of something better.
2. Complicated learning technologies can be refined to streamline activities, be more easily understood, usable, enjoyable, etc., but in many cases, the activity of learning cannot be simplified or made easier. Learning is inherently dynamic and disruptive of prior knowledge, and the challenge of acquiring new knowledge and skills is what spurs growth, critical thinking, creativity, and problem-solving. No amount of great UX can account for this.
3. Learning goals are often set by educators or organizations, not learners. Most often, the educator sets the tone and designs the learning activities. In digital products and from a UX perspective, the user has their own goals, and the product or service provides a means for the user to accomplish her goals. However, this is often not the case in a learning context where learners have relatively little agency.
4. Although UX designers constantly monitor users' performance, UX design typically does not inform users how well they accomplish their goals. This is not to say that UX designers do not track key performance indicators to optimize system design. In contrast, assessment (usually in the form of grades) is central in formal education contexts**.** In informal learning contexts, formative or summative feedback is a crucial contributor to the learning process. The nature of performance indicators are fundamentally different in UX and education/learning contexts.

LXD as a Multidimensional, Interrelated, and Complex System

Having provided background on LXD, presented theories that have been used to inform LXD, and laid out the groundwork for a theory of LXD, we now segue to specific considerations of the components that might inform a theory of LXD. Specifically, we argue that a theory of LXD would have the aim to provide guidance in crafting effective learning experiences while taking into account the following dimensions:

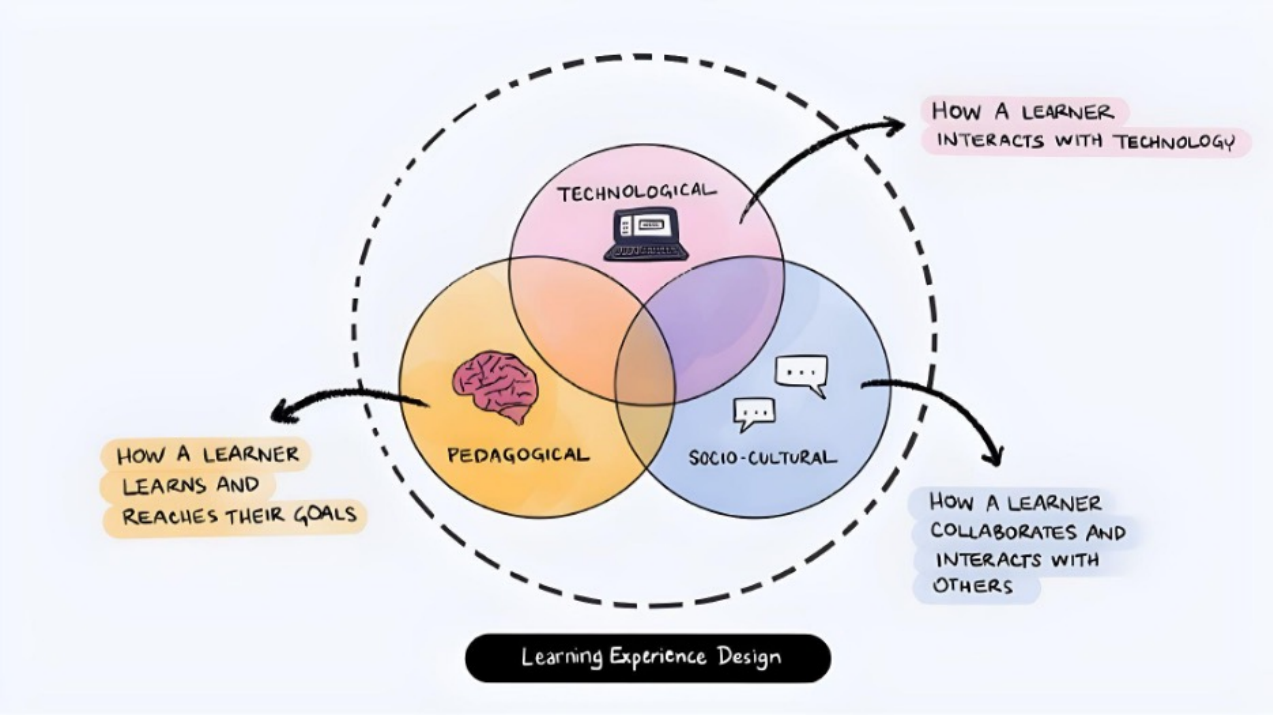
- the social/sociocultural dimension,
- the technological dimension, and
- the pedagogical dimension.

Figure 2 illustrates the three dimensions that influence LXD theory. As established above, LXD (1) has the goal of designing digitally-mediated learning experiences that are effective, efficient, and satisfying (i.e., the technological dimension), (2) takes into consideration how learning occurs and how learners reach their learning goals (i.e., the pedagogical dimension), as well asl (3) how learners collaborate and interact with one another through technology and how sociocultural elements influence these interactions (i.e., the social/sociocultural dimension). These dimensions should not be interpreted to be independent constructs, per-se. Instead, they represent an interconnected and interdependent system in which these three components reciprocally inform one another. This point is clarified by Jahnke and colleagues (2021):

Learning Experience Design encompasses all aspects of a learner's interaction with: (a) the digital technology/service/space; (b) the pedagogical components, such as course type, learning goals, learning activities, process-based assessment, and learner control; and (c) the social dimension, such as quality of communication forms, collaboration, sociality, social presence, and social interactivity (p. 431).

Figure 2

Sociotechnical-pedagogical dimensions of LXD theory



Socio-technical-pedagogical dimension of LXD

Continuing the above line of reasoning, the three dimensions laid out in the previous section can be characterized as a sociotechnical-pedagogical (STP) system. This view has been partially articulated by Jahnke and colleagues (2020) in their work that seeks to explore the construct of usability from a sociotechnical-pedagogical lens. Extending this perspective beyond usability to more broadly explain and describe the nature of LXD, we circle back to the theories we referenced in the "Existing Theories in the Field of Learning Experience Design" section above. From a LXD perspective, those theories can be classified using the dimensions of STP as being primarily social/sociocultural, technological, or pedagogical in nature. Some theories might be located at the intersections of these dimensions. While many of the theories referenced here originate from other fields (e.g., flow theory and its origins in cognitive psychology), they include important implications for how the field of learning design defines and applies elements of LXD (McDonald & Yanchar, 2020). However, these theories must be deconstructed and critically considered from a learning design perspective so as to avoid improper or inappropriate application. As an interconnected and complex system, the multidimensional nature of STP can provide a novel lens/conduit through which to critically consider the above-referenced theories from an LXD perspective.

First, the social/sociocultural dimension of LXD foregrounds the importance of social interaction to learning and acknowledges that experiences are not isolated events (Vygotsky, 1978). It draws from the foundations of social learning theory (Bandura, 1977), sociocultural theory, cultural usability (e.g., Vatrapu & Suthers, 2010), and cultural dimensions (Hofstede, 2001). These include considerations of the importance of context; accounting for learner diversity, equity, and inclusion (also for teachers, instructors, and administrators); adopting a conceptual view of learning not only as an individual act but as a social endeavor; and intentionally engaging in activities that will promote empathy for those who might have different sociocultural backgrounds. To reiterate the point made above, social/sociocultural considerations are insufficient to inform design for effective, efficient, and satisfying learning experiences from an LXD perspective, as it is the interplay of the social/sociotechnical dimension with the technological and pedagogical dimensions that produces synergistic effects.

Second, the technological dimension of LXD focuses on user experience, usability, and HCI-related topics (e.g., Hassenzahl, 2013). Central to this is the question of how to capture the quality of a learner's experience, how easy or difficult a task might be for a learner, and how effective, efficient, or satisfying an educational technology might be. The technological perspective broadly considers any user performing any task to accomplish a range of goals with any

product or service. However, a purely technological focus does not account for considerations of learning, which underscores why this dimension alone is insufficient in learning contexts. To further underscore this point:

- Not all users are learners;
- Not all technologies are learning technologies;
- Not all tasks are related to learning;
- Learners seldom get to choose technologies; and
- Learners seldom set their own goals.

Third and finally, the pedagogical dimension of LXD captures aspects of instructional and learning design (e.g., Merrill, 2012). It incorporates knowledge and principles from the field of ID, such as Merrill's (2012) first principles of instruction which underscore the centrality of creating pedagogical interventions and strategies that are effective, efficient, and appealing. However, pedagogical considerations alone are unhelpful to LXD, as LXD must also consider questions of system usability and sociocultural issues. For example, a learning technology could include all elements of Merrill's First Principles but present the content in a way that is difficult to navigate and includes extraneous interactions that might deter from the content. While the pedagogical dimension is central to learning, it must synergistically align with the technological and social/sociocultural dimensions.

To conclude, a theory of LXD: (a) foregrounds sensitivity to social and sociocultural aspects of learning, such as sociality, social presence, and social interactivity, as well as how culture influences communication and collaboration; (b) encompasses all technical aspects of the learner's interaction-in-context with a digital technology or service; and (c) considers pedagogical aspects of digital learning, such as the interaction with the learning space, learning goals, learning activities, forms of assessment, and learner controls. In LXD theory, sociocultural considerations are interrelated with notions of learner-centrism (Quintana et al., 2001; Soloway et al., 1994) and pedagogical usability (Hadjerrouit, 2012; Nokelainen, 2006; Silius et al., 2003). Ultimately, this synergistic confluence of the sociocultural, technological, and pedagogical dimensions—a sociotechnical pedagogical ecology—provides a multidimensional construct for understanding and describing individual, perceptive qualities of technology-mediated learning and informing learning experience design.

Conclusion, Final Remarks and Outlook

We propose a theory of LXD that draws from multiple traditions (i.e., user experience/technology design, learning design, and sociocultural studies). The proposed theory of LXD seeks to establish a depth of understanding of external perspectives that is currently absent in the field LIDT (as well as in outside disciplines). LXD theory has the aim to guide designers, researchers, and educators in crafting effective, efficient, and satisfying learning experiences while taking into account the social/sociocultural, technological, and pedagogical dimensions of digital learning. In doing so, LXD theory lays the theoretical foundation for ways to explore and connect UX research and methods with canonical instructional design theory and practice. In alignment with Honebein and Reigeluth (2021), the theory of LXD presented here has the broader goal to support research to improve, not just research to prove. Also, our proposed theory provides an operable framework for informing iterative and formative educational design research (EDR) studies, and, as such, can be considered a part of the broader family of approaches associated with EDR, i.e., design-based research, design-based implementation research, design and development research, etc. (McKenney & Reeves, 2018). We understand LXD theory as a design research framework in which the goal is to improve and optimize designed learning experiences by way of data-based decision-making and data-informed design. Our approach builds on design approaches and tools (e.g., personas, learner journeys) that are somewhat novel to the field of LIDT, presents fresh methods and units of analysis (e.g., interaction design, experience design), and provides a multidimensional perspective (e.g., sociocultural, technological, pedagogical) for informing the design of learning experiences in digital environments. We argue that LXD theory is a critical theory and that it provides a critical lens for interrogating design, application, and study of learning phenomena. We also conceive of LXD theory as transdisciplinary, that is, it serves as an interdependent confluence of multiple traditions that emerges as conceptually distinct. Finally, LXD represents a radical departure from muted calls

for learner centrism in our field, elevating the role of the learner to one that is paramount in the design of digital learning experiences.

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Maturation of Universal Design for Learning

From Design Framework to Theory

Susie L. Gronseth, Jill E. Stefaniak, & Elizabeth M. Dalton

Instructional Design | Universal Design for Learning | UDL | Curriculum Design | Instructional Technology

Universal Design for Learning (UDL) was conceptualized as a curriculum design framework grounded in neuroscience research addressing learner variability in the forefront of instructional design. We argue that over the past 30 years, UDL has "matured" from solely a curriculum design framework to now articulating key components characteristic of instructional-design theories. Framing UDL as an instructional-design theory further supports the mission of the Association for Educational Communications and Technology (AECT) and other instructional technology and education research professional organizations working to advance scholarship and best practices that support equitable and accessible learning and instruction.

In this paper, we argue that over the past 30 years, Universal Design for Learning (UDL) has "matured" from solely a curriculum design framework to now embodying key components that are characteristic of instructional-design theories (as framed by Reigeluth, 1983, 1999), including methods for facilitating learning and situational variables for desired learning outcomes and instructional conditions. UDL was conceptualized in the 1990s by the Center for Applied Special Technology (CAST) as a curriculum design framework grounded in neuroscience research addressing learner variability at the forefront of instructional design (CAST, 2022). UDL, as first defined in the US Department of Education (2008) Higher Education Opportunity Act, is:

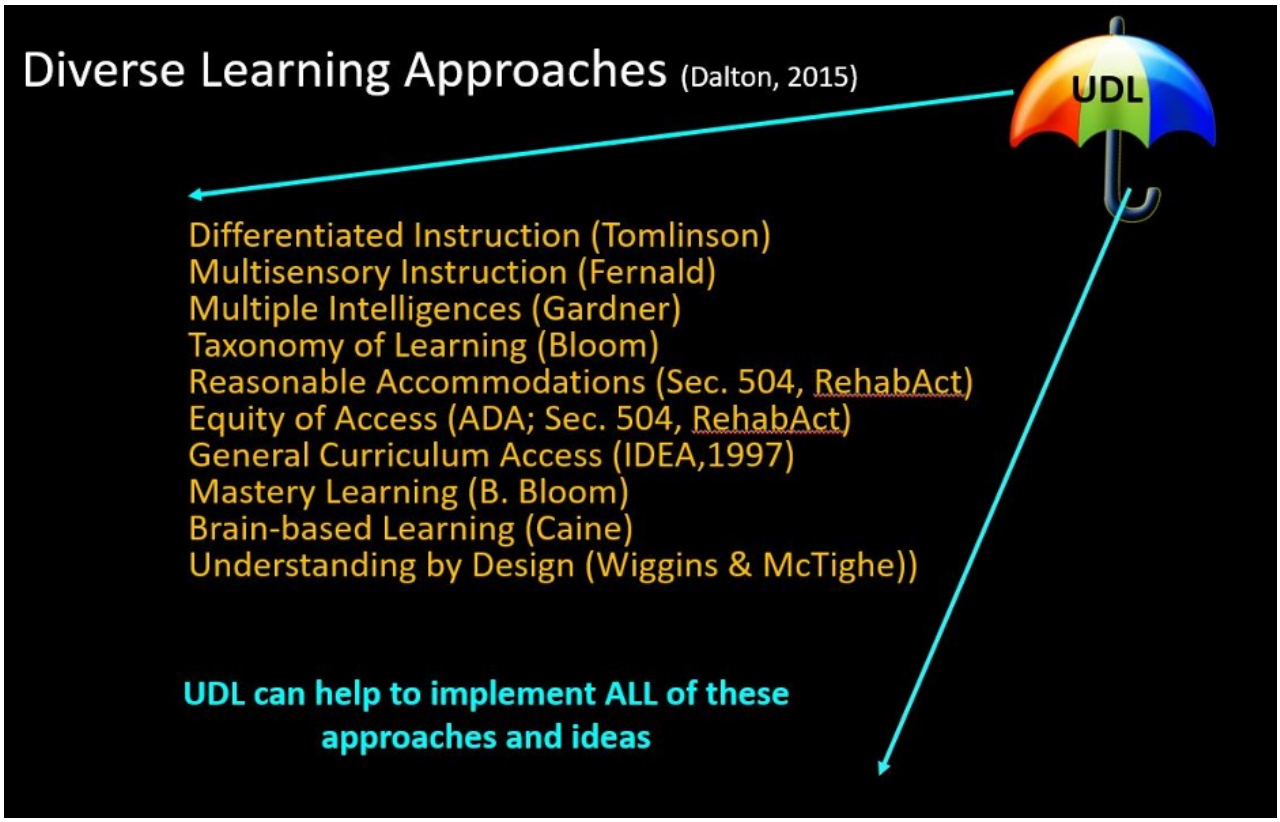
a scientifically valid framework for guiding educational practice that —(A) provides flexibility in the ways information is presented, in the ways students respond or demonstrate knowledge and skills, and in the ways students are engaged; and (B) reduces barriers in instruction, provides appropriate accommodations, supports, and challenges, and maintains high achievement expectations for all students, including students with disabilities and students who are limited English proficient.

UDL positions learner variability as the norm, and thus advises that variations of materials, methods, and assessments should be built into the design of lessons and instruction to benefit ALL students (Chita-Tegmark et al., 2012; Dalton, 2017). UDL's strategic variation vision is carried through three core principles: (a) multiple means of engagement, (b) multiple means of representation, and (c) multiple means of action and expression (Meyer & Rose, 2005; Rose & Gravel, 2009). The principles are further articulated through nine guidelines (three for each principle) and 31 associated checkpoints. Through this organizational structure, the framework components guide the application of varied instructional methods, materials, and experiences—so that every learner can become an "expert learner." The guidelines and checkpoints have a vertical order of progression that focuses first on education access, then the building of learning understandings, and ultimately internalization of learning strategies that lead to learner empowerment and self-

regulation. UDL also has a clear relationship with other diverse learning approaches, as depicted in Figure 1 (Dalton, 2015), through which the three core principles can be applied to support implementation of other related learning approaches.

Figure 1

UDL as an Umbrella Concept to Other Diverse Learning Approaches



With the rise of multiple universal design-related models (including UDL, as well as Universal Design [UD], Universal Design of Instruction [UDI], and Universal Instructional Design [UID]) and their implementation at scale in early stages of development, the need for further research in this area is great (Smith et al., 2019). Could a primary reason for the lack of quantifiable evidence of the value of UD-related methods in post-secondary educational settings be potentially theory-based? Thus, we propose that UDL may legitimately be viewed as an instructional-design theory and present our arguments grounded in literature that connects inclusive education, instructional design, and technology.

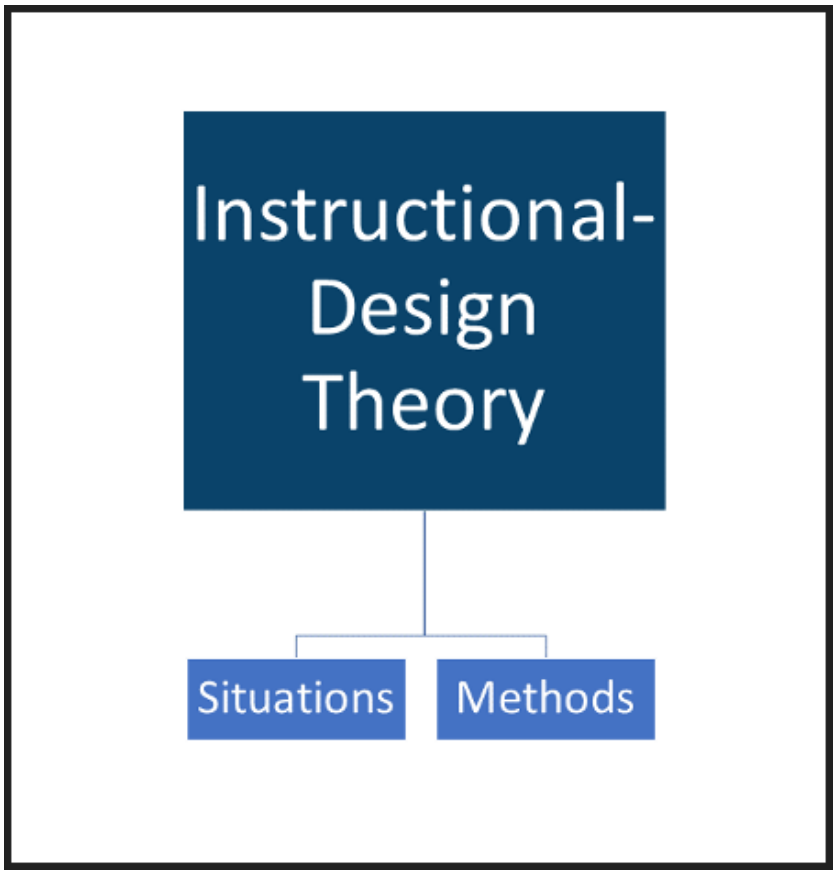
UDL as ID Theory

A theory is “a plausible or scientifically acceptable general principle or body of principles offered to explain phenomena” (Merriam-Webster, 2022). Theories help researchers to organize information, explain events, and make predictions. Educators and researchers have long relied on theories to provide patterns for interpretation, identify commonalities among research, supply frameworks to attribute importance to variables, and interpret the larger meaning of our findings. Bringing discussion of theory into instructional design, Robert Gagne’s (1965) theory of instruction challenged the field by recognizing the differences in learning across learning domains and how these differences could be connected to design of varied ways in which content is presented and assessed. Three decades later, Reigeluth (1999) characterized instructional-design theory as “a theory that offers explicit guidance on how to better help people learn and develop” and that it must include specific instructional method variables (p. 5). These variables address methods used to support and facilitate learning in ways that are likely to result in the attainment of learning goals (see Figure 2).

Instructional-design theories place emphasis on the means to attain goals focused on learning and development and are differentiated from learning theories in that they can be broken down into component methods to assist educators. In sum, instructional-design theories are characterized as being probabilistic regarding the attainment of goals.

Figure 2

Reigeluth's Components of Instructional-Design Theory



Inclusive education scholars David Rose and Anne Meyer (2002) laid the foundation for UDL in their seminal book, *Teaching Every Student in the Digital Age: Universal Design for Learning*, calling attention to the potential of leveraging digital technology to design equitable, flexible, and responsive learning environments for all students, regardless of the nature or scope of learner variation. From an instructional design and technology perspective, we propose that UDL, which is widely identified specifically as a curriculum design framework, is actually much more than that. We view UDL as meeting both the general definition of theory and the more specific definition of instructional-design theory, offering clear guidance to help people learn.

Based on our study of Reigeluth's (1999) characteristics of instructional-design theories, we conclude that UDL indeed fulfills these characteristics by addressing method variables such as instructional strategies, instructional platforms, and learning affordances as well as situational variables that comprise desired learning outcomes and instructional conditions. UDL supports the attainment of desired outcomes by serving as a theoretical foundation that guides instructional design in ways that support how people learn and develop. UDL assists educators and their students in attainment of desired outcomes by providing a mechanism that contributes to effective and efficient instruction, as well as an ease to learning. Meyer et al. (2014) articulated some key connections of UDL theory to practice, including—

- Planning for systematic variability from the beginning of instructional design
- Expecting and appreciating learner diversity
- Facilitating optimal levels of challenge
- Building-in scaffolds to develop learning expertise, and
- Providing support for teachers in their practice and continuing development (p. 68)

UDL in Conceptual Frameworks

UDL is increasingly being used to ground the conceptual frameworks for practice-based research, as evident in recent systematic reviews on UDL applications in various educational settings (Al-Azawei et al., 2016; Faggella-Luby et al., 2017; Ok et al., 2017; Seok et al., 2018). Studies featured within these reviews implicate UDL in terms of instructional methods variables (e.g., Basham et al., 2010; Katz, 2013; King-Sears et al., 2015) and situational environment variables (e.g., Coyne et al., 2012; Kennedy et al., 2014; Marino et al., 2014). In their synthesis of post-secondary education applications of UDL, UD, UDI, and UID, Faggella-Luby et al. (2017) report trends across 44 studies analyzed, including that (a) students and faculty value UD-related principles but may perceive their impact differently, (b) measured impacts of UD on academic outcomes for postsecondary students were very rare, and (c) faculty training and support are both beneficial and needed to implement UD models with fidelity.

Australian educational researcher, Matthew James Capp (2017) conducted a meta-analysis of empirical, peer-reviewed articles published during 2013-2016 and found 924 UDL research articles before narrowing his scope to just those with a pre-/post-test design. Across the remaining 18 studies, he concluded that the implementation of the UDL framework was found to improve the learning process for all students. However, he noted a curious limitation—many other studies may have been theoretically connected to UDL, as sometimes seems evident in an intervention's design alignment with UDL principles and guidelines, but such theoretical connections were not necessarily clearly articulated by the authors in the resulting publications.

UDL can also be seen as grounding the conceptual frameworks for present instructional designs and interventions. For example, the *Journal of Applied Instructional Design* special issue in 2021 focused on "Designing for All: An Exploration of Universal Design for Online Learning" and featured nine articles that attempted to cross the bridge between theory and practice. In each of the studies, UDL was used as the theoretical framework (e.g., Evmenova, 2021; Higgins & Maxwell, 2021; Kilpatrick et al., 2021) or in connection with other constructs, such as active learning (Rogers & Gronseth, 2021); social learning (Gagné & Grimaldi, 2021); attention, memory, and multi-tasking (Levicky-Townley et al., 2021); and diffusion of innovation (Oyarzun et al., 2021). The authors described applications of UDL in higher education course design in an array of subject matter areas (e.g., education, geoscience, public health), as well as faculty development and workforce development. It is worthwhile to note that in these articles, UDL connections to practice are sometimes at the level of the three principles—expanding options for engagement, representation of content, and learner action and expression—and sometimes applied through mapping of individual framework checkpoints to particular aspects of course design.

Bridging Theory to Practice

As education researchers, we need to know—what does UDL look like when it is theoretically applied to practice through strategic design and implementation of inclusive learning interventions? To go even further, how could UDL provide the theoretical framing for inquiry into more emergent educational technologies, like augmented reality (AR) learning research? Walker et al. (2017) argued for this connection between UDL theory and AR learning research, saying that AR is "uniquely positioned to support instruction within a UDL framework because the virtual objects that can be used in the AR system are flexible forms of media that can be leveraged" (p. 2). Stylianidou et al. (2020) in Cyprus and Greece carried this line of research forward in their design of a serious AR game called "Helping Nemo." They specifically connected UDL theory to aspects of their design, development, and implementation process. Through their multimodal intervention, they targeted second-grade student learning of selected Greek language, math, and arts second-grade

content objectives. They reported findings of higher levels of student engagement and participation for all students, including bilingual students and students with and without identified disabilities.

UDL is strong in its clarity for describing methods of how strategic flexibility and learner empowerment embody inclusively designed instruction; however, there is room for growth in how to implement UDL with fidelity. Faggella-Luby et al.'s (2017) discovery of few empirical studies on the effectiveness of UD-related impact on student outcomes fits with other literature findings (McGuire, 2014; Roberts et al., 2011). Thus, considerable variability may be observed in connecting UDL theory to practice. Further, if our argument for UDL as "a theory that offers explicit guidance on how to better help people learn and develop" (Reigeluth, 1999 p. 5) is correct, then research evidence should demonstrate that the principles of this theory have associated results. The literature reviewed points to instances of initial evidence; however, much more research is needed and recommended to definitively make such a claim.

International Implications

Interest and commitment to inclusive education and equity of access for all students has become a top priority around the world, driven by three landmark UNESCO documents. The World Declaration on Education for All (UNESCO, 1990) established that "Every person–child, youth and adult–shall be able to benefit from educational opportunities designed to meet their basic learning needs." The UNESCO (1994) Salamanca Statement & Framework for Action for learners with disabilities specifies the "fundamental right of every child to education, the uniqueness of every child's abilities and needs, [and] the importance of designing education systems to address diversity." Most recently, the UNESCO (2020) *Global Education Monitoring* report entitled "Inclusion and Education: All Means All" identifies UDL at least 16 times as a recommended approach to achieve global inclusive education. Recognition of UDL as inclusive design theory would further empower governments and universities around the world with a powerful theoretical tool to build positive and inclusive world-wide systems change.

Similar to other instructional-design theories, UDL is probabilistic, as application of its methods does not guarantee target learning outcomes but increases the probability of effective learning through its principles. The literature base that connects UDL as theory to practice is building, with examples across varied instructional contexts around the world. The spread of UDL into instructional design thinking and practice has attended to how methods integrate with educational practices and philosophies in differing cultures and available resources. Alumen (2020) reports on how UDL is being applied by Kuwaiti teachers, finding the theory to be universal and "not associated with a specific culture, but rather it is attached to the learning needs of students with and without disabilities" (p. 12). *Universal Access Through Inclusive Instructional Design: International Perspectives on UDL* (Gronseth & Dalton, 2020) features 47 chapters of UDL applications in over 15 countries (including Jamaica, Ecuador, Chile, Spain, England, Ireland, Sweden, Germany, Israel, South Africa, India, Thailand, Philippines, China, Japan, Australia, Canada, and US), highlighting widely ranging practices and outcomes. Another text focused on UDL applications in higher education, *Transforming Higher Education Through Universal Design for Learning: An International Perspective* (Bracken & Novak, 2019) includes additional discussions from authors in Norway and Brazil. UDL can even be seen in country-specific legislation such as Chile's Decree 83/2015: "Universal Design for Learning is a strategy that responds to diversity, whose goal is to maximize learning opportunities of all students, considering the broad spectrum of abilities, learning styles and preferences" (Ministerio de Educación Gobierno de Chile, 2015, p. 6). Clearly, UDL has begun to be recognized on a global scale as an effective means to support learning and instruction.

Though at the time of this writing, there are very limited empirical studies published in the Association for Educational Communications and Technology (AECT) high impact journal *Educational Technology Research & Development (ETR&D)* that specify UDL as part of the theoretical framing, Maria Santos and colleagues from Portugal are among the first with their 2017 Development section article about a digital learning environment to promote mathematical reasoning in students with Autism Spectrum Disorder (Santos et al., 2017). More such work is anticipated, as UDL researchers involved in CAST's UDL-Implementation and Research Network (UDL-IRN), the Society for Information Technology and Teacher Education (SITE)'s UDL Special Interest Group (UDL SIG), the International Society for Technology in Education (ISTE)'s Inclusive Learning Network, the INCLUDE Collaboratory, and others are working to

clarify how to measure and document UDL interventions in research. Such “growing pains” are characteristic of instructional-design theories that seek to foster education reform more broadly, as Pogrow (1996) remarks, “Reform requires technology, methodology, structure, dosages, and materials. It is far more difficult to figure out how to implement theory than it is to generate it” (p. 658). Work in this area is underway, with leaders in the field, such as Edyburn (2020), calling attention to the need for “guidelines about the dosage of a UDL intervention needed to achieve access, engagement, and success in demonstrating a learning outcome” (p. 340).

Future Directions and Connections to the Field

AECT is an instrumental organization for those actively involved in the design of instruction and systematic approaches to learning. Recognizing UDL as an instructional-design theory further supports the organizational mission to provide international leadership by promoting scholarship and best practices in the creation, use, and management of technologies for effective teaching and learning. In doing so, it will stabilize how UDL is referenced in scholarship and support sustainable efforts to provide inclusive education on a global scale.

To realize this aim, the research base on UDL, its relationship with other learning and design theories, and its measured impact when applied as an instructional-design theory must expand. Proof of the validity and reliability of UDL as a guiding theory for positive and inclusive learning results is both needed and welcomed. Professional regional, national, and international research-focused educational organizations and centers such as ISTE, SITE, UDL-IRN, INCLUDE Collaboratory, Organisation for Economic Co-operation and Development (OECD) Centre for Educational Research and Innovation (CERI), Institute of Education Sciences (IES) National Center for Education Research (NCER), American Educational Research Association (AERA), Horizon Europe, and Erasmus+, in conjunction with research universities, need to be included in the expanded effort to build the research base on inclusive instructional design and UDL.

Conclusion

In summary, we argue that UDL embodies an instructional-design theory in that it (a) is design-oriented, (b) addresses methods of instruction and situational factors in which those methods should be used, (c) provides more detailed component methods (through its guidelines and checkpoints), and (d) is probabilistic in creating instructional environments that are likely to meet varied learner needs. UDL supports educators and their students in the attainment of desired outcomes by providing a mechanism that contributes to greater likelihood of effective and efficient instruction as well as addressing equity and accessibility considerations.

Recognizing UDL as an instructional-design theory highlights the importance of thoughtful practice that actively engages learners; this, in turn, will likely enable researchers, practitioners, and scholars both within the AECT community and beyond to be responsive to the needs of a widely varied learner community through change that is supported by research outcomes.

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