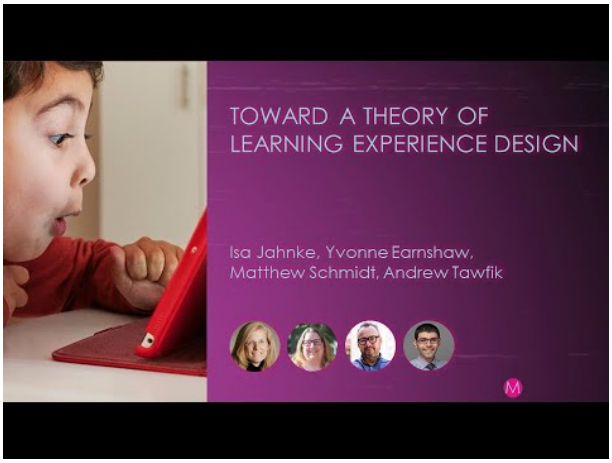
Theoretical Considerations of Learning Experience Design

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

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.



Watch on YouTube https://edtechbooks.org/-xfJfH

> 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.

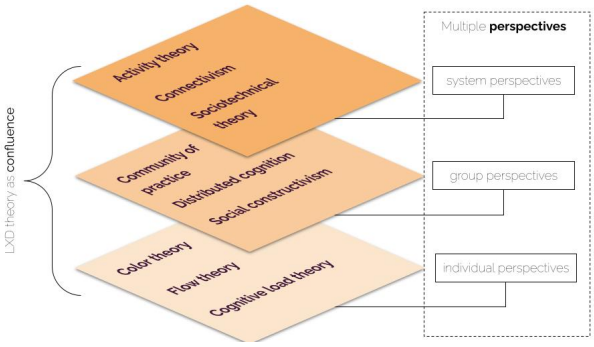
Although LXD is an important part of design, a theoretical foundation is needed to more explicitly elaborate and bound this phenomenon. We therefore suggest a timely and urgent need exists to develop a theory of LXD for framing research, informing design, and predicting experience.

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:

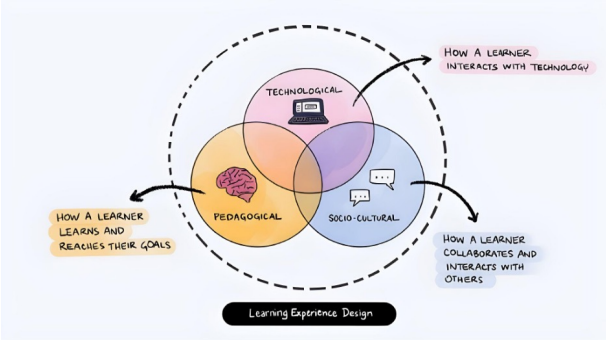
- the social/sociocultural dimension,
- the technological dimension, and
- the pedagogical dimension.

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.

References

Baek, E.-O., Cagiltay, K., Boling, E., & Frick, T. (2008). User-centered design and development. In J. M. Spector, M. D. Merrill, J. G. van Merriënboer, & M. P. Driscoll (Eds.), *Handbook of research on educational communications and technology* (3rd ed., pp. 659-670). Routledge.

Bandura, A. (1977). *Social learning theory*. Prentice Hall.

Barab, S. A., Thomas, M., Dodge, T., Carteaux, R., & Tuzun, H. (2005). Making learning fun: Quest Atlantis, a game without guns. *Educational Technology Research and Development, 53*(1), 86-107.

Bowen, K., Forssell, K. S., & Rosier, S. (2020). Theories of change in learning experience (LX) design. In M. Schmidt, A. A. Tawfik, I. Jahnke, & Y. Earnshaw (Eds.), *Learner and user experience research: An introduction for the field of learning design & technology*. EdTech Books. https://edtechbooks.org/-AQt

Cheng, K.-H. (2019). Parents' user experiences of augmented reality book reading: Perceptions, expectations, and intentions. *Educational Technology Research and Development, 67*(2), 303–315. https://doi.org/10/gjh33b

Dimitrijević, S., & Devedžić, V. (2021). Utilitarian and experiential aspects in acceptance models for learning technology. *Educational Technology Research and Development, 69*, 627-654. https://doi.org/10/gjh33f

Ebner, M., & Holzinger, A. (2007). Successful implementation of user-centered game based learning in higher education: An example from civil engineering. *Computers & Education, 49*(3), 873-890. https://doi.org/10/c49f6n

Engeström, Y. (2000). Activity theory as a framework for analyzing and redesigning work. *Ergonomics*, *43*(7), 960–974. https://doi.org/10/b39br2

Fernandez-Lopez, A., Rodriguez-Fortiz, M. J., Rodriguez-Almendros, M. L., & Martinez-Segura, M. J. (2013). Mobile learning technology based on iOS devices to support students with special education needs. *Computers & Education, 61*, 77-90. https://doi.org/10/f4hnzg

Gray, C. M. (2020). Paradigms of knowledge production in human-computer interaction: Towards a framing for learner experience (LX) design. In M. Schmidt, A. A. Tawfik, I. Jahnke, & Y. Earnshaw (Eds.), *Learner and user experience research: An introduction for the field of learning design & technology*. EdTech Books. https://edtechbooks.org/-wvCD

Hadjerrouit, S. (2012). Investigating technical and pedagogical usability issues of collaborative learning with wikis. *Informatics in Education*, *11*(1), 45–64. https://doi.org/10/ghdx4g

Hassenzahl, M. (2013). User experience and experience design. In M. Soegaard & R. F. Dam (Eds.), *The encyclopedia of human-computer interaction* (2nd ed.). Interaction Design Foundation. https://www.interaction-design.org/literature/book/the-encyclopedia-of-human-computer -interaction-2nd-ed/user-experience-and-experience-design

Hofstede, G. (2001). *Culture's consequences: Comparing values, behaviors, institutions, and organizations across nations*. Sage.

Hollan, J., Hutchins, E., & Kirsh, D. (2000). Distributed cognition: Toward a new foundation for human-computer interaction research. *ACM Transactions on Computer Human Interaction*, *7*(2), 174–196. https://doi.org/10/cbdnrv

Honebein, P. C., & Honebein, C. H. (2015). Effectiveness, efficiency, and appeal: Pick any two? The influence of learning domains and learning outcomes on designer judgments of useful instructional methods. *Educational Technology Research and Development, 63*(6), 937-955.

Honebein, P. C., & Reigeluth, C. M. (2021). Making good design judgments via the instructional theory framework. In J. K. McDonald & R. E. West (Eds.), *Design for learning: Principles, processes & praxis*. EdTechBooks. https://edtechbooks.org/-qKNY

Jahnke, I., Riedel, N., Singh, K., & Moore, J. (2021). Advancing sociotechnical-pedagogical heuristics for the usability evaluation of online courses for adult learners. *Online Learning Journal*. https://edtechbooks.org/-MPk

Jahnke, I., Schmidt, M., Pham, M., & Singh, K. (2020). Sociotechnical-pedagogical usability for designing and evaluating learner experience in technology-enhanced environments. In M. Schmidt, A. A. Tawfik, I. Jahnke, & Y. Earnshaw (Eds.), *Learner and user experience research: An introduction for the field of learning design & technology*. EdTech Books. https://edtechbooks.org/-Qoj

Kaptelinin, V., & Nardi, B. (2018). Activity theory as a framework for human-technology interaction research. *Mind, Culture, and Activity*, *25*(1), 3–5.

https://doi.org/10/ggndhm

Kimmons, R. (2020). Color theory in experience design. In M. Schmidt, A. A. Tawfik, I. Jahnke, & Y. Earnshaw (Eds.), *Learner and user experience research: An introduction for the field of learning design & technology*. EdTech Books. https://edtechbooks.org/-LIV

Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. Prentice-Hall.

Matthews, M. T., & Yanchar, S. C. (2018). Instructional design as manipulation of, or cooperation with, learners? *TechTrends, 62*(2), 152–157. https://doi.org/10/gjh384

McDonald, J. K., & Yanchar, S. C. (2020). Towards a view of originary theory in instructional design. *Educational Technology Research and Development*, *68*(2), 633–651. https://edtechbooks.org/-Znbg

McKenney, S., & Reeves, T. C. (2018). *Conducting educational design research*. Routledge.

Merrill, M. D. (2012). *First principles of instruction: Identifying and designing effective, efficient, and engaging instruction*. Pfeiffer.

Merrill, M. D., Drake, L., Lacy, M. J., Pratt, J., & ID_2 Research Group (1996). Reclaiming instructional design. *Educational Technology*, 5-7.

Merrill, M. D., (2018). Using the First Principles of Instruction to make instruction effective, efficient, and engaging. In R. E. West (Ed.), *Foundations of learning and instructional design technology.* EdTechBooks. https://edtechbooks.org/-Gnmv

Nakamura, J., & Csikszentmihalyi, M. (2009). Flow theory and research. In C. R. Snyder & S. J. Lopez (Eds.), *Handbook of positive psychology* (pp. 195–206). Oxford University Press.

Nielsen, J. (1994a). Enhancing the explanatory power of usability heuristics. *CHI '94: Proceedings of the SIGCHI conference on human factors in computer systems* (pp. 152-158). ACM.

Nielsen, J. (1994b). Heuristic evaluation. In J. Nielsen & R. Mack (Eds.), *Usability inspection methods* (pp. 25-62). John Wiley & Sons,

Nokelainen, P. (2006). An empirical assessment of pedagogical usability criteria for digital learning material with elementary school students. *Journal of Educational Technology & Society*. https://edtechbooks.org/-vuZ

Quintana, C., Carra, A., Krajcik, J., & Soloway, E. (2001). Learner-centered design: Reflections and new directions. In J. Carroll (Ed.), *Human-computer interaction in the new millennium* (pp. 605–626). Addison-Wesley Professional.

Quintana, C., Krajcik, J., & Soloway, E. (2000). Exploring a structured definition for learner-centered design. In B. Fishman & S. O'Connor-Divelbiss (Eds.), *Fourth international conference of the learning sciences* (pp. 256-263). Erlbaum.

Schatz, S. (2019). Learning experience design. In J. J. Walcutt & S. Schatz (Eds.), *Modernizing learning: Building the future learning ecosystem* (pp. 83-102). Government Publishing Office.

Schmidt M., & Huang, R. (2021). Defining learning experience design: Voices from the field of learning design & technology. *TechTrends.* https://edtechbooks.org/-JeB

Schmidt, M., & Tawfik, A. A. (2022). Activity theory as a lens for developing and applying personas and scenarios in learning experience design. *Journal of Applied Instructional Design, 11*(1). https://edtechbooks.org/-spMp

Schmidt, M., Tawfik, A. A., Jahnke, I., & Earnshaw, Y. (Eds.). (2020). *Learner and User Experience Research: An Introduction for the Field of Learning Design & Technology*. EdTech Books. https://edtechbooks.org/ux

Shernoff, E. S., Von Schalscha, K., Gabbard, J. L., Delmarre, A., Frazier, S. L., Buche, C., Lisetti, C. (2020). Evaluating the usability and instructional design quality of Interactive Virtual Training for Teachers (IVT-T). *Educational Technology Research and Development, 68*(6), 3235-3262. https://edtechbooks.org/-ZhIA

Silius, K., Tervakari, A.-M., & Pohjolainen, S. (2003). A multidisciplinary tool for the evaluation of usability, pedagogical usability, accessibility and informational quality of web-based courses. *The Eleventh International PEG Conference: Powerful ICT for Teaching and Learning*, *28*, 1–10.

Soloway, E., Guzdial, M., & Hay, K. E. (1994). Learner-centered design: The challenge for HCI in the 21st century. *Interactions*, *1*(2), 36–48. https://doi.org/10/d2kw7v

Stefaniak, J. E., & Sentz, J. (2020). The role of needs assessment to validate contextual factors related to user experience design practices. In M. Schmidt, A. A. Tawfik, I. Jahnke, & Y. Earnshaw (Eds.), *Learner*

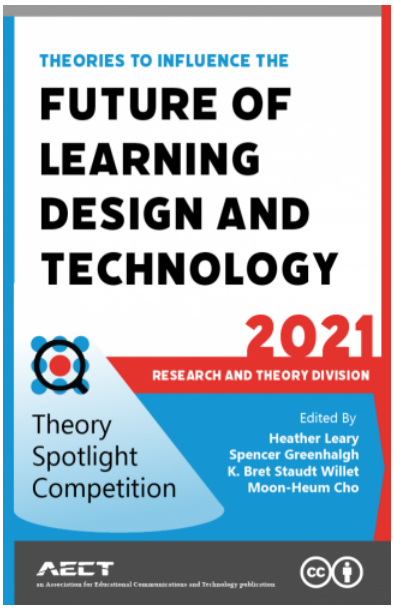
and user experience research: An introduction for the field of learning design & technology. EdTech Books. https://edtechbooks.org/-IZHa

Sweller, J., Merriënboer, J. J. G., & Paas, F. G. W. C. (1998). Cognitive architecture and instructional design. *Educational Psychology Review*, *10*, 251–296. https://doi.org/10/fxd3d5

Tawfik, A. A., Gatewood, J., Gish-Lieberman, J. J., & Hampton, A. J. (2021). Toward a definition of learning experience design. *Technology, Knowledge, and Learning*, *27*, 309-334. https://doi.org/10/gh27hp

Vatrapu, R., & Suthers, D. (2010). Intra- and inter-cultural usability in computer-supported collaboration. *Journal of Usability Studies, 5*(4), 172-197.

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.



Jahnke, I., Schmidt, M., Earnshaw, Y., & Tawfik, A. A. (2022). Theoretical Considerations of Learning Experience Design. In H. Leary, S. P. Greenhalgh, K. B. Staudt Willet, & M. H. Cho (Eds.), *Theories to Influence the Future of Learning Design and Technology*. EdTech Books. https://edtechbooks.org/theory_comp_2021/toward_theory_of_LXD_jahnke_earnshaw_schmidt_tawfik