The Journal of Applied Instructional Design

Learning Experience Design: Informing Practice and Extending the Tradition

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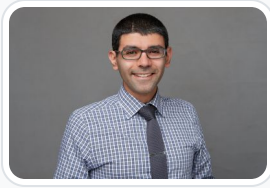

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About the Journal

During the past 50 years, journals in the field of instructional design have been responsive to the changing needs of both scholars and to a lesser degree, the practitioner. We have seen an evolution of AVCR to ECTJ, the emergence of JID, and finally the merging of ECTJ and JID to form ETR&D. ETR&D is a widely recognized, scholarly journal in our field that maintains rigorous standards for publications.

During the past 50 years, we have also witnessed a change in the field due in part to the success of instructional design in business and other nonschool environments. The number of instructional designers working outside the university has dramatically increased. Of particular importance is the rise in the number of instructional designers with doctorates who consider themselves practitioners, but not necessarily scholars. This growing group of designers might be best described as reflective practitioners who can make a significant contribution to the knowledge of our field.

This growth and success in the application of instructional design has also changed the field. From the early days of the field until the mid-1980's, the theory and practice of instructional design was almost exclusively influenced by the academic community. With the growth of instructional designers, the theory and practice of the field is now defined by both academics and practitioners. There is a need for greater communication between the scholars and the practitioners in a scholarly journal that will support innovation and growth of our knowledge base.

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Goals

The purpose of this journal is to bridge the gap between theory and practice by providing reflective practitioners a means for publishing articles related to the field. The journal establishes and maintains a scholarly standard with the appropriate rigor for articles based on design and development projects. Articles include evaluation reports (summative and formative), lessons learned, design and development approaches, as well as applied research. The articles are based on design and development projects as opposed to pure research projects and focus on lessons learned and how to improve the instructional design process. Rigor is established through articles grounded in research and theory.

A secondary goal of this journal is to encourage and nurture the development of the reflective practitioner in the field of instructional design. This journal encourages the practitioner as well as collaborations between academics and practitioners as a means of disseminating and developing new ideas in instructional design. The resulting articles inform both the study and practice of instructional design.

Philosophy

This journal will provide a peer-reviewed format for the publication of scholarly articles in the field of applied instructional design. The journal recognizes the role of the practitioner in the work environment and realizes that outside constraints may limit the data collection and analysis process in applied settings. The limitations of real-world instructional design of the practitioner can still provide valuable knowledge for the field.

Sponsoring Organization

JAID is a publication of the Association for Educational Communications and Technology (AECT).

JAID is an online open-access journal and is offered without cost to users.

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About AECT

The Association for Educational Communications and Technology (AECT) is a professional association of instructional designers, educators and professionals who provide leadership and advise policy makers in order to sustain a continuous effort to enrich teaching and learning. Seizing opportunities to raise awareness and leverage technology, our members may be found around the world in colleges and universities, in the Armed Forces and industry, in museums, libraries, and hospitals, and in the many places where educational change is underway. Our research and scholarly activity contribute to the knowledge base in the field of Learning. We are on the cutting edge of new developments and innovations in research and application.

AECT is the premier organization for those actively involved in the design of instruction and a systematic approach to learning. We provide an international forum for the exchange and dissemination of ideas for our members and for target audiences. We are the national and international voice for improvement of instruction and the most recognized association of information concerning a wide range of instructional and educational technology. We have 24 state and six International Affiliates all passionate about finding better ways to help people learn.

Since 1923, AECT has been the professional home for this field of interest and has continuously maintained a central position in the field, promoting high standards, in both scholarship and practice with nine Divisions and a Graduate Student Assembly that represent the breadth and depth of the field. Other journals sponsored by AECT include *Educational Technology Research and Development* and *TechTrends*.

The Journal of Applied Instructional Design (JAID) is a refereed online journal designed for the publication of scholarly articles in the field of applied Instructional Design. The purpose of JAID is to provide the reflective ID scholar-practitioners and researchers a means for publishing articles on the nature and practice of ID that will support the innovation and growth of our knowledge base. The journal is for practitioners, instructors, students, and researchers of instructional design.

Call for Submissions

JAID is for reflective scholar-practitioners, who through documentation of their practice in ID, make significant contributions to the knowledge of our field. Authors are invited to submit articles documenting new or revised approaches to ID; the processes of ID including in-depth documentation of analysis, design, and development, implementation and evaluation; design-based research; as well as applied research. Articles must be based on instructional design projects as opposed to pure research projects and focus on documented processes, lessons learned, and how to improve the overall process of ID. Articles must be grounded in research and theory connecting the intellectual foundations of the ID field and how these foundations shape its practice.

The journal will establish and maintain a scholarly standard with the appropriate rigor for articles based on design and development projects. A secondary goal of this journal is to encourage and nurture the development of the reflective practitioner in the field of ID. This journal encourages the practitioner as well as collaborations between academics and practitioners as a means of disseminating and developing new ideas in ID. The resulting articles should inform both the study and practice of ID.

Submit an Article

Article Types

JAID currently accepts submissions of three article types.

Instructional Design Practice

This is an applied journal serving a practicing community. Our focus is on what practitioners are doing in authentic contexts and their observed results. These articles cover topics of broad concern to instructional design practitioners. The articles should represent issues of practical importance to working designers.

Research Studies on Applied Instructional Design

JAID is interested in publishing empirical studies exploring the application of instructional design principles in applied settings. Quantitative and qualitative studies are welcome.

Instructional Design/Performance Design Position Papers

JAID also accepts position papers that attempt to bridge theory and practice. Examples may include conceptual frameworks and new ideas facing the instructional design community. The paper must also provide enough information to allow the replication of the innovation or continuation of the research in other settings. Position papers must be based in the context of a theoretical framework. Efficacy data is strongly preferred, but not always required, contingent upon the potential generalizability or value of the innovation.

Submission Guidelines

The journal will focus on in-depth applications of the ID process and publish a variety of articles including case studies of the ID process; application articles that go beyond a mere how-to approach that provide implementation insights, guidance and evaluation of a process; evaluation articles that focus on the viability of a product or process; applied research resulting from evaluation of materials, studies of project implementation, articles on ways to improve the ID process from the perspective of the practitioner, and short essays that provide a scholarly debate of relevant issues related to the application of ID and relevant book reviews. When applicable, articles should include supplementary materials including examples of ID products, evaluation instruments, media files, and design artifacts.

The articles in the journal will be from the perspective of the scholar-practitioner rather than from the researcher. However, the manuscripts must demonstrate scholarly rigor appropriate to applied manuscripts.

Articles, including tables or figures, must follow APA 7th edition formatting and be submitted in a word or doc format using at least 12-point New Times Roman font. Each article must have an abstract (75-100 words) and a list of keywords. While there is some flexibility in the length of an article, 4,000 to 5,000 words is a best-guess estimate. If in doubt, contact the editor prior to submitting the article. Identifying information must only be located on the cover page including contact information for the first author.

You may contact the editor via email, if you have further questions.

Contact the Editor

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Informing Practice and Extending the Tradition of LXD: Introducing the Special Issue

Yvonne Earnshaw & Matthew Schmidt

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Tracing Our Journey with Learning Experience Design

By all accounts, the phenemonon of Learning Experience Design (LXD) continues to evolve and gain prominence. Our journey with LXD, as the editors of this special issue, has spanned several years leading up to this publication. In 2017, we (along with Andrew Tawfik) started our initial conversations about LXD and wrote a book chapter entitled "User Experience Design" (Earnshaw et al., 2018) for Rick West's first edition of the *Foundations of instructional design and technology* book (West, 2018). The chapter was well received, and thus, our conversations about how user experience methods could be applied to the field of instructional design and technology continued. Shortly thereafter at an Association for Educational Communications and Technology (AECT) convention, we were introduced to Isa Jahnke, who at the time was the Director of the Information Experience Lab at the University of Missouri. She joined our ongoing conversations about LXD, which led to an edited book in 2020 entitled *Learner and user experience design research: An introduction for the field of learning design & technology* (Schmidt et al., 2020). Since then, we have had a number of presentations at AECT conventions and have been invited guest speakers and discussants in other spaces. In 2021 at the AECT convention, we presented our theory on LXD for the AECT Research and Theory Division Theory Competition. We received the People's Choice Award for our theory. Our chapter on "Theoretical Considerations of Learning Experience Design" (Jahnke et al., 2022) is published in Heather Leary, Spencer P. Greenhalgh, K. Bret Staudt Willet, and Moon-Heum Cho's (2022) edited book on *Theories to influence the future of learning design and technology: 2021 AECT RTD theory spotlight competition.* Building on our continuous engagement with LXD, in 2023, the theme of the AECT Summer Research Symposium was centered around LXD, and an edited book based on the papers presented at the symposium will be published in 2024.

As we pursued these achievements, we were fortunate to encounter passionate scholars deeply interested in this topic. Among them were Tammy Huang and Noah Glaser, both of who studied under Matthew Schmidt and have since transitioned into faculty roles. Their work embodies the LXD tradition, and given their dedication and expertise, we felt it was only fitting to invite them to join us as editors for this special issue. In addition to this special issue, we will also be participating with them at this year's AECT convention, where we will be engaging in a range of concurrent sessions and panel discussions on LXD and related research. Their contributions have been invaluable in shaping the narrative and direction of our collective endeavor. Reflecting on this journey, it is evident that the realm of LXD research is not only vibrant but also highly productive. The continuous exploration, discussions, and contributions from scholars and practitioners alike have solidified LXD's position as a pivotal area of study.

The evolving landscape of LXD has brought forth numerous terminologies and methodologies, sparking debates and discussions among professionals. Over the past several years, we have had many discussions with colleagues about LXD and how we can better define LXD. Is it just a new term for instructional design? What makes the distinction between LXD and instructional design? For us, LXD goes beyond the traditional viewpoint of instructional design, as evidenced by its definition: “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” (Schmidt & Huang, 2022, p. 151). Furthermore, LXD is transdiscplinary. It not only draws from fields such as psychology, educational technology, instructional design, and human-computer interaction, but also represents a synergistic confluence of these disparate traditions. LXD's emphasis on human-computer interaction is critical. However, LXD not only takes into account how learners interact with technology, but also the sociocultural and pedagogical dimensions of these interactions and how this influences learning (Jahnke et al., 2020). We need to see how the learner is interacting with their peers and the instructor. We must also see how the learner is assessed. Hence, drawing from a pure user experience (UX) or usability perspective is insufficient because learning goals are not included. UX and HCI are largely technocentric, that is, the emphasis is primarily on the technology and how a user interacts with the technology. However, with LXD, learning is central. Indeed, as Gray and Boling (2023) point out in this special issue, without learning, LXD fails to differentiate itself in any recognizable way from UX. The holistic, transdisciplinary approach of LXD places emphasis on technology, human interaction, and the learning process itself. As such, LXD offers exciting possibilities for moving beyond the traditional focus areas of effectiveness, efficiency, and appeal, and into areas of design that traditionally have received less attention. In reflecting upon the contributions to this special issue, we are invigorated by the diversity and depth of ideas and perspectives presented. The innovative thinking and provocative discourses showcased here suggest that LXD research and practice is injecting renewed vitality into the field of learning design while at the same time inspiring us to question our assumptions and push our boundaries. We look forward to continuing these conversations.

Inside the Special Issue

From the start of planning this special issue, we aimed to gather a wide range of views on LXD. Our efforts attracted 10 articles, each showing different ways LXD methods are used, how various models fit in, and what experts think about LXD. In addition, we wanted to invite prominent authors to contribute to the special issue. By invitation, Colin Gray, Elizabeth Boling, Jason McDonald, and Charles Reigeluth have graciously contributed their viewpoints on LXD. For these invited authors, we hosted a mini-symposium where they could discuss their rough drafts and ideas with other invited authors. This led to 3 additional articles, bringing the total to 13 articles. Below, each of these articles is briefly described. It is our hope that readers of this special issue will be inspired by the discussions that are taking place within and across this corpus of literature.

In the article "Do-It-Yourself, Low-Cost Pop-Up Usability Labs for Learning Experience Designers," authors Matthew Schmidt and Yvonne Earnshaw build upon their original book chapter on user experience design (Earnshaw et al., 2017) to offer practical guidance, especially beneficial for newcomers, on how to set-up a usability lab for evaluating educational and learning technologies. They provide no-cost and low-cost solutions for setting up a portable usabilty lab, including hardware and software configurations as well as options for integrating various LXD methodologies. They also offer insights on how to use the portable usability lab to conduct usability evaluations. The authors' pragmatic approach helps demystify the process of usability testing, making it more accessible and achievable for educators and designers alike, regardless of budget constraints.

In her research study, "Designing and Evaluating a 3D Virtual World Game for English Language Learning: A Learning Experience Design Approach," Rui (Tammy) Huang describes the process and outcomes of an iterative, three-phase approach to enhance the usability of a 3D virtual world game created using Mozilla Hubs and Mozilla Spoke. She uses several key LXD methodologies, including empathy interviews, cognitive walkthroughs, heuristic evaluation, and task-based think-aloud usability testing, to ensure a more comprehensive analysis. Huang's application of LXD

methodologies not only underscores the importance of a learner-centered design approach but also offers a valuable blueprint for practitioners aiming to optimize learning experiences within immersive learning environments.

Ji Hyun Yu describes the role of the learning experience designer in "Learning Experience Design as Collective Praxis: Two Design Cases From Higher Education." She argues that critical pedagogy, which takes into account power structures, can be used by learning experience designers to create a more equitable learning experience. This includes using LXD methodologies in the design and development of online courses. Yu's exploration into the intersection of critical pedagogy and LXD offers a fresh perspective, emphasizing the potential for designers to foster more inclusive and just learning environments.

In "Learning LXD Through LXD: Applying Conceição and Howles' Framework for Designing Online Learning Experiences," Joseph Rene Corbeil and Maria Elena Corbeil present a design case focused on the redesign of a fully online graduate course based on LXD principles. They also describe how LXD is taught using a cognitive apprenticeship approach where students could practice applying the LXD principles by developing their own courses. This approach exemplifies the essence of "learning by doing." By immersing students in a real-world application of LXD principles, they illuminate the transformative power of hands-on experience.

Katarzyna Sims, Maximilian Wegener, Lisa Nichols, and Merceditas Villanueva present their design case on how they applied LXD in "Using Learning Experience Design (LXD) to Promote Decreasing Stigma in Creating a Video Series about Syringe Services Programs (SSP)." They emphasize how LXD focuses on the learner's sociocultural background and describe their process of designing animated videos. They call for more research on LXD to reduce stigma in the medical field, particularly for marginalized populations. The work of this author team underscores the profound potential of LXD in addressing sensitive and critical issues in healthcare. By thoughtfully considering sociocultural nuances of their target audience, these authors have demonstrated how LXD can be a powerful tool in fostering understanding and empathy.

In her research study, "Going Through the Motions? Asynchronous Online Course Discussions Considered Within a Learner Experience Design Framework," Andrea Gregg uses a combination of interpretive qualitative methods and user experience methodologies to analyze interviews and discussion board posts and to conduct think aloud observations. The findings of the study suggest that applying an LXD framework to analyze discussion board posts can be beneficial and suggests a new model for asynchronous online course discussions and LXD. Asynchronous online discussion boards represent an area in need of ehnancement, and Gregg's innovative approach to integrating LXD within this context underscores the versatility of the LXD framework for creating more enriching and meaningful experiences.

Rebecca Quintana and Chris Quintana present a design case on a four-course MOOC series on LXD in "Situating MOOC Learners Within the Field of Learning Experience Design Through Immersion in Authentic Contexts." They apply interactive XR-enhanced videos to walk learners through a simulated apprenticeship using the Development of Instructional Designers Apprenticeship (DIDA) Model. The Quintanas' fusion of technology and pedagogy underscores LXD's potential to redefine the boundaries of digital learning.

In "Theory-Driven and Practice Oriented Perspectives on Instructional Design and Learning Experience Design," Victoria Abramenka-Lachheb provides three examples from her experience as a learning designer in higher education. She discusses the similarities and differences between LXD and instructional design and suggests that LXD methodologies are something that more advanced designers will be integrating into their work. This acknowledgement of the field gravitating toward LXD methodologies underscores LXD's growing significance and its potential to shape the future of holistic and learner-centered design approaches.

In "Exploring the Relationship Between Usability and Cognitive Load in Data Science Education," Andrew Tawfik, Linda Payne, Andrew Olney, and Heather Ketter investigate the correlation between LXD, specifically using the System Usability Scale instrument, and factors of cognitive load and conceptual knowledge. Their study provides precedent for subsequent investigations into the multifaceted relationship between LXD, cognitive load, and effective learning.

Peter Honebein and Charles Reigeluth introduce a process model for designers to use in "Designing Rational and Emotional Learning Experiences via the Learning Experience Canvas (LXC)." They describe the seven steps of the LXC process which are used during a brainstorming session with designers to focus on design elements associated with both rationality and emotion. Through this emphasis on the symbiotic relationship between rationality and emotion, the authors' model not only underscores the interconnected and holistic nature of effective LXD, but also presents it in an easily understandable framework, ensuring that even those new to the field can grasp and apply these principles effectively.

In their paper "Learning Experience Design an an Orienting Guide for Practice: Insights From Designing for Expertise," Jason McDonald and Tyler Westerberg delve into the relationship between LXD and ID. They articulate that LXD is not a mere reiteration of traditional ID or HCI/UX methodologies, but instead, that it offers a fresh perspective by emphasizing distinct learning affordances, questioning the blanket applicability of established ID techniques, and broadening the scope of desired outcomes in design. To illustrate this, the authors showcase a simulation that immerses students in an ethical quandary, aiming to stir emotional dissonance and guide novices toward achieving comprehensive expertise. This work underscores the evolving landscape of LXD while highlighting its transformative power in shaping learning experiences.

The paper "Learning Experience Design in the Light of Design Knowledge and Philosophy" by Colin M. Gray and Elizabeth Boling discusses the emerging field of LXD in relation to ID. The authors argue that LXD is not a separate field but an alternate philosophy of design that focuses on learner- and experientially-focused characteristics. Through exploration of the concepts of design knowledge and design philosophy, and how these concepts impact the current and future state of ID and LXD practice, the authors not only chart the evolving contours of the LXD landscape but also underscore its potential to redefine the future of the learning design and technology field.

In "What's the Difference Between Learning Experience Design and Instructional Design?" Charles Reigeluth and Yunjo An locate their work at the intersection of LXD and ID, suggesting that while these two phenomena have historically used different skills and methods, there is room for integration. This work challenges the traditional boundaries of LXD and ID, advocating for a harmonious blend of both fields. By emphasizing the symbiotic relationship between the artistic and scientific facets of design, they present a compelling vision for the future of instructional design. Their work serves as a beacon, guiding practitioners toward a more integrated and holistic approach, yet at the same time ensuring that the essence of both LXD and ID remains preserved.

Closing Remarks

In curating this special issue, our aspiration was to create a platform that not only showcases the depth and breadth of LXD but also sparks meaningful dialogue and exploration within our field. The outstanding contributions from the included authors have been instrumental in achieving this vision. The diverse perspectives and rigorous research presented in this special issue both enrich our understanding of LXD and highlight its growing significance and potential in shaping the future of learning design. However, these conversations are far from concluded. Indeed, the discussions and debates surrounding LXD, as presented in this special issue, underscore its evolving nature and the importance of continued exploration and refinement. Such dialogues will be critical for continued growth and maturation of the field, ensuring that LXD remains relevant, useful, and responsive to ongoing permutations.

Looking ahead, it remains clear that the landscape of LXD research and practice remains largely unmapped. We therefore encourage scholars and practitioners to delve deeper, to challenge existing paradigms, and to innovate with bold new approaches. Whether this be clarifying our understanding of just what LXD might be, exploring novel or less common design approaches, or delving into more theoretical territory, the future of LXD is rife with possibilities.

In closing, we extend our heartfelt gratitude to the authors in this special issue. Your passion and commitment to advancing the field of LXD are what made this special issue possible. We look forward to witnessing the continued growth and evolution of LXD with you in the years to come.

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Do-It-Yourself, Low-Cost Pop-Up Usability Labs for Learning Experience Designers

Matthew Schmidt & Yvonne Earnshaw

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Learning Experience Design | Usability Testing | Portable Usability Labs | Human-centered Learning Design | Usability Research Methodology

THE JOURNAL OF APPLIED INSTRUCTIONAL DESIGN

This article introduces the concept of pop-up usability labs as a practical and cost-effective solution for conducting usability testing in real-world learning experience design (LXD) contexts. Various configurations of pop-up usability labs are presented, including budget-friendly, portable, semi-permanent, and mobile setups, along with recommendations for hardware and software requirements. The importance of selecting appropriate software packages for usability data analysis is emphasized, with suggestions for low-cost, no-cost, and open-source options for quantitative and qualitative data analyses. Pop-up usability labs offer numerous advantages, such as accommodating limited funding and reaching participants in rural areas. However, they also present challenges that require LXD professionals to become familiar with the equipment and data analysis methods. Despite these limitations, pop-up usability labs provide a viable, resource-efficient approach for LXD professionals to conduct usability testing in real-world settings, identify and address design flaws related to usability, and embrace more human-centered design practices in the development of educational and learning technology products, systems, or services.

Introduction

Researchers and practitioners in the field of learning design and technology (LDT) increasingly have become aware of the phenomenon known as learning experience design (LXD). LXD is defined as “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 [user experience design] methods” (Schmidt & Huang, 2021, p. 141). A challenge that exists in the field of LXD has to do with measuring learning experiences. To date, learning experience (LX) designers have borrowed many measurement strategies from the field of user experience (UX). Perhaps most prevalent among these borrowed strategies is usability testing (Lu et al., 2022), which, arguably, is the most prevalent method

used to assess UX (Albert & Tullis, 2022). Usability testing is a robust and effective user-centered evaluation method that has been broadly used across a range of disciplines to uncover design flaws related to ease-of-use, utility, and accessibility. It is used to evaluate the effectiveness and efficiency of a product, system, or service (for example, an online course, software application, or user interface) by gathering feedback from users through observing their interactions with the product and analyzing their experience.

Usability testing plays a vital role in LXD as it enables learner-centered design, enhances engagement, identifies design flaws, and informs design decisions (Schmidt, Earnshaw, et al., 2020). Usability in learning environments includes considerations of accessibility, efficiency, and user satisfaction, which can promote learner engagement and motivation (Jahnke et al., 2020; Nora & Snyder, 2008; Schmidt et al., 2022). Specifically, usability testing in LXD includes the following benefits:

- **Learner-centered design**: Usability testing involves actual learners, gathering valuable feedback and insights to create intuitive, user-friendly learning experiences aligned with their needs and expectations (Soloway et al., 1994).
- **Enhanced engagement**: Usability testing helps and improve the overall learner experience, making it easier to navigate content, access resources, and interact with elements that require user input or participation (Dahleez et al., 2021).
- **Early identification and resolution of design flaws**: By observing learner interactions, usability testing allows for early detection of areas of difficulty, confusion, or frustration, facilitating timely design improvements and eliminating barriers (Schmidt, Earnshaw, et al., 2020).
- **Data-informed design decisions**: Usability testing provides direct feedback from learners, enabling evidence-based design decisions that prioritize elements with the greatest impact on ease-of-use (Carr-Chellman & Savoy, 2013).
- **Continuous improvement**: Usability testing fosters a culture of ongoing enhancement by incorporating user feedback, ensuring that learning experiences evolve with shifting needs and priorities (Schmidt, Earnshaw, et al., 2020).

Although there are many reasons that usability testing can contribute positively to the design of learning experiences, usability testing historically has received limited attention in the context of learning and educational technologies (Lu et al., 2022). This is not to say that our field does not trial learning environments with actual learners. For example, Tessmer (1993) advocated for pilot testing in which a product, system, or service is put through a trial run before its full deployment. More recently, the relatively low uptake of usability testing in LDT has been attributed to a lack of sophistication with the method and a general misunderstanding of how it is performed (Lu et al., 2022). Furthermore, formal usability testing, using specialized tools and infrastructure as described in Table 1, is often associated with challenges, such as:

- **High cost**: Acquiring and maintaining the necessary usability testing equipment and software can be expensive. Eye-tracking devices, biometric sensors, and other specialized tools can come with significant expense, presenting a barrier for researchers with limited budgets.
- **Physical space and staff**: Usability testing often requires dedicated testing rooms or spaces equipped with cameras, microphones, and other observation equipment. Setting up and maintaining such spaces can be a logistical challenge. Additionally, usability testing often involves a team of researchers, including moderators, observers, and technical staff, adding to the resource requirements.
- **High level of experimental control**: Formal usability testing typically requires a controlled environment to ensure consistent and reliable results. This level of experimental control necessitates strict protocols, standardized procedures, and careful management of variables, which can be time-consuming and demanding for researchers.

Table 1

Specialized Usability Research Tools and Infrastructure

Devices	
Eye-tracking devices	Track and record eye movements, gaze patterns, and fixation points, providing insights into user attention and visual perception.
Biometric sensors	Measure physiological responses such as heart rate, skin conductance, and facial expressions, providing additional data on user emotional states and engagement levels.
Mobile testing devices	Devices such as smartphones and tablets for testing mobile applications and responsive designs to ensure usability across different screen sizes and surfaces.
Software	
Usability testing software	Assist in conducting and recording usability tests, allowing for easy capture of user interactions, screen recordings, and audio/video recordings.
Clickstream analysis tools	Capture and analyze user interactions with a website or software, recording mouse movements, clicks, scrolling behavior, and navigation paths.
Usability analysis software	Aid in the analysis of collected data, providing visualizations, heatmaps, and metrics to interpret user behavior patterns and identify usability issues
Research Apparatus	
Usability testing kits	Typically include tools such as cameras, microphones, tripods, and recording devices, allowing for easy setup and capturing of user testing sessions.
Survey and feedback tools	Enable the collection of quantitative and qualitative data from users, including satisfaction ratings, feedback, and suggestions.
Infrastructure	
Usability testing rooms	Specifically designed testing environments equipped with one-way mirrors, cameras, and microphones to observe and record user behavior without interfering with their experience.
Remote usability testing tools	Facilitate conducting usability tests remotely, allowing testers to observe and interact with users remotely, collect data, and share screens for real-time feedback.

Although the challenges with usability research detailed above are valid, alternative approaches to usability research exist that can help mitigate some of these challenges. For example, so-called “quick-and-dirty” usability testing has long been recognized as a low-cost, low-resource approach to usability testing. This approach can produce useful results for making pragmatic improvements to technology systems both in industry (e.g., Brooke, 1996; Krug, 2009) and learning design (e.g., Mayes & Fowler, 1999; Reeves et al., 2002). This form of usability testing is often performed in informal spaces using less sophisticated technologies that allows for evaluating the usability of a product, system, or service in a spontaneous and low-cost manner. It typically involves recruiting participants on the spot, in a public setting, and asking them to perform specific tasks with the product, system, or service, while observing and recording their behavior and feedback. It is often used as a quick and effective way to gather insights about a product, system, or service’s usability, identify potential issues, and inform design decisions (Krug, 2009).

Researchers and practitioners in LDT can conduct usability testing in their own evaluation contexts, even if they do not have access to sophisticated, high-cost usability laboratories and equipment, such as psychophysiological measurement tools (see Table 1). Indeed, usability research that is conducted with humble resources is well established in industry and, in some cases, is better suited to the evaluation context and able to provide authentic perspectives that simply are not possible in laboratory settings.

The purpose of this article is to provide guidance and lessons learned for LDT researchers to create their own no-cost or low-cost usability research labs. To this end, we propose the notion of “pop-up” usability labs. A pop-up usability lab is a

solution for conducting usability testing that is usually limited to a relatively short period of time. In contrast to formal usability labs, pop-up labs are usually low- or zero-cost, require little space, can be supported by one or two trained personnel, and are often highly portable. These pop-up usability labs can allow for conducting educational and learning technology usability research in low resource or impromptu contexts.

Usability Research Methodology

Before presenting the pop-up usability lab configurations, we first provide a short description of usability research methodology, specifically focusing on observations, the think-aloud method, eye tracking, and frequently used usability questionnaires (i.e., Computer System Usability Questionnaire and the System Usability Scale). These methods can be used together or separately, depending on the specific research goals and context. They are not mutually exclusive and can complement one another to provide a comprehensive understanding of learner experiences and usability issues. While there are other methods that are commonly used to evaluate usability (i.e., heuristics), the methods we include here are intentionally selected because they are most appropriate for use with pop-up usability labs.

Observation

Observation is a fundamental technique employed in usability testing to gather data about users' interactions, behaviors, and experiences while using a product, system, or service (Albert & Tullis, 2022). In LXD, this technique involves carefully observing and documenting learner actions, verbalizations, and non-verbal cues during the testing session. During the session, researchers usually observe participants as they perform predetermined tasks or scenarios with the product, system, or service. This method allows researchers to directly witness how learners navigate interfaces, make decisions, and encounter any challenges or difficulties. It also provides valuable insights into learner behaviors and subjective experiences, which are essential for evaluating the usability and effectiveness of a design.

Observation often involves a combination of techniques. For example, researchers may use various tools, such as video recording, screen recording, and note-taking, to capture and document users' actions and behaviors. This allows for later analysis. Researchers should pay close attention to the sequence of steps taken, the time required to complete tasks, the strategies employed, and any errors or points of confusion encountered. Researchers may also note verbalizations, such as participants' comments, questions, and feedback during the testing session. These insights provide valuable qualitative data, revealing user perceptions, preferences, frustrations, and suggestions for improvement.

Think-Aloud Method

The think-aloud method is frequently used in conjunction with observation, meaning that similar tools are employed (e.g., video cameras, screen recording software). Think aloud is perhaps the most widely-used usability evaluation technique in which a participant verbally expresses their thoughts while interacting with a product, system, or service. Jakob Nielsen, a leading expert in the field, has called it "the single most valuable usability engineering method" (1993, p. 195). The think-aloud method is typically used during the functional prototyping phase, where a single participant is tested at a time. The functional prototyping phase occurs during design and development, in which a high-fidelity prototype is created to test and validate the functionality and performance of a product, system, or service. The prototype is then tested rigorously to identify any design flaws or usability issues and to gather feedback from learners. The participant narrates their thoughts, actions, and emotions verbally while using the prototype or fully functional educational or learning technology artifact (e.g., online course, learning module, interactive activity). For further information on functional prototyping, the reader is referred to Schmidt, Earnshaw, et al. (2020).

Think-aloud user testing is considered a valuable method for capturing user/learner feedback on a user interface; however, it can be unnatural for some participants, so the researcher should encourage participants to continue verbalizing throughout a session. An alternative approach is the *retrospective* think-aloud, in which participants review the recorded testing session and speak to the researcher about their thoughts during the process. It is important to conduct this as soon after the testing session as possible.

Think-aloud testing is widely used in practice and increasingly gaining acceptance in LDT (cf. Reeves & Hedberg, 2003; Gregg et al., 2020; Lu et al., 2022; Schmidt & Tawfik, 2022) as it allows evaluating new and advanced learning technologies with a relatively small number of participants. Most experts suggest that a small number of participants is sufficient for usability testing, with as few as five being sufficient for prototype testing (Nielsen, 2000). However, in the field of LDT, Schmidt and colleagues (in press a) state, "Given the limited resources provided to learning designers, think-aloud user testing is particularly attractive because it can be conducted with relatively small numbers of participants (5-12 users depending on the complexity of the system) and with open source or free-to-use tools."

A full discussion of think-aloud methods is beyond the scope of the current paper. However, the U.S. government's online resources for usability (U.S. Department of Health & Human Services, 2016) provide a high-quality primer on how to conduct think-aloud user testing. Further, Andrea Gregg and her colleagues (2022) provide a webinar on think-aloud methods in LDT, which draws from a book chapter on the same topic (Gregg et al., 2020).

Eye Tracking

For quick-and-dirty usability testing, the inclusion of rudimentary eye-tracking capabilities can greatly enhance the research process. An example of one such device is the Tobii Eye X, discussed in the Portable Pop-Up Usability Lab section below. Eye-tracking technology provides valuable insights into user attention and visual perception, allowing researchers to optimize user experience and understand user interactions. While this approach may not be suitable for those new to usability methodology, integrating eye tracking into usability testing enables the collection of objective data on user gaze patterns, fixation points, and attention focus. Eye tracking can be used in conjunction with the observation and think-aloud methods. Recording gaze patterns via eye tracking can allow researchers to gain deeper insights into learners' cognitive processes and decision-making while the learners verbalize their thoughts. Analysis of eye-tracking data in conjunction with verbal feedback can allow researchers to connect visual attention patterns and verbalized perceptions or difficulties. This can provide a more comprehensive understanding of user behavior and aids in the interpretation of qualitative data (Conley et al., 2020).

Commonly Used Quantitative Usability Instruments

A range of validated and reliable instruments has been developed for assessing the usability of a product, system, or service. For an overview, the reader is referred to Lewis (2018a). In the sections below, we present two of the most prevalent instruments, the System Usability Scale (SUS) and the Computer System Usability Questionnaire (CSUQ).

System Usability Scale

The SUS, developed by Brooke (1996) while working at Digital Equipment Corporation, is perhaps the most widely used tool for measuring the usability of a product, system, or service. It consists of a 10-item questionnaire that users complete, rating their agreement on a 5-point Likert scale (strongly disagree to strongly agree) on the statements provided in Table 2. The scores for each item are then added together to produce a single overall score, which can be used to compare the usability of different products or versions of the same product, with scores greater than 68 indicating above-average usability. The SUS has been found to be a reliable and valid measure of usability (Lewis, 2018b; Peres et al., 2013).

Table 2

System Usability Scale Items

#	Item
1	I think that I would like to use this system frequently.
2	I found the system unnecessarily complex.
3	I thought the system was easy to use.

#	Item
4	I think that I would need the support of a technical person to be able to use this system.
5	I found the various functions in this system were well integrated.
6	I thought there was too much inconsistency in this system.
7	I would imagine that most people would learn to use this system very quickly.
8	I found the system very cumbersome to use.
9	I felt very confident using the system.
10	I needed to learn a lot of things before I could get going with this system.

Computer System Usability Questionnaire

The Computer System Usability Questionnaire (CSUQ) is a widely used instrument for evaluating the usability of computer systems. Developed in 1995 by James Lewis at IBM, the CSUQ is available in the public domain for researchers to use. One of the key advantages of the CSUQ is that it is a post-test questionnaire, which can help to obtain a broader view of the perceived usability of the tested system. The instrument has established internal consistency, validity, and reliability, and assesses overall usability, system usefulness, information quality, and interface quality using a 7-point Likert scale. The CSUQ consists of 19 statements in total, which are worded positively. One of the reasons that researchers may be particularly interested in using the CSUQ is because the third version of the CSUQ questionnaire has been psychometrically analyzed for factor structures, with the reported factor structure consisting of four main factors: overall (items 1-16), system usefulness (items 1-6), information quality (items 7-12), and interface quality (items 13-15) (Sauro & Lewis, 2016).

The CSUQ v. 3 items are provided below in Table 3. In addition, readers can use an online, form-fillable version of the CSUQ, available at Gary Perlman's website. This latter resource is of particular value for pop-up usability labs, as usability evaluators do not need to set up any data collection system, but instead can simply use this pre-existing resource.

Table 3

Computer System Usability Questionnaire Items

#	Item
1	Overall, I am satisfied with how easy it is to use this system.
2	It was simple to use this system.
3	I could effectively complete the tasks and scenarios using this system.
4	I was able to complete the tasks and scenarios quickly using this system.
5	I was able to efficiently complete the tasks and scenarios using this system.
6	I felt comfortable using this system.
7	It was easy to learn to use this system.
8	I believe I could become productive quickly using this system.
9	The system gave error messages that clearly told me how to fix problems.

#	Item
10	Whenever I made a mistake using the system, I could recover easily and quickly.
11	The information (such as online help, on-screen messages, and other documentation) provided with this system was clear.
12	It was easy to find the information I needed.
13	The information provided for the system was easy to understand.
14	The information was effective in helping me complete the tasks and scenarios.
15	The organization of information on the system screens was clear.
16	The interface of this system was pleasant.
17	I liked using the interface of this system.
18	This system has all the functions and capabilities I expect it to have.
19	Overall, I am satisfied with this system.

The SUS and CSUQ are validated measures; however, they only measure technological usability. LDT researchers have noted that technological usability alone is insufficient in that it does not fully account for considerations of learning (Jahnke et al., 2020; Mayes & Fowler, 1999). While it may be tempting to adapt these measures to enhance their focus on learning, researchers are advised that this would be methodologically unsound, as this would influence the reliability and validity of the instruments. There is a need in LDT for usability measures that are specifically designed for learning technologies (Lu et al., 2022).

Pop-Up Usability Labs

As we have explained in the above sections, usability testing is an essential part of designing effective, efficient, and appealing educational and learning technologies, but can be challenging to conduct in real-world contexts due to factors such as limited funding, outdated hardware, lack of dedicated space, etc. In addition, performing usability tests in controlled lab settings is inauthentic, suggesting that usability testing in the field is needed–a context for which pop-up usability labs are well-suited.

In the following sections, we provide four hardware and software configurations that can support usability testing across a range of real-world educational and learning technology evaluation contexts. First, we describe a “budget-friendly” configuration, which requires nothing more than a laptop with a web camera and zero-cost software (e.g., Open Source, freemium). Second, we detail a portable configuration that extends the budget-friendly configuration with low-cost peripherals and more sophisticated analysis software. Third, we outline a semi-permanent configuration that is designed to last for the duration of a given project using low- and no-cost data collection and analysis software. Last, we explain how LDT professionals can create their own mobile learning usability rig. The first three configurations are shown in Table 4.

Table 4

Profiles of Pop-up Usability Labs

Budget-Friendly Pop-up Usability Lab	Portable Pop-Up Usability Lab	Semi-Permanent Pop-up Usability Lab
• Wanting to trial method before investing • No funding • Limited access to hardware/outdated hardware • No dedicated space • Urgent turnaround needs	• Single researcher • Brings pop-up usability lab materials to the site where users are located • Some costs involved • Often multiple sites • Limited time at site • Ideal for school-based or home-based research • Can provide way to include rural participants	• Single and multiple researchers • Shared or limited space • Limited time • Limited resources • More sophisticated usability research needs • Need for observation using “virtual two-way mirror”

Hardware and Software Configurations for Pop-Up Usability Labs

This section provides detailed information on different configurations for pop-up usability labs. The section begins by discussing the budget-friendly pop-up usability lab configuration, which can be created with a standard laptop or desktop equipped with a webcam. The portable pop-up usability lab configuration is also described, which is useful when a researcher needs to collect data on-site. The semi-permanent pop-up usability lab configuration is discussed, which is ideal for situations where there is available space but only for a limited time. Finally, the section includes information on the mobile learning usability rig, which is designed to evaluate the usability of mobile learning apps.

Budget-Friendly Pop-Up Usability Lab

A budget-friendly pop-up usability lab can be created with nothing more than a standard laptop or desktop computer that is equipped with a webcam. The key consideration with the budget-friendly system is keeping at a near-zero price point. It can be situated in a static setting (i.e., the hardware remains in a single location), or it can be portable. Most modern laptops (i.e., released in the past 5 years) come equipped with a webcam. However, because camera resolution is not a major concern, low-end, low-cost USB webcams can be used in case the computer does not have a webcam or the webcam is not operational. According to Krug (2009), it is very important to use an external mouse for usability data collection, as trackpads can be difficult to use (Figure 1). When working with disabled populations, it is also important to accommodate any assistive technologies, such as screen readers, switch input, and screen magnifiers. For a budget-friendly pop-up usability lab, nearly any computer produced within the last five to seven years will work, including Macintosh, Windows, and even Chromebooks (with some caveats). This means that donated, repurposed, and refurbished computers can all be allocated for this task.

Figure 1

A Computer Equipped With a Webcam and External Mouse is Sufficient for the Budget-Friendly Pop-Up Usability Lab Configuration

In addition to the product, system, or service that is the focus of the evaluation, researchers using a budget-friendly pop-up usability lab need screen recording software. A range of freely available screen recording software packages are available as built-in software, such as Quicktime for MacOS, or can be downloaded from the Internet, such as Zoom video conferencing software (note that the free version of Zoom has limitations). We provide recommendations for high quality software in Table 5. If the researcher is including the SUS or CSUQ questionnaires as part of their usability study, software for delivering digital forms is recommended. For example, a freely-available digital version of the CSUQ is available at Gary Perlman's website (see Computer System Usability Questionnaire section above). Researchers can also use free-of-cost form software such as Google Forms to create their own digital forms, although Google tools may not be available to all. A benefit of the latter approach is that data are automatically entered into a spreadsheet when a participant submits their responses.

Table 5

High Quality, No-Cost Screen Recording Software

	Windows/MacOS	ChromeOS
Name	OBS Studio	Screencastify
URL	https://obsproject.com/	https://www.screencastify.com/
Application Type	Installable package	Chrome browser extension
License	Open source (GNU General Public License v2.0)	Proprietary/freemium

	Windows/MacOS	ChromeOS
Description	Powerful, highly configurable, cross-platform screen recording and streaming software that can run on low-end hardware.	Simple, user-friendly, cloud-based screen recording solution that can run on Chromebooks.
Caveats	Has a challenging learning curve, but tutorials and how-to guides are readily available.MacOS system may require additional plug-ins to capture system sounds (records microphone inputs with no additional plug-ins).	Free version is limited to 30 minutes of recording, and video export options are limited with the free version.

Portable Pop-Up Usability Lab

With a portable pop-up usability lab, the key intent is portability. This can be particularly useful for when a researcher must be on-site in order to collect data, such as when working in K-12 or industry contexts, in situations where home visits are part of the research, or in rural settings that are geographically distant from a research site. However, there is often no space to house equipment in such contexts, meaning that the researcher must not only bring the equipment to the site, but also remove it when data collection is finished. Given that data is often collected by a single researcher in this type of scenario, it is critical that the entire pop-up usability lab kit be lightweight and highly portable. Therefore, portable storage is an important factor in this pop-up usability lab configuration, as is the use of mobile technologies such as laptops or tablets.

Although a budget-friendly pop-up usability lab can be used as a portable pop-up usability lab, the assumption with the budget-friendly configuration is that there is no funding or support. With a portable pop-up usability lab, the assumption is that portability is the primary requirement, and that there is some provision of funding for equipping hardware and software. Therefore, researchers interested in a portable pop-up usability lab should consider higher-end, more recent, and ultra-portable laptops such as the MacBook Air or the Lenovo ThinkPad X series, as they are both powerful and lightweight.

A key consideration with a portable pop-up usability lab is storage for the various components that are required. Higher-end, commercial solutions might use hard cases equipped with interior cut-outs to hold the hardware and wheels. For a do-it-yourself, portable pop-up usability lab, a small, rolling suitcase, such as those commonly used as carry-on bags for air travel, provides an ideal, low-cost solution. These provide ample storage for a laptop, mouse, and cables, and can even provide for additional peripherals like a small, low-cost eye tracker, high quality wireless microphones, game controllers (if conducting playtesting of educational games), etc. In lieu of dedicated cut-outs in a hard case, researchers can use the commercial cardboard packaging for the various hardware components, which typically provides ample protection. Indeed, the first author of this paper has used this approach to transport usability hardware as checked baggage on airlines (Figure 2).

Figure 2

Portable Pop-Up Usability Lab With Laptop, Mouse, and Tablet (Left) and With Laptop and VR Headset (Right)

The portable pop-up usability lab can benefit from the inclusion of a small, rudimentary eye tracker. One low-cost option for rudimentary eye tracking is the Tobii Eye X, available for approximately US$259. Older, used versions can be found for less on platforms like eBay or Facebook Marketplace. It is important to note that the Tobii Eye X is only compatible with Windows-based computers, limiting its use for Mac users. While the Tobii Eye X provides an on-screen indicator of user gaze, it lacks analysis software and does not generate detailed data for fixation and saccade analysis. More sophisticated eye-tracking systems are available for portable labs, but they often require additional hardware and configuration, making setup and breakdown more complex and time-consuming.

A key limitation of the portable pop-up usability lab is that it must be set up and broken down each time it is used. This introduces the possibility of human error, which can lead to data corruption and data loss. For example, simply missing a single configuration option while setting up could lead to audio not being captured in screen recordings, thereby rendering them useless. Failing to pack a cable or dongle can lead to a study not being able to be performed. Therefore, strict quality control protocols and checklists are paramount when using this type of pop-up usability lab (see Figure 3).

Figure 3

Example Setup Checklist for a Portable Pop-Up Usability Lab Used for Mobile App Usability Testing

Setup Checklist

- ☐ All equipment present?
  - ☐ Clipboard
  - ☐ iPad Mini
  - ☐ Power cable
  - ☐ USB hub
  - ☐ Ziggi document camera
  - ☐ Logitech webcam
  - ☐ Mac laptop
- ☐ Mac laptop booted?
- ☐ Open Broadcaster Studio (OBS) launched?
- ☐ Open Broadcaster Studio (OBS) configured correctly?
- ☐ Open Broadcaster Studio (OBS) tested?
- ☐ Connected to a guest wireless network?
- ☐ Network connection tested?
- ☐ Prototype loaded and showing launch screen?
- ☐ OBS Studio recording started?

Semi-Permanent Pop-Up Usability Lab

A semi-permanent pop-up usability lab is a useful configuration when one or more researchers have available space, but only for a limited time (i.e., a one-month project), or are using a shared space on an irregular basis (i.e., once a week for an afternoon). In this situation, it is possible to create a semi-permanent pop-up usability lab that can facilitate regular data collection sessions, but without the challenges of having to set up and break-down equipment as with the portable pop-up usability lab.

A room that is ideal for a semi-permanent pop-up usability lab is one that:

- Has a door that can be locked,
- Has no windows or windows that have blinds to avoid distractions,
- Is in a location that is quiet and away from busy areas,
- Has moveable furniture,
- Has sufficient electrical outlets, and
- Has Internet connectivity/strong WiFi.

The semi-permanent configuration differs from the budget-friendly and portable pop-up usability lab configurations in one particularly notable way. The same hardware and software from those configurations can be used in the semi-permanent configuration; however, because this configuration has a more permanent space, researchers have the opportunity to create a more sophisticated usability research setup in comparison to those other configurations. For example, more powerful desktop (not laptop) computers can be used because they do not have to be transported every time they are used, which can be useful for conducting virtual reality and digital games-based research. Eye tracking using more robust systems is also possible because trackers do not need to be set up and configured every time they are used. Researchers working in higher education contexts might reach out to colleagues in other colleges or departments to see if this equipment might be available on loan. In this way, a semi-permanent pop-up usability lab can be equipped with relatively sophisticated data collection apparatus for very little cost.

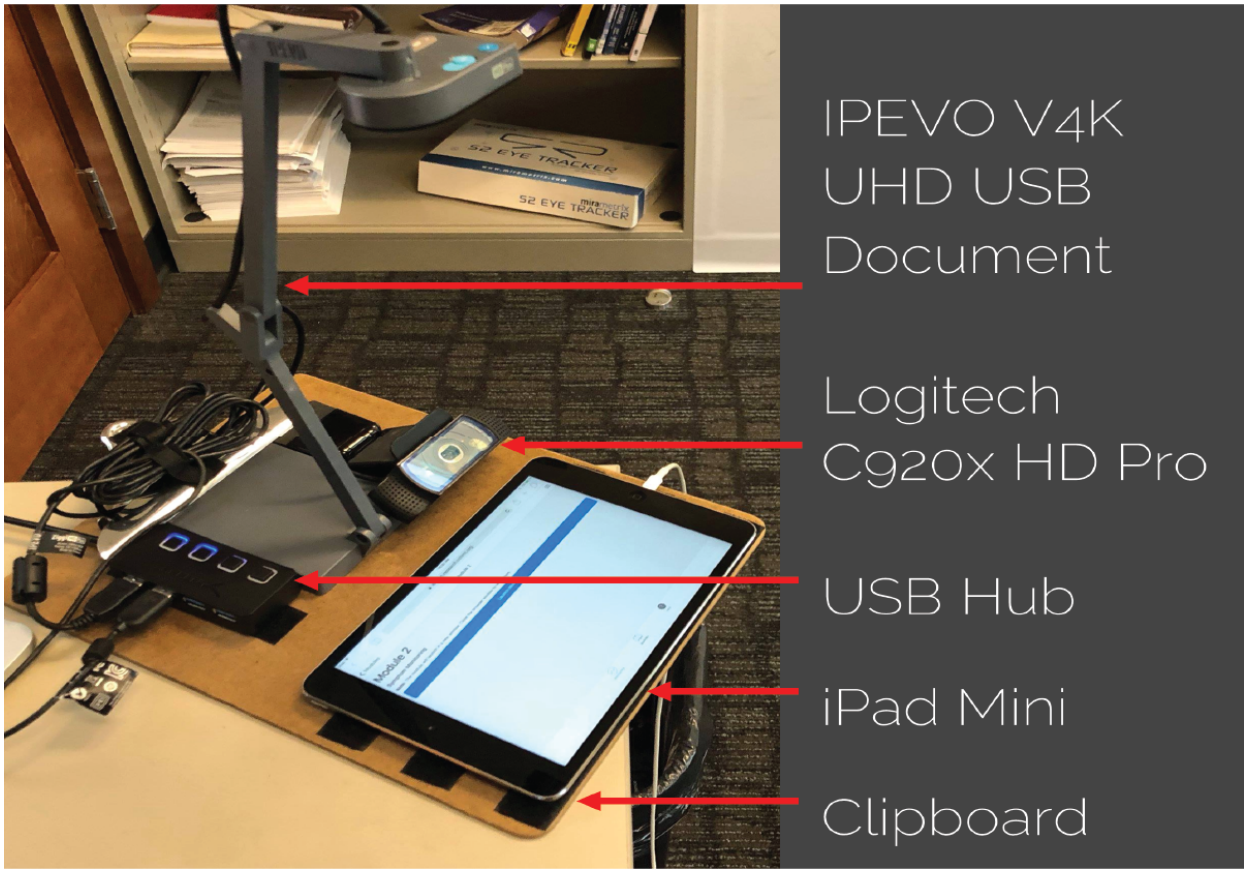
In addition to this, researchers can set up a “virtual two-way mirror” using the semi-permanent pop-up usability lab configuration. This allows observers in another room or location to observe usability studies while they are happening. A virtual two-way mirror can be achieved simply by mounting a smartphone on a tripod near the participant and streaming the usability session to observers using web conferencing software such as Zoom or Microsoft Teams. This can allow the facilitator to focus on conducting the usability study with the participant, while the observers assist with problem identification and recording of field notes.

Mobile Learning Usability Rig

The pop-up usability labs detailed above are all based on traditional laptop and desktop configurations. However, given the prevalence of smartphones and tablets (particularly in mobile learning contexts), researchers may be interested in how to conduct usability research on mobile devices, for example, to evaluate the usability of mobile learning apps. Collecting usability data on mobile devices requires different configurations than when using traditional computing surfaces. For example, while most smartphones are capable of screen recording, the tools to do so are rudimentary and do not allow for embedding of front-facing camera videos. Smartphones are also controlled using a touchscreen–not a mouse. Therefore, it is not possible to observe mouse movements (or in this case, finger movements, gestures, and taps) using screen recording apps. To overcome these challenges, we designed a low-cost mobile learning usability rig (see Figure 4).

Figure 4

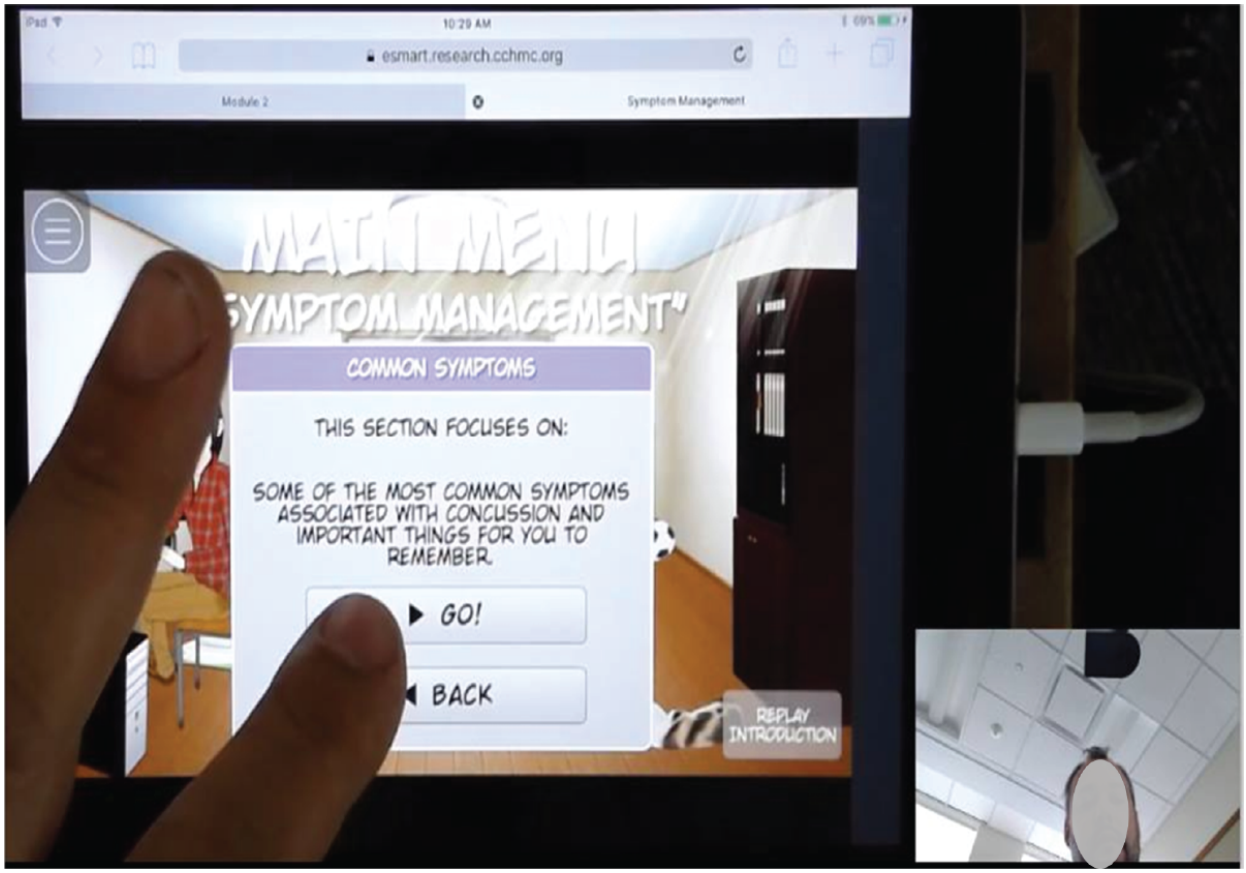
Hardware and Configuration Used for Low-Cost Mobile Usability Rig



This hardware configuration uses a USB document camera to record the screen of the mobile device, which allows for capturing finger movements and gestures. It also uses a webcam to record the user. These devices are connected to a USB hub, which is connected to a laptop running OBS Studio (Figure 5).

Figure 5

Output From Mobile Usability Rig, as Recorded Using OBS Studio



The hardware sits on top of a clipboard. All hardware, including the mobile device itself, is affixed to the clipboard using hook-and-loop strips. Video output from this hardware configuration is of high quality and overcomes the challenges of not being able to observe finger movements and gestures or record the user when using mobile screen recording solutions.

Considerations for Pop-Up Usability Lab Data Analysis

The analysis of usability data requires appropriate software packages, which should be selected based on the type(s) of data being analyzed. Usability data is often multi-modal, including webcam videos, screen recordings, audio files, transcriptions, and quantitative data from usability instruments. Spreadsheet software is generally sufficient for generating descriptive data, charts, and data summaries of quantitative data. Software such as Google Sheets and OpenOffice are no-cost and open-source options that can run on low-end hardware. For qualitative data, analysis methods vary, but for identifying problems with ease-of-use, it is common to review videos and mark where usability errors occur. A simple way to do this is to simply play the video of the usability session using built-in video playback software (i.e., Quicktime Player, VLC) and note the usability errors identified in a spreadsheet, along with timestamps that indicate when the identified errors start and end. The identified usability problems can be reviewed by the design team and prioritized based on their severity. To this end, readers are referred to Nielsen (1994), who proposes a five-point severity scale ranging from 0 (not a usability issue) to 4 (catastrophic). Another option is to use dedicated video analysis software, which can be costly. Alternatively, the open source ELAN linguistic annotator software is a no-cost solution for annotating video-based data, with many built-in data analysis features; however, this software is complex and has a substantial learning curve. Ultimately, a range of low- and no-cost solutions exist to evaluate both quantitative and qualitative usability data; however, the extent of data analysis afforded by these software tools is limited. For more sophisticated analyses, dedicated, proprietary software packages are usually necessary.

Implications

Pop-up usability labs can serve as a means for providing people with tools to evaluate educational programs and technology and bringing the benefits of usability testing to LDT evaluation contexts that traditionally may not have had the resources to conduct such learner-centered evaluations. However, a potential misconception that should be addressed is that pop-up usability labs are only useful for evaluating technology-based products, systems, and services. This is incorrect - they can also be useful for evaluating more traditional, non-technology educational products. Indeed, usability testing can focus on the clarity of instructions, the organization of content, the accessibility of resources, and the overall learner experience of taking a course.

It is necessary to address the limitations and contextual factors that influence the adoption of usability testing in educational contexts. While usability testing is widely recognized as a valuable approach in product design and user experience research, its application in the field of LXD may vary. Awareness and familiarity with usability testing among practitioners in educational settings may not be universal, and there may be various factors, including limited resources, time constraints, and a predominant focus on course design rather than product design, that contribute to the limited uptake of usability testing. Additionally, the low prevalence of pilot testing, which shares similarities with usability testing, further suggests that there are challenges beyond cost that impede the widespread implementation of these methodologies in educational contexts. Thus, it is crucial to acknowledge that a range of factors can limit its adoption. Hence, we maintain that there is a need for further research in this area. However, guidance such as what is provided in this article can provide researchers and practitioners in the field of LDT with opportunities to conduct usability testing in their own evaluation contexts and/or in situ (i.e., where learners will likely use the product, system, or service), identify and remedy design flaws related to usability, and adopt more human-centered design and development approaches for educational and learning technology products, systems, and services.

Of course, as with any research effort, considerations of data privacy and ethics is critical when using pop-up usability labs. Because this approach involves the collection and storage of personally identifiable data (i.e., webcam recordings, screen recordings, and survey responses), researchers must consider how this data is handled and utilized. To ensure protection of human subjects, it is essential to have clear protocols in place for obtaining informed consent from participants, protecting their privacy, and securely managing the collected data. Researchers must be transparent regarding data usage, outlining how it will be anonymized, stored, and accessed. Additionally, obtaining appropriate ethical clearance or approval from relevant review boards (i.e., institutional review board) ensures that studies will align with ethical guidelines and will safeguard participant rights and confidentiality.

While there are a range of benefits associated with using pop-up usability labs, such as accommodating issues like limited funding, outdated hardware, lack of dedicated space, reaching more rural participants, and urgent turnaround needs, the pop-up usability lab approach does suffer from some pitfalls. First, we refer in this article only to moderated and in-person usability studies. Pop-up usability labs, as described here, do not consider remotely moderated studies (although we expect that they could easily be adapted for remote moderation). Next, the hardware and software configurations recommended here will require that LXD professionals spend time getting familiar with operating the equipment, understanding file formats and data outputs, and how all of these various components interoperate. This is not the case with off-the-shelf, commercial solutions, which typically provide more seamless integration. Finally, pop-up usability labs may not provide the same level of control and experimental rigor as more formal usability labs. As we have discussed, pop-up usability labs are designed to be practical and cost-effective solutions for conducting usability testing in real-world contexts, and they may not have all of the specialized equipment or resources of a dedicated usability lab. This may limit the types of usability studies that can be conducted or the level of detail that can be captured in the data. As a result, researchers may need to be more creative and resourceful in designing and conducting studies in these contexts. However, they do provide for more authenticity because they allow for usability testing to be conducted in situ.

Usability testing is a key component of ensuring effective LXD. By raising awareness of the importance of usability testing in LXD and providing guidance on how to conduct it effectively and affordably, LXD professionals have the opportunity to create more impactful and engaging learning experiences that better serve the needs of learners.

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Designing and Evaluating a 3D Virtual World Game for English Language Learning: A Learning Experience Design Approach

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Learning Experience Design | User Experience Design | Game-based Learning | English Language Learning | Usability Framework

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This study took an iterative multi-phase learning experience design (LXD) approach to design and evaluate a 3D virtual world game focusing on English language learning. Multiple LXD methods were conducted including empathy interview, heuristic evaluation, cognitive walkthrough, and concurrent think-aloud usability testing, in order to identify usability problems and how learners rated the usability of the intervention. A total of 137 usability problems were identified. Learners rated the game with high overall perceived usability. This study provided evidence for the multi-dimensional usability framework proposed by Jahnke and colleagues and its application at a micro level.

Introduction

Research interest in digital games-based second language learning (DGBL2L) has been around for over two decades (e.g., Coleman, 2002; Emde et al., 2001) and has continued to grow in the past ten years (Huang & Schmidt, 2022). A review of 16 peer-reviewed systematic reviews, scoping reviews, and meta-analyses published between 2011 and 2020, and a systematic review of prior empirical studies in the field of DGBL2L between 2011 and 2020 revealed various benefits digital games could potentially bring to English language learners. For example, motivation is widely accepted by second language researchers and practitioners as an important factor that can impact the success of second language acquisition (Dörnyei, 1998; Ebrahimzadeh & Alavi, 2017). Digital game-based learning may influence motivation by bringing an authentic second language sociocultural context (e.g., Jabbari & Eslami, 2019; C. Wang et al., 2020; Yaşar, 2018), which is typically remote to learners in the physical world, to an immersive learning environment (e.g., Blume, 2020; Neville et al., 2009; Rankin et al., 2009). Furthermore, evidence suggests that digital game-based

learning promotes second language motivation by providing challenge, a sense of control, and awards (Jackson & McNamara, 2013; Laine & Lindberg, 2020; Sandberg et al., 2014). Digital games may also enhance learner engagement (Chen & Kent, 2020; Hung & Young, 2015), persistence (e.g., Chen et al., 2018; Eltahir et al., 2021; Sung et al., 2017), and enjoyment (Gellar-Goad, 2015; Hartfill et al., 2020; Lingwati, 2017), and promote social interaction (e.g., Jabbari & Eslami, 2019; Poole & Clarke-Midura, 2020; Yudintseva, 2015). DGBL2Ls are also beneficial for vocabulary learning, communicative skills, creativity, and writing skills development etc. (Poole & Clarke-Midura, 2020; C. Wang et al., 2020; Xu et al., 2020; Yaşar, 2018).

While digital games show promising potential to support English language learning, researchers pointed out a range of limitations in prior empirical research and practice, among which, two limitations are related to the design and development of digital learning games. Firstly, prior review articles pointed out a lack of study on second language skills beyond vocabulary learning skills (Hung et al., 2018; Poole & Clarke-Midura, 2020; Xu et al., 2020). This was also evidenced in a systematic review I conducted across 10 academic databases (Huang & Schmidt, 2022). In a total of 209 empirical studies, 52% focused on enhancing vocabulary learning alone. A potential solution to this limitation is to intentionally design and develop language learning games that promote language skills such as listening, speaking, reading, and writing. Secondly, prior review articles pointed out a need to better integrate second language pedagogies into game mechanics (Acquah & Katz, 2020; C. Wang et al., 2020; Xu et al., 2020; Yudintseva, 2015). Aligned with Common European Framework of Reference for Languages (Council of Europe, n.d.) and the American Council on the Teaching of Foreign Languages Proficiency Guidelines 2012 (ACTFL, 2012), task-based language teaching is based on a competence-based communicative approach (Littlewood, 2004) and aims to promote the development of learners' communicative skills (e.g., Cai & Lv, 2019; Ellis, 2000). Bryfonski and Mckay's (2019) meta-analysis suggested that task-based language teaching can be efficacious to promote language communication skills. Therefore, intentionally designing digital games that integrate task-based language teaching pedagogy with the game mechanics could be the potential solution to address the second limitation.

Digital games for learning are not easy to design effectively due to their interdisciplinary nature (Bellotti et al., 2013), especially the link between pedagogy and game design (Abbott, 2020). Digital learning games are likely to fail without a pedagogical and learner-focused foundation (Lepe-Salazar, 2015; Westera, 2019). Unfortunately, most of the prior empirical studies on DGBL2L did not unpack the design of the learning games before testing their impact on language learning outcomes (Rankin & Edwards, 2017). Similar to how a quantitative study's validity diminishes when employing an unvalidated instrument, a study based on a designed intervention is weakened when utilizing designs that have not undergone scrutiny with the intended learners. To address the weakness in the design of digital game-based learning interventions, such as the link between pedagogy and game design, Abbott (2020) proposed taking an LXD approach to develop digital learning games as a potential solution.

As part of a multi-phase mixed-methods iterative LXD project, the purpose of this paper is to present the iterative design and formative evaluation of a 3D virtual world game for English language learning, The Future Writers, as an example to showcase how the LXD approach may be used to systematically design and evaluate learner experience, which may be beneficial to both researchers and practitioners in the field of DGBL2L and the field of learning/instructional design and technology (LIDT) who are interested in LXD related research and practice. To enhance the understanding of LXD, this paper also serves to showcase that multiple usability dimensions (technological, pedagogical, and sociocultural; Jahnke et al., 2020) not only coexist but also intersect in a product designed for learners as users. The overarching research questions that guided this inquiry were:

> *RQ1: What usability problems are present and design improvements might be needed when participants formatively evaluate this intervention?*
>
> *RQ2: How do intended learners rate the intervention's usability?*

Learning Experience Design Approach

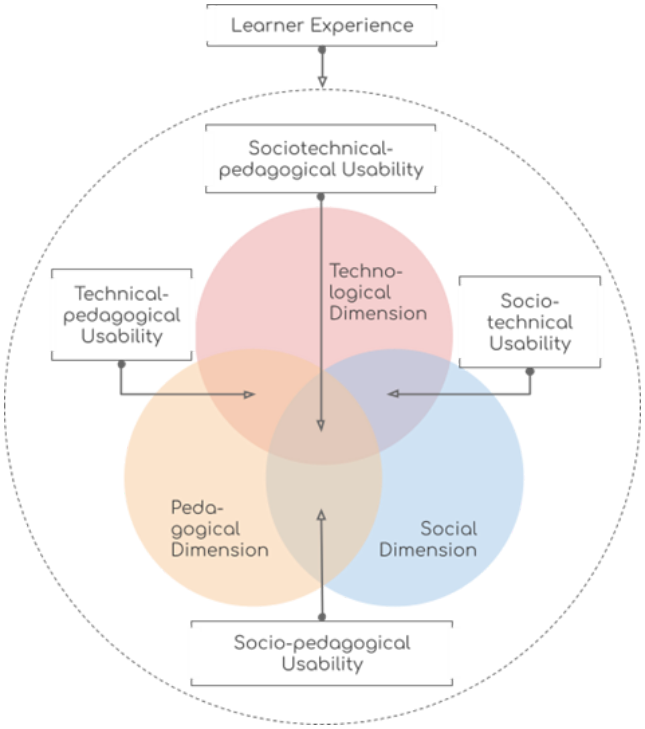
Gray (2020) defines design thinking as a user-centered approach to design, which has been instantiated substantially across disciplines in user experience design (UXD). UXD can be broadly applied to any design (a chair, a cell phone app, a vacation package, etc.). From the researcher's side, in the field of LIDT, there has been an increasing interest to adopt or adapt UXD methods and processes to design, develop, and evaluate interventions for the purpose of learning (e.g., Chang & Kuwata, 2020; Quintana et al., 2020; Schmidt, Earnshaw, et al., 2020). For example, in Cavignaux-Bros and Cristol's (2020) study, they adopted participatory design and co-design methods in the iterative design and development of a Massive Open Online Courses (MOOC) on public innovation. Stefaniak and Sentz (2020) also suggest that UXD can benefit LXD by helping designers take an empathetic and pragmatic approach to align interventions to learners' actual and contextual needs. From the practitioner's side, there is evidence of rapid adoption of the LXD approach across multiple industries (Waight et al., 2023; X. M. Wang et al., under review).

As an emerging phenomenon in the field of LIDT, researchers and practitioners are still trying to gain a better understanding of LXD (e.g., Gray, 2020; Quintana et al., 2020; Schmidt, Tawfik, et al., 2020). For example, some pioneer researchers have put in efforts to define LXD (Ahn, 2018; Chang & Kuwata, 2020; Stefaniak, 2020; Vann & Tawfik, 2020). Among these efforts, Schmidt and Huang (2021) assert that LXD 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. 1).

As a close sibling to UXD, the LXD approach shares many common UXD methods, such as (1) heuristic evaluation and cognitive walkthrough (Schmidt, Earnshaw, et al., 2020), (2) empathy interview (Schmidt et al., 2022), (3) personas (Schmidt, Earnshaw, et al., 2020), (4) participatory design (Cavignaux-Bros & Cristol, 2020), and (5) task-based think-aloud usability study (Lu et al., 2022). However, these methods need to be adapted for the purpose of learning. For example, Nielsen's usability heuristics evaluation (Nielsen, 1994), perhaps the most widely used usability instrument, only gauges technological usability. The pedagogical perspective and sociocultural perspective are missing from this instrument. To address this gap, Jahnke and colleagues (2020) proposed a multi-dimensional usability framework (Figure 1). Findings from this study shows that not only the multi-dimensions of usability exist in technologies designed specifically for learning purposes, but also some usability considerations live at the intersections of the three dimensions.

Figure 1

Multi-Dimensional Usability Framework for Learner Experience (Jahnke et al., 2020; used with permission)



Methods

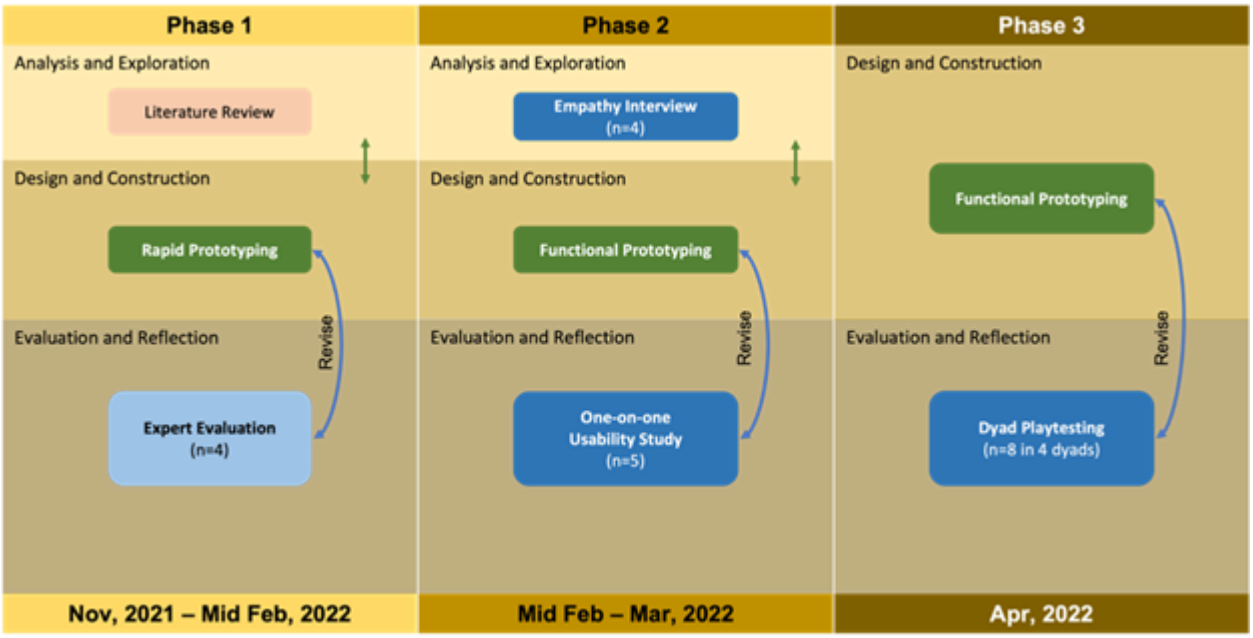
There were two research questions guiding this study. RQ1 asked what usability problems are present and design improvements might be needed when participants formatively evaluate this intervention? This question focused on gaining a deeper understanding of what usability problems are presented that could be identified by experts and intended learners, and the corresponding improvements needed. RQ2 asked how do intended learners rate the intervention's usability? This question focused on using System Usability Scale (SUS; Brooke, 1996) to quantitatively analyze how intended learners rated the intervention's usability.

Research Design

The study used a mixed-methods research design (see Figure 2) and was approved by the institutional review board at the University of Florida. The study consisted of three phases in which various LXD methods were used to help with design iteration that occurs after each round of formative evaluation (e.g., four iterations in Phase 1 expert evaluation). Phase 1 focused on front-end analysis and early-stage prototyping, Phase 2 focused on empathy interview, formative evaluation, and iterative design improvements, and Phase 3 focused on the game's functionality in terms of how well it facilitated collaborative language learning. This paper only reports the first two phases.

Figure 2

A Multi-Phase LXD Approach to Design and Develop a DGBL2L Intervention



The 3D Virtual World Game Overview

I created, designed, and developed The Future Writers, a browser-based 3D virtual world game. The tools I used to develop this environment are publicly available and free of cost, including: (1) Mozilla Hubs [Software app], which is like a virtual world playroom, and (2) Mozilla Spoke [Software app], which is the toolbox to build virtual spaces. The Mozilla Hubs environment provided affordances for learners to use multiple language communication skills such as reading, writing, listening, and speaking, including: (1) multimedia playback function, (2) voice chat function, and (3) text chat function.

This intervention is composed of six virtual spaces: (1) pre-game lobby area (Figure 3), where everyone meet and learners watch a short overall introduction video, (2) Future Land (Figure 4), where the two learners enter the game world on each side of the partition rail, and watch an introduction video to learn the game premise and immediate quests together, (3) two Evidenceverse spaces, one for Tom and the other for Jenny (Figure 5), in which only one learner may enter one of the two Evidenceverse to watch an introduction video on game/learning quests in this space, three videos related to the story character (Tom or Jenny), so the player may collect information he/she thought could be helpful to share with his/her partner in the next space, (4) Magicverse (Figures 6 and 7), which is the space where the two learners reunite to watch a game/learning quests video, discuss their findings, draw a conclusion on what tragedy might happy to the two characters (Tom and Jenny), and then write a story to change their future, and (5) post-game meeting area (Figure 8), where learners and researchers meet to discuss their learning and gameplaying experiences.

Figure 3

Pre-Game Lobby Area

Figure 4

Future Land

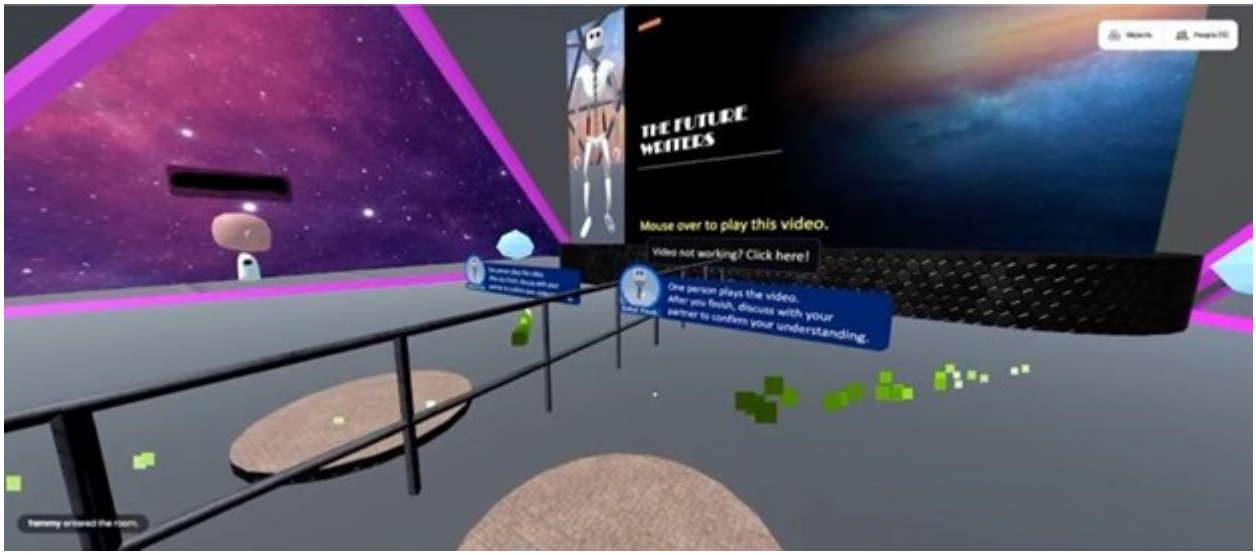


Figure 5

Evidenceverse for Jenny

Figure 6

Entering Magicverse Where They First Reunite to Watch Another Introduction Video to Learn About Game/Learning Quests

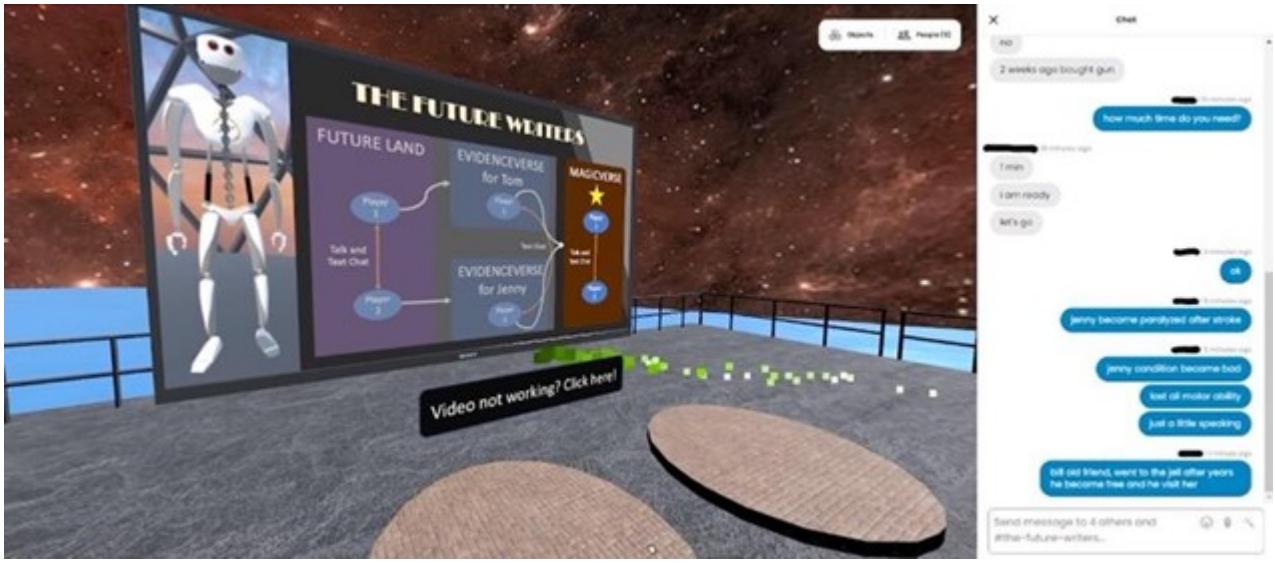
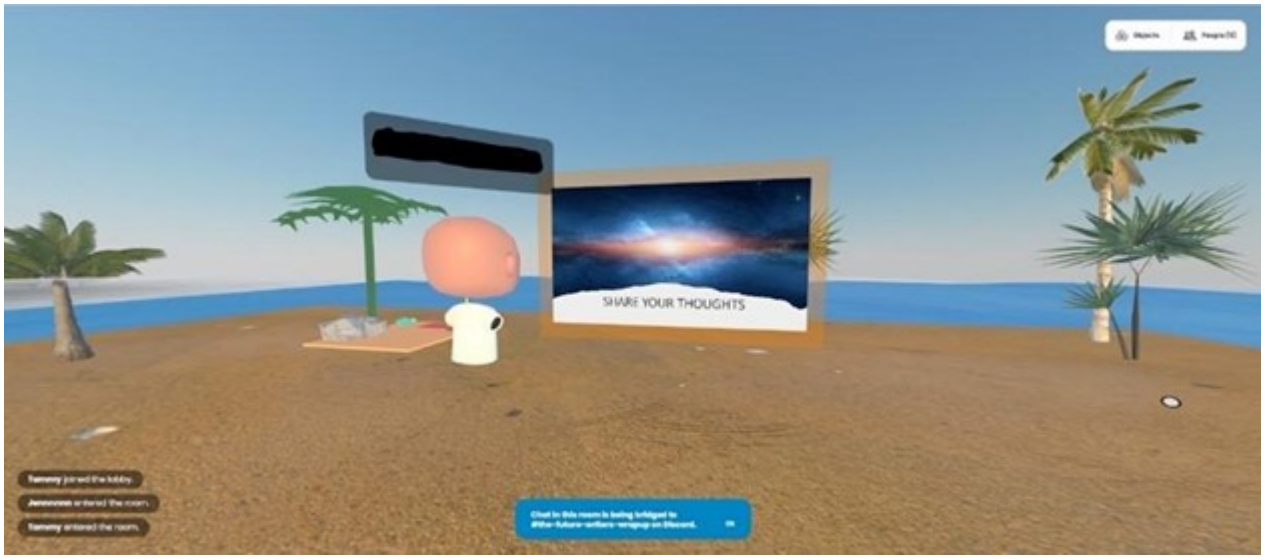


Figure 7

Learners Compose a Future Story in Magicverse

Figure 8

Post-Game Meeting Area



Phase 1 Expert Evaluation

Participants

I used a convenience sampling method for expert evaluation recruitment. Specifically, two immersive learning experts (with at least three years of immersive learning technology research or teaching experience) performed a heuristic evaluation, and two subject-matter experts (English as a second language researcher or instructor) performed a cognitive walkthrough (Schmidt, Earnshaw, et al., 2020).

Expert evaluation methods may be applied in any design phase throughout an LXD process (Schmidt, Earnshaw, et al., 2020); however, given the scarcity of prior empirical studies that unpack the “black box” of how DGBL2L interventions were designed to foster language learning, it is helpful to have experts evaluate early-stage prototypes to avoid potential major flaws.

Data Collection

A heuristic evaluation was performed by the two immersive learning experts looking at the interface and sharing their professional opinions using a heuristic evaluation checklist (Jahnke et al., 2021). A cognitive walkthrough was performed by the two subject matter experts following Spencer's streamlined cognitive walkthrough (2000) guidelines. Each data collection session was performed on Zoom, video recorded, and transcribed.

Data Analysis

To iteratively improve the design of the intervention, after each data collection cycle, I prioritized problems identified by the experts by assigning severity levels between 0 and 4 using the usability severity rankings (Nielsen, 1994). All level 3 and 4 and most of level 2 problems were solved before the next expert evaluation. Level 1 problems were addressed when time permitted. Level 0 problems were not addressed because these issues were not considered to be usability problems.

The problems coded between level 1 and level 4 were used as the data source to answer RQ1. Through thematic coding, technological, pedagogical, and sociocultural usability problems (Jahnke et al., 2020) were identified.

Phase 2 Empathy Interview

Participants

I used a convenience sampling method for intended learner participants. The inclusion criteria for this empathy interview required that the participant: (1) must be an international student studying in the United States, (2) must be officially enrolled in English Language Institute programs at the University of Florida, and (3) must be a beginner to intermediate levels according to the proficiency levels standard of the English Language Institute. Four participants (two female and two male) participated in the empathy interview.

Data Collection

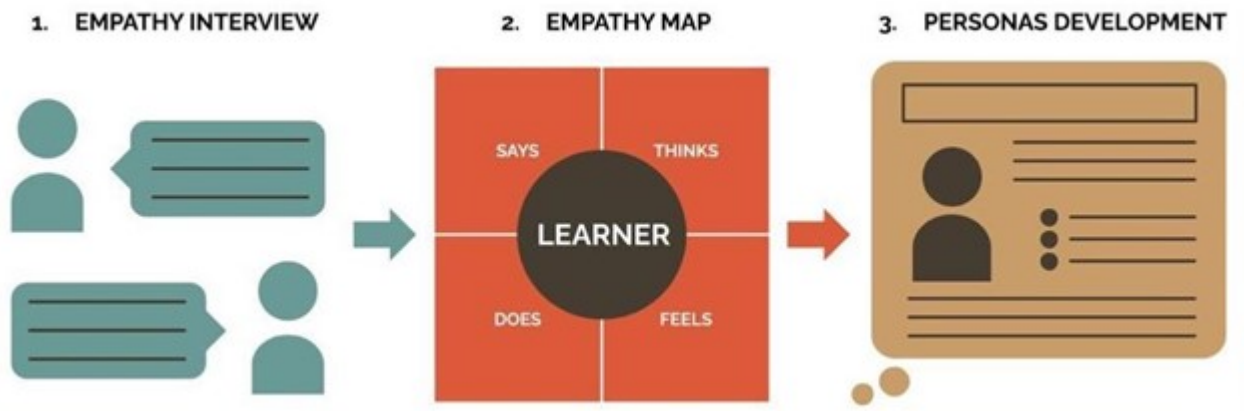
The interviews were conducted using Zoom online meeting software. Webcam video and audio were recorded. I also took interview notes.

Data Analysis

Empathy interview transcripts were analyzed using empathy mapping methods (Siricharoen, 2021; Thompson et al., 2016). The empathy map is composed of four major parts, including what each participant (1) says, (2) thinks, (3) does, and (4) feels. After four empathy maps were generated, they were compared to identify themes across multiple maps. Figure 9 illustrates a typical empathy interview data analysis process, including the empathy interview, empathy map, and personas development (Ferreira et al., 2015; Schmidt et al., 2022). Personas are fictitious users who are representations of typical users and who might employ the technology within their specific usage context (Miaskiewicz & Kozar, 2011). In LXD approach, personas may be used throughout the entire iterative design process to help situating learning within learners' lived experiences (Robinson & Harrison, 2017; Schmidt & Tawfik, 2022).

Figure 9

Process of Empathy Interviews, Empathy Mapping, and Development of Patient Personas (Schmidt et al., 2022; used with permission)



Phase 3 One-on-One Usability Study

Participants

Participants were recruited through a convenience sampling method. The inclusion criteria remained largely the same as the empathy interview, except the English language proficiency levels were refined to intermediate level. Five qualified learners participated in the usability study: two female and three male students (ages between 19 and 27, three from Asian countries and two from Arabic countries).

Procedure

Each usability study session lasted around two hours. Upon completion of a Mozilla Hubs training game, the participants took a short break. Then, I facilitated the usability study with the participants. During the usability study, a task-based concurrent think-aloud approach (Krug, 2010) was used, followed by the administration of the SUS, and then a self-developed semi-structured interview protocol. The task-based think-aloud protocol and the semi-structured interview questions were created using guidelines by Krug (2010) and are provided in the appendix.

Data Collection

In addition to data collection approaches used in the empathy interviews, screen recordings from the participants' game-playing experience were also captured using OBS (2022).

Data Analysis for RQ1

Usability problems were identified through four different approaches: (1) participants' task completion status, (2) participants' verbal expression of problems or preferences, (3) conversation between a participant and me which revealed a usability problem, and (4) my observations of existing or potential usability problems. The problems were then thematically coded to identify evidence of multi-dimensional usability problems.

Data Analysis for RQ2

Participant ratings of usability were determined via analysis of SUS data. All participants' SUS results were calculated according to Brooke's guidelines (1996). Specifically, the calculation function has two steps, (1) for odd (positive) items, subtract one from the score, and for even (negative) items, subtract the score from five, and (2) multiply the sum of all items scores by 2.5 to normalize them on a scale of 100.

Results

In this study, usability problems were identified via expert evaluation and usability testing; therefore, the results from both are presented together. This section is composed of three subsections: (1) findings from the empathy interview,

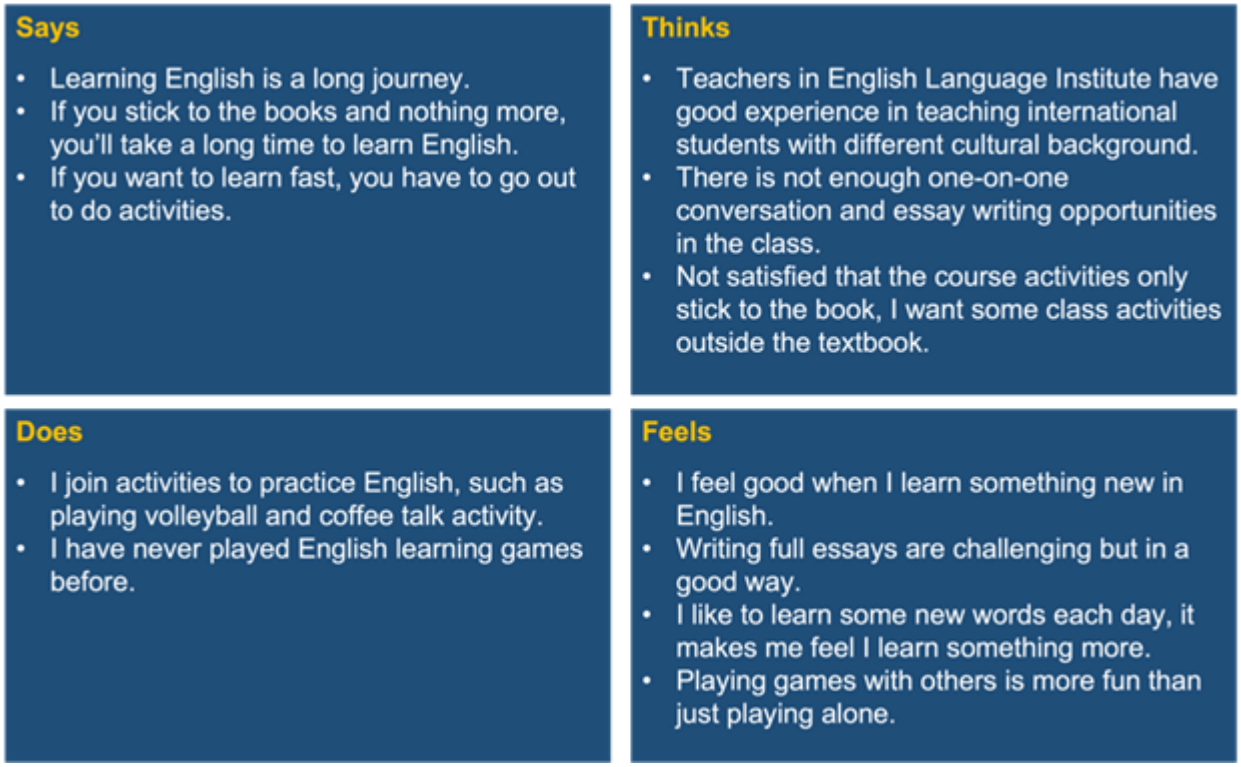
and specifically, the empathy map and persona, (2) identified usability problems across two phases, and (3) findings from the SUS.

Empathy Map and Persona

Four learners participated in empathy interviews. Based on the interview transcripts and video recordings, four empathy maps were developed (see Figure 10 for an example).

Figure 10

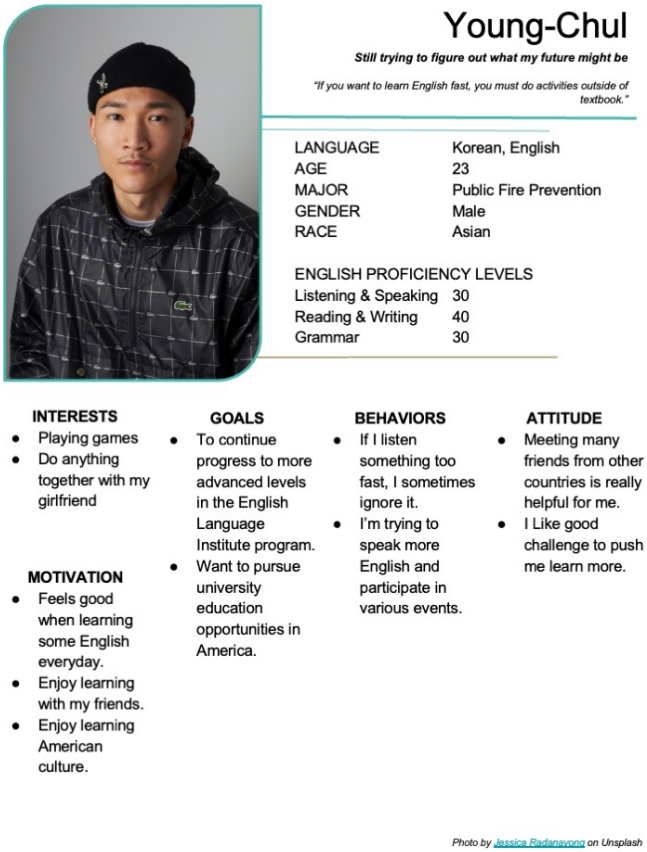
An Example Empathy Map Based on an Empathy Interview Performed in This Study



Empathy maps were then used to inform the development of learner personas. Figure 11 provides an example of personas, which was used to help situate my design in target learners' lived experiences.

Figure 11

An Example Persona Developed for This Study



Identified Usability Problems

Four experts identified 75 usability problems in Phase 1, and five intended learners identified 62 usability problems in Phase 2. Table 1 shows the stratified usability problems across three usability dimensions in both phases.

Table 1

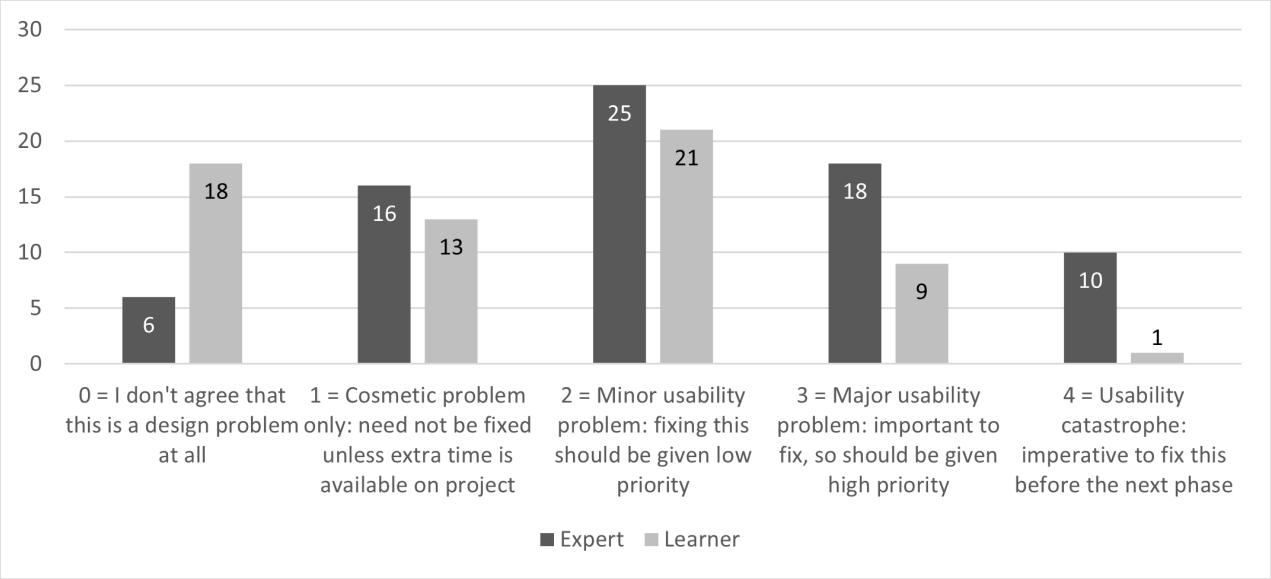
The Stratified Usability Problems in Phase 1 and Phase 2

	Phase 1		Phase 2	
Category	**Count**	**Percentage**	**Count**	**Percentage**
Technological	54	72%	40	65%
Pedagogical	19	25%	20	32%
Sociocultural	2	3%	2	3%
Total	75	100%	62	100%

If only evaluated based on the total number of identified usability problems, it appears that the game design might have not improved that much throughout the iterative process. However, Figure 12 depicts identified problems by severity levels, which shows clear improvements in terms of reduced higher-level usability problems identified by intended learners compared to those identified by experts.

Figure 12

Usability Problems in Two Phases by Severity Levels



Technological Problems

In Phase 1, examples of Level-4 technological usability problems include: (1) too much information in the intro video in Future Land space that caused player's cognitive overload, which was a learnability problem, according to ISO 25010 (International Organization for Standardization, 2011), and (2) the player could not continue the game quests after reading instructions in Magicverse because the navigation system was confusing, which was an operability problem (International Organization for Standardization, 2011).

In Phase 2, the Level-4 technological usability problem was a 3D virtual space floor plan problem. It occurred due to some revisions made in the Mozilla Spoke project file that accidentally blocked the walkable area. While it was a catastrophic problem, the fix was easy. Level-3 technological usability problems appear to be in four subcategories, including (1) multimedia object settings (e.g., Dome 1 video volume too low), (2) human-computer interaction-related problems (e.g., not clear the exact media frame position to put the text chat message), (3) unclear game instruction (e.g., not clear which player can use which yellow glass to post notes), and (4) 3D space technological problem (e.g., the participant's avatar moved under the sand because he was looking down). Some of the problems I identified were triangulated by the post-usability testing interview. For example, one participant commented that: "In the game, sometimes I was not clear; should I click on this, should I press the link on the crystal? This is the only part that I was a bit confusing."

Pedagogical Problems

In Phase 1, an example pedagogical problem identified by an immersive learning expert was that, not until the player came to the Magicverse, he could then figure out why he must listen to the videos and take notes in Evidenceverse. This problem revealed that the language learning task integrated in the game needed to be better explained. An example pedagogical problem identified by a subject matter expert was that, in Magicverse when learners were asked to compose the final story, there was no clear clue of the difference between the five blue glass panels on what to write. He suggested providing prompting questions to guide learners' story-development considering their level of English proficiency.

In Phase 2, the ten Level-2 pedagogical usability problems were further grouped into four subcategories, including (1) the narrative speed of the videos in the game was not appropriate (three were considered too slow, and one was too fast), (2) the story videos without closed caption were a bit hard to understand, (3) was not clear how to use the writing glass panels collaboratively, and (4) did not fully understand the writing prompt questions (e.g., not clear what the word "overview" means on the first blue glass). An example improvement was that while one subject matter expert suggested adding closed captions to the story videos, I designed videos with and without a closed caption and performed an A/B test during the first two usability study sessions with intended learners to verify this pedagogical design feature. Both participants preferred videos with closed captions. Therefore, closed captions were added to all story videos and tested in the following three usability study sessions. The results showed a unanimous preference for the participants to have closed captions.

Sociocultural Problems

This intervention is built on the basis of a jigsaw type of task-based language learning activity. Therefore, making sure communication and interaction between two players/learners is fundamental. When I coded usability problems, any problems that could potentially hinder communication and interaction between two learners were coded as sociocultural problems, no matter what causes. In addition, any cultural-related problems, such as uni-demographically representative, culturally misrepresentative, may be coded as sociocultural problems. In this study, no such problems were identified. In Phase 1, there were two sociocultural problems. Firstly, one immersive learning expert pointed out that the last game instruction said players would share evidence in Magicverse, but he thought the evidence had been typed in Chat message, so he has already shared it with the other player. This problem could potentially hinder the collaborative learning activity, which this game was designed to foster. Secondly, although discussion was encouraged through game prompts in Evidenceverse, a subject matter expert worried that learners might not discuss with each other unless something wasn't clear. This could be a potential valid point, which I was not able to address in the scope of this study. However, this could be a potential future research direction to compare interventions between learners watching Evidenceverse videos together vs. separately in terms of desired language learning behaviors.

In Phase 2, there were also two sociocultural usability problems. Firstly, a participant correctly understood he was by himself when in the Evidenceverse. However, it was only based on his guess instead of reading it from the game instruction. The second sociocultural usability problem was that a participant thought he could not talk to his partner in Magicverse because the microphone on Mozilla Hubs interface was muted. Both sociocultural problems led to one improvement solution that a game world map with indications of means of communication in each space (see the game world map in Figure 6) was added in each introduction video for all game spaces. In addition, a game instruction was added in the introduction for Evidenceverse to remind players: "you can't see each other in Evidenceverse, but you can still chat."

SUS Findings

To answer RQ2, the SUS results collected in Phase 2 from five intended learners across all ten items with aggregated statistics are reported in Table 2. The aggregated SUS scores were calculated by first subtracting one from all odd (positive-oriented) items and subtracting the original score from five for all even (negative-oriented) items, and then multiplying the sum of all scores by 2.5 to normalize scores on a scale of 100. A mean score of the aggregated scores across five participants was then calculated as the final SUS rated by the participants. The benchmark score for a system with average usability is 68, according to Lewis and Sauro's (2018) suggestion. The participants rated the usability of this intervention with high overall perceived usability (M = 83, SD = 10.67).

Table 2

Quantitative Analysis From the SUS Survey Results

Items	Participants Score					Mean	Min	Max	SD
	P1	P2	P3	P4	P5				
1. I think that I would like to use this space frequently.	4	5	5	4	4	4.4	4	5	0.55
2. I found the space unnecessarily complex.	2	2	1	2	3	2	1	3	0.71
3. I thought the space was easy to use.	4	4	5	5	4	4.4	4	5	0.55
4. I think that I would need the support of somebody to be able to use this space.	3	4	1	1	2	2.2	1	4	1.30
5. I found the various functions in this space were well integrated.	4	5	5	5	4	4.6	4	5	0.55
6. I thought there was too much inconsistency in this space.	2	1	1	2	2	1.6	1	2	0.55
7. I would imagine that most people would learn to use this space very quickly.	4	4	4	5	5	4.4	4	5	0.55
8. I found the space very awkward to use.	2	1	1	1	1	1.2	1	2	0.45
9. I felt very confident using the space.	4	5	5	3	5	4.4	3	5	0.89
10. I needed to learn a lot of things before I could start using this space.	4	1	1	3	1	2	1	4	1.41
Aggregated Score	67.5	85	97.5	82.5	82.5	83			10.67

Discussion

While the intervention's design outcome was largely positive, this study has several limitations. Firstly, the majority of the participants were around the same age. Secondly, because this study was based on my dissertation, all data analysis was performed by me; no additional researchers were involved to do member checks. To account for this limitation, this mixed-methods study is designed with multiple approaches to do data triangulation.

As discussed earlier, usability evaluation is a widely practiced methodology in user experience research and practice (Jahnke et al., 2020). However, in the context of LXD, there is a lack of pedagogical and sociocultural usability considerations. In this study, the multi-dimensional usability, namely, technological, pedagogical, and sociocultural dimensions, are clearly evidenced in the design and evaluation of this intervention through both expert evaluation and usability study. As presented in findings, all usability problems (except Level 0 which were coded as non-usability problems) were stratified as one of the three dimensions, and most of the problems were solved with corresponding solutions.

Based on the above findings, it seems the three dimensions were mutually exclusive, which appears to be contradicted with Jahnke and colleague's (2020) multi-dimensional usability framework. However, I would argue that: (1) the multi-dimensional usability framework serves well as a guiding framework when viewing the usability of a learning technology, at the macro level; (2) when examining usability problems and solutions at the micro level, it is better to decompose usability problems to single dimension, so solutions could be designed more specifically, often differently, and potentially more effective in solving the problems.

At the macro level, an LXD product or an intervention is composed of many design objects, among which, some design objects only have one type of usability (e.g., game navigation system has technological usability, prompts for learners to discuss video content with partners has pedagogical usability), some objects are at the intersection of two usability dimensions (e.g., writing prompts for posting key information), or even the intersection of all three dimensions (e.g., story videos). Table 3 provides examples of design objects and the corresponding design considerations from each usability dimension. This provides evidence that not only does usability have multiple dimensions in LXD, but also these dimensions intersect, when viewing a product or an intervention at the macro level.

Table 3

Design Informed From Multiple Usability Perspectives

Dimension	Design Object	Example Usability Considerations
Technological	Game navigation system	Do players understand that the moving particles system indicates the direction they should move in the game world?
Pedagogical	Future writing prompts	Do the writing prompts provide affordances for extended and creative writing opportunities, which is essential to promote language learning?
Sociocultural	The game environment	The game premise is a science-fiction with futuristic feeling, does the game environment (e.g., the surrounding view) align with the players' perception of the futuristic culture?
Techno-pedagogical	Writing prompts for posting key information	Technological: Do players know which yellow glass to use to post their information? Do players know how to post information in the 3D game world? Pedagogical: Do players know what to write and post?
Sociotechnical	Post-game meeting area	Sociocultural: Do the environment and 3D objects in the environment create a comfortable feeling to elicit discussion? Technological: Are there technological affordances in this area to support players' preferred means of communication (e.g., text chat, voice chat)?
Socio-pedagogical	The game quest that asks players to discuss the disaster	Sociocultural: Does the quest instruction elicit discussion between players? Pedagogical: Does the task type provide affordance to a meaningful discussion?
Sociotechnical-pedagogical	Story videos	Sociocultural: Are images for the story figures (e.g., Tom, Jenny) culturally inclusive and non-discriminating? Technological: Are the videos easy to interact with for playing, pausing, and rewinding? Can the videos play normally? Pedagogical: Are the wordings in the video stories slightly above players' language proficiency level so they have a pleasant challenge? Is the audio narrative speed appropriate for target learners?

At the micro level, the examples in Table 3 also reveal that, because each design object resides in one or multiple dimensions of usability, when designing a product or an intervention at a micro level, it is beneficial for designers to intentionally come up with usability design considerations and corresponding solutions along each dimension. This same practice extends to the analysis of identified usability problems, in which case, the decomposition of problems into single dimension usability problems helped more focused solutions to address the specific problems. For example, in Phase 1, one expert was not able to accomplish a writing task at the end of the game because she was not clear on the game instruction. This problem was broken down into two usability problems: (1) technological usability (learnability) problem: the participant thought literally that she needed to write on the glass, and (2) pedagogical usability problem: three instructions on top of five blue glass panels made her think she needed to write three parts; however, the original design intention was to leave it open for learners but encourage them to write as much as possible. After the two usability problems were identified, I created different solutions to address them. For the technological problem, I added an instruction on how to post text into the 3D game world; for the pedagogical problem, I added writing prompts on top of each of the five glass panels. This is one of many examples in this study that showcases that in LXD practice, when designing an intervention at a micro level, it is helpful to decompose usability problems to a single dimension and address them correspondingly.

As mentioned above, this paper reported two phases of this three-phase study. Following Phase 2, a Phase 3 playtesting was conducted with four dyads of intended learners to find evidence of language learning when they played this online game, and whether the learners were satisfied with their learning experience. Findings revealed positive results on both.

Grounded in the entire three-phase study, several future research directions emerged. For example, other pedagogical design approaches could be integrated into game mechanics that might also potentially support language learning

opportunities, such as comparing the effectiveness of language learning outcomes between collaborative watching story videos and the current model (jigsaw type of task). Another direction could be the use of natural language processing to support on-demand language learning.

Conclusion

Most of the prior empirical studies on DGBL2L did not unpack the design of the interventions before testing their impact on learning outcomes (Rankin & Edwards, 2017). Just as a quantitative study would be weakened by using a non-validated instrument, so is a design study weakened by using designs that have not been vetted with intended learners. This study showcased how the LXD approach may be used to design and evaluate learner experiences. In addition, this paper provides evidence of how the multi-dimensional usability framework is useful to guide LXD design practice at a macro level. This study also proposed the application of multi-dimensional usability at a micro level, which hopefully could be applied and further examined by researchers and practitioners in future studies.

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Appendix

USABILITY STUDY PROTOCOL

Introduction (2-3 minutes)

Hi, [insert participant's name]. My name is [Tammy Huang]. I am a doctoral candidate majoring in Educational Technology and minoring in Human-Computer Interaction. My dissertation study focuses on designing and developing a 3D virtual world English language learning game for international students in America. As part of my dissertation study, today, I am facilitating this usability study session.

Before we continue, I would like to send you a link so you can read the consent form. If you agree to participate, please make the selection at the end of the form and let me know when you are done.

https://ufl.qualtrics.com/jfe/form/SV_aYpoK0lJMmgBGom

[START OBS RECORDING]

[START ZOOM RECORDING]

Great, thanks! May I ask, what is your next step plan after finishing the ELI program?

[Today, we have two parts of activities, first you will go through a training game to learn how to use the game platform. Next, you will do the usability study of this game. I will explain what a usability study is what you will do later.

Training

For now, I am sending you a link for the training game: https://hubs.mozilla.com/gj2mehh/peaceful-witty-place

When you go through this training game, I will help you when you have any questions. Are you ready to get started?

Go ahead clicking on it and wait for it to load.

Once the page is fully loaded.

Before we visit the room, let's get you signed in.

On the lower right corner there is a button that says "More" (an icon with three dots). Go ahead clicking on it and choose "Sign In" from the menu.

Use the username I just sent in Chat.

Username: altstudio@coe.ufl.edu

Input the username and click on Next. I will authorize you on my end.

Ask participant to mute Hubs upon entry

You did a great job in the training game. Now, do you want to take a break before we move on to the next activity of the day?

Game Usability

Before we begin this activity, I would like to give you a brief introduction to how we do this usability study and how you can help me improve this game. I'm going to read it to make sure that I cover everything.

Today, you are helping me to do a usability study on this learning game. I would like to see how you perceive the game works. You can evaluate it from three perspectives: technology, language learning, and interaction.

This meeting should take about 1 hour. There will be a pre-game meeting area, three game areas, and a post-game meeting area. In each area, I would like to first get your overall impression, and then, you'll be asked to complete tasks in each area by using different features. When you do the tasks, I will ask you to try to think out loud as much as possible: to say what you're looking at, what you're trying to do, and what you're thinking. This will be a big help for me to understand how you, as a learner, think when playing this game. In the end, I will also ask you some questions about what you thought of your experience.

The first thing I want to clarify right away is that I am testing the design of this virtual world English learning game – not you. You can't do anything wrong here. If you find yourself confused or unable to understand, that means it is exactly what I need to work on to improve. So, don't worry about hurting my feelings because you are helping me make this learning game better for you and other learners like you.

If you have any questions as we go along, just ask them at any time. I may not answer them right away since we're interested in how people do when they don't have someone who can help. But if you still have any questions when we're done, I'll try to answer them then.

And if you need to take a break at any point, just let me know.

Do you have any questions so far?

Are you feeling comfortable and ready to begin?

****

OK, great. Before we get into the learning game, I would like you to share your screen, and I would like to video record the remaining time of our meeting. This video is for the research purpose only, and it will be kept confidential and only accessible to the research team. Is it OK with you?

Thank you very much!

****

I just pasted a link to the learning game in Zoom's chat.

https://hubs.mozilla.com/k757sST/the-future-writers-lobby

Facilitator link:

https://hubs.mozilla.com/k757sST/the-future-writers-lobby#Facilitator

Please click on it. Good. Now, please click on "Join Room." You are doing great.

Pre-Game Meeting Area

Overall Impression (2 minutes)

Good. Now, you entered the Pre-Game Meeting Area. In this area, the two players will meet with the teacher to get to know each other and learn the basic information about this game.

Now, I want you to look around the space and tell me:

1. What is your first impression of this space?
2. What do you think you can do here?

Usability Task

Now, please watch the video. After finishing, I'd like to ask several questions.

1. What do you think about the visual design and color of the video?
2. What do you think about the voice of the video? Is the speed good for you?
3. Do you have any question for me after you watch this video?
4. What do you think you should do next?

> *Note: Allow the participant to proceed from one task to the next until you don't feel like it's producing any value, or the participant is unable to complete the task. Repeat until the participant has provided sufficient feedback on the task, the task is completed, or until time runs out.*

Future Land Area

Overall Impression (2 minutes)

Good. Now, you entered the Future Land area of this virtual world. First, I will ask you to look around this space by pressing Q or E key on your keyboard and tell me what you think of it.

1. What is your first impression of this space?
2. What do you think you can do here, and what do you think the space is for based on what you see?

Usability Task

Now I'm going to ask you to do whatever you think you should do based on your understanding of the message and videos you read or watch in this game world. Again, as much as possible, it will help me if you can try to think out loud as you go along.

When facilitating

Provide verbal encouragement to motivate the participant to continue, "Good job," "Fantastic," "You are doing great," etc.

Observe

● *Is the system-level instruction helpful for the participant to know what to do on this page? (T usability)*

● *Is the pedagogical-level instruction clear to the participant? (P usability)*

● *Does the pedagogical-level instruction prompt them to do the learning task? (P usability)*

Upon completion, ask the following questions:

● What do you think about the instructions provided by Robert Finch? Did you find anything not clear? (TP usability; Design principle: appropriate scaffolding)

● What do you think about the collaborative discussion promotes in this quest? Do you feel they are helpful to prompt you to discuss English language that you are not certain with your game partner? (S usability, potential to elicit LREs)

● Do you have any immediate ideas or suggestions on how to improve this part you just experienced?

Evidenceverse Area

Overall Impression (2 minutes)

Good. Now, you entered the Evidence Verse. First, I will ask you to look around this space by pressing Q or E key on your keyboard and tell me what you think of it.

1. What is your first impression of this space?
2. What do you think you can do here, and what do you think the space is for?

Usability Task

Now I'm going to ask you to do whatever you think you should do based on your understanding of the message and videos you read or watch in this game world. Again, as much as possible, it will help me if you can try to think out loud as you go along.

Observe

● *Is the system-level instruction helpful for the participant to know what to do on this page? (T usability)*

● *Is the pedagogical-level instruction clear to the participant? (P usability)*

● *Does the pedagogical-level instruction prompt them to do the learning task? (P usability)*

Upon completion, ask the following questions:

● If two players are playing this game, do you think you will see your partner in this current area?

● Tell me who's information you are collecting in this area?

● What do you think about the instructions provided by Robot Finch? Did you find anything not clear? (TP usability)

● What do you think about the collaborative discussion prompts in this task? Do you feel they are helpful to prompt you to discuss English language that you are not certain with your game partner? (S usability, potential to elicit LREs)

● Do you have any immediate ideas or suggestions on how to improve this part you just experienced?

Magicverse Area

Usability Task

Now, you entered the Magic Verse. I'm going to ask you to do whatever you think you should do based on your understanding of the message and videos you read or watch in this game world. Again, as much as possible, it will help me if you can try to think out loud as you go along.

Observe

● *Is the system-level instruction helpful for the participant to know what to do on this page? (T usability)*

● *Is the pedagogical-level instruction clear to the participant? (P usability)*

● *Does the pedagogical-level instruction prompt them to do the learning task? (P usability)*

Upon completion, ask the following questions:

● What do you think the overall design of this area? Does it feel like a game?

● What do you think about the instructions provided by Robert Finch? Did you find anything not clear? (TP usability)

● What do you think about the questions or requirements for writing? (P usability)

● What do you think about the requirements for two learners to work together? Would you like to discuss English language that you are not certain with your game partner? (S usability, potential to elicit LREs)

● Do you have any immediate ideas or suggestions on how to improve this part you just experienced?

Post-Game Meeting Area

Overall Impression of Magic Verse (2 minutes)

Great, you entered the Post-Game Meeting Area. Now you have finished this game. I have some questions for you. Could you please tell me your overall impression of the last game area – Evidence Verse.

Evaluation Interview (15-20 minutes)

Great! Thank you for sharing your thoughts and testing on this game. Now you have experienced the entire game, I would like to ask you some questions about your overall experience.

1. Overall experience (overall satisfaction):

a. How would you describe your overall satisfaction with this game?

b. Was there anything you found frustrating or confusing? If so, please describe it.

2. Experience with the learning game (technical usability):

a. What did you expect the learning game to be like?

b. How was the game world like or different from what you expected?

c. What do you think of the video quality and sound quality?

3. The interaction and potential to support social interaction (social usability):

a. How do you feel about setting up your avatar's name and appearance? (Design principle: personalized identity)

b. How do you feel about the social interaction functions, such as chatting via text message, sharing content in the virtual world space, voice chatting via microphone? (Design principle: support text and voice chat)

4. Experience with language learning (pedagogical usability):

a. What is your overall impression of this game in terms of helping you improve your English communication skills?

b. What would make this language learning game more helpful for you?

c. How do you feel about the level of English language used in the game in relation to your current English proficiency? (Design principle: appropriate language level)

5. What questions do you still have?

System Usability Scale (5 minutes)

OK, as the last part of our meeting, I have a survey form for you to fill out. I am going to share the survey form link in Zoom chat. Please click on it and finish the survey. If you need any help explaining the survey questions, please feel free to ask me.

https://ufl.qualtrics.com/jfe/form/SV_7TDFviBhRfeqaJE

Please select the number that reflects your immediate response to each statement. Don't think too long about each statement. Make sure you respond to every statement.

Table C-1.

System Usability Scale Used in This Study.

Item	Strongly disagree				Strongly agree
1. I think that I would like to use this space frequently.	1	2	3	4	5
2. I found the space unnecessarily complex.	1	2	3	4	5
3. I thought the space was easy to use.	1	2	3	4	5
4. I think that I would need the support of somebody to be able to use this space.	1	2	3	4	5
5. I found the various functions in this space were well integrated.	1	2	3	4	5
6. I thought there was too much inconsistency in this space.	1	2	3	4	5
7. I would imagine that most people would learn to use this space very quickly.	1	2	3	4	5
8. I found the space very awkward to use.	1	2	3	4	5
9. I felt very confident using the space.	1	2	3	4	5
10. I needed to learn a lot of things before I could start using this space.	1	2	3	4	5

11. Overall, I would rate the user-friendliness of this space as:

Worst Imaginable	Awful	Poor	Ok	Good	Excellent	Best Imaginable

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Learning Experience Design as Collective Praxis: Two Design Cases from Higher Education

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Critical Pedagogy | Learning Experience Design | Participatory Design | Collaborative Praxis | Inclusive and Social Just Education

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This paper explores the pivotal role of learning experience designers in fostering collective praxis through two design cases, embracing critical pedagogy. In the "Centering Justice" program, they facilitate collaboration among faculty, students, and instructional technologists, for an inclusive and socially just teaching framework. Navigating power dynamics, they promote awareness of privilege and oppression, and encourage dialogue and reflexivity. In the online course on intimate partner violence, they orchestrate interdisciplinary collaboration, ensuring authentic and empathetic content through participatory design. These case studies highlight the central role of learning experience designer in managing stakeholders, power dynamics, and fostering transformative education.

Introduction

The swift advancement of technological innovation has fundamentally transformed the educational landscape, opening new possibilities for interactive and personalized learning experiences (Dumford & Miller, 2018; Marcus, 2022). The rapid pace of technological advancement within higher education institutions has been paralleled by a notable demographic shift, with today's student body reflecting unprecedented diversity in terms of culture, socio-economic standing, and prior educational experiences (Bass, 2023; Orr et al., 2020). These transformative changes necessitate a profound reassessment of traditional pedagogy and call for the implementation of critical pedagogy, which not only conveys knowledge but also empowers learners to critically analyze and influence their world (Giroux, 2020).

The traditional instructional design approach, often perceived as an isolated entity solely working with subject matter experts and serving as the final link in the chain to create instructional content (Davey et al., 2019; González & Quiroz, 2019; Richardson et al., 2019), falls short in meeting the expectations of this evolving educational landscape. It lacks

effectiveness in engaging learners and fostering their ownership of the learning process, while failing to encourage critical analysis and student agency in navigating their complex world. For example, when designing a face-to-face undergraduate course, instructional designers may only be required to define learning objectives and create standardized assessments based on a predetermined structured curriculum. However, the emergence of advanced learning technologies (e.g., MOOCs, extended reality) has highlighted the need for more personalized and adaptive experiences. In addition, it underscores the importance of designing equitable learning environments that address diverse learner needs, promote inclusivity, and bridge educational disparities.

In response, there is an unprecedented demand for learning experience designers recognizing their pivotal role in meeting the needs of the diverse and technologically adept student population (Heggart & Dickson-Deane, 2021). With their expertise in pedagogy and technology, learning experience designers are uniquely positioned to design innovative learning experiences that leverage emerging tools and methods, ultimately enhancing student engagement and improving learning outcomes. Their focus is broad and holistic, encompassing the complete learning journey to create more enjoyable, engaging, and effective learning experiences (Schmidt & Tawfik, 2022). To achieve this, learning experience designers wield a robust toolkit that combines design thinking, user-experience strategies, system design principles, change management techniques, and insights from learning sciences and analytics (Thurber et al., 2021).

These endeavors have led learning experience designers to gain professional recognition that extends beyond standard course design and development to encompass new responsibilities such as project management, learning analytics, and faculty development and collaboration (Brown et al., 2020). Furthermore, learning experience designers play a central role in orchestrating *collective praxis*. This process integrates the efforts of various stakeholders, including faculty and students, to co-create learning experiences anchored in theory, best practices, and learner needs, all while addressing educational inequities. Despite this progress, a gap remains in our understanding of how learning experience designers facilitate collective praxis to embody critical pedagogy. There are outstanding questions concerning how learning experience designers manage divergent perspectives, navigate power dynamics, apply their extensive toolkit, and build consensus to foster an environment that promotes critical thinking and transformative learning.

In this paper, I present learning experience design as a collective praxis by positioning two cases. Each case prefaces a form of the praxis of deliberate, thoughtful, and reflective action amongst an interdisciplinary team, including learning experience designers, subject matter experts, potential learners, technology experts, and other stakeholders. The process involves acting and reflecting in tandem to bring more social justice by negotiating, challenging, and reshaping knowledge to awaken others to the possibilities of a different perspective. Finally, I outline how learning experience design methodologies (e.g., learner persona, journey map, participatory design) were utilized that embrace differences to nurture critique, challenge, and extend our design thinking.

Related Work

From Isolated Practice to Collective Praxis

The Cambridge English Dictionary defines praxis as “the process of using a theory or knowledge in a practical way”. It emphasizes that theory should be firmly grounded in real-world experiences and that practical action should be informed by critical reflection and analysis (Walker et al., 2019). While practice refers to the actual execution of an activity, procedure, or technique for the acquisition of practical abilities, praxis emphasizes the holistic integration of theory, action, and critical reflection, encompassing a broader understanding of the social, political, and ethical dimensions of an activity or discipline (Wenglinsky, 2004).

Praxis, often misunderstood as mere reflection, requires a more comprehensive understanding of learning experience designers operating in complex and diverse contexts with power disparities, conflicting reforms, and equity concerns (Freire, 1970). Extensive research emphasizes the importance of ethical awareness in learning design practice, recognizing that decisions made in learning experience design are not neutral and can have significant social, cultural,

and political implications (Gray & Boiling, 2016; Gray & Howard, 2015). Learning experience designers should navigate these complexities, taking into account the broader ethical implications of their design choices to ensure inclusive and equitable learning experiences for all learners. Reflection, although important, is just one aspect of the multifaceted praxis that learning experience designers engage in, encompassing critical analysis, ethical considerations, and a deep understanding of the social and cultural contexts in which learning occurs (Gray et al., 2015).

To address biases and assumptions that can perpetuate inequalities and marginalize certain learner groups, learning experience designers should adopt more participatory approaches. This involves recognizing their biases, embracing diverse perspectives, and incorporating the needs and experiences of learners and stakeholders (Gray et al., 2015; Hladik et al., 2021). By including more participatory approaches, learning experience designers can foster inclusivity, promote equity, and create design outcomes that challenge dominant discourses. It is essential for learning experience designers to reflect on their biases, engage in critical analysis, and collaborate with diverse stakeholders to ensure more inclusive, equitable, and responsive learning experiences (Gray et al., 2015).

Another essential part of this process is the designer's capacity for high-level *epistemic fluency* (Colton et al., 2022; Markauskaite & Goodyear, 2017). Epistemic fluency refers to one's aptitude to understand, interpret, and apply various knowledge forms, appreciate their distinct expression and evaluation methods, and empathize with individuals operating within a different knowledge framework (Morrison & Collins, 1995, p. 40). In general, learning experience designers are expected to perform complex design work with subject matter experts to create rigorous, high-quality, and accessible educational programs that serve the needs of all learners (Roberts et al., 2022). By virtue of epistemic fluency, learning experience designers can question traditional pedagogical thinking (Boling & Gray, 2021) and remain open to innovative design approaches.

What traits, then, can learning experience designers facilitate collective praxis for their design practices? *Be reflexive*—reflexivity enables them to recognize and challenge their biases and assumptions and reflect on how their designs may perpetuate social inequities. *Have a critical perspective*—A critical perspective allows them to challenge the current state and power dynamics in their design contexts and to consider how their designs can support social justice and equity. *Be collaborative*—collaboration facilitates the exchange of diverse perspectives and knowledge, enabling learning experience designers to co-create solutions that respond to the needs of all learners (Door, 2014). Together, these qualities enable learning experience designers to engage in a continuous cycle of reflection, action, and refinement, leading to more responsive and equitable learning design practices (Hutchings et al., 2013).

Critical Pedagogy and Praxis

Critical pedagogy and praxis have a close and interconnected relationship. Critical pedagogy is a teaching philosophy that stresses the need for education to be empowering and transformational and to question the status quo (Giroux, 2020). It is grounded on the notion that education is not neutral but rather perpetuates and reinforces existing power systems and inequities. By empowering students to become critical thinkers and agents of change, critical pedagogy strives to challenge these power structures (Braa & Callero, 2006). In this sense, critical pedagogy emphasizes praxis as a central component of its approach.

An essential principle of critical pedagogy is that education should be based on the experiences and perspectives of students. This implies that students are encouraged to share their stories and experiences and critically assess their social surroundings (Joseph Jeyaraj, 2021). For example, learning experience designers might create a "learning circle" activity in which students sit in a circle and take turns sharing a personal experience related to the course topic. After each person shares, the group can discuss the underlying power structures and social context contributing to the experience. Learning experience designers can also create assignments that ask learners to reflect on their experiences and how they relate to course content and provide opportunities for learners to share these reflections with the class. By incorporating these activities, learning experience designers can create a more inclusive and empowering learning environment grounded in learners' experiences and perspectives.

Barab et al. (2007) state that “designers should regard their work in terms of its impact not on a situation directly but, rather, on how users transact with the work, with each other, and with their contexts” (p. 296). By integrating critical

pedagogy ideas into learning experience design, learning experience designers should be able to create transformational learning experiences that enable students to become engaged community members. For example, to encourage learners to critically examine the world around them and take action to challenge injustice and promote social change, learning experience designers can design a project where students work with a local community organization to address an environmental issue. Students could research the issue, develop a plan of action, and work collaboratively with the community organization to implement their plan. Through this project, students would not only apply the knowledge and skills they gained in the course but also engage in praxis by taking action to promote social change.

Likewise, critical pedagogy aims to develop inclusive and empowered learning settings that inspire students to challenge presumptions, study social and political situations critically, and take action to promote social change (Green & Chewning, 2020; Morris, 2018). It also entails developing critical thinking and reflection and designing activities that encourage students to assess situations from many viewpoints and engage in conversation with others (Barab et al., 2004, 2007). However, research shows that learning experience designers are not always receptive to a critical perspective on design practices (e.g., Gray, 2020; Reeves et al., 2005; Schmidt & Huang, 2022).

One possible reason is that learning design has traditionally focused on scientific approaches prioritizing unbiased design models (Yeaman et al., 1994). Despite the non-neutrality of learning, the learning design community has primarily a process-oriented, model-driven understanding of practice, which excludes a critical awareness of the underlying power dynamics and social inequalities that influence the learning process (Barab et al., 2007; Gray & Boiling, 2016). Another reason might be that the current emphasis on efficiency and effectiveness in learning design can prioritize technical solutions over critical inquiry and transformational experimentation (Boling & Gray, 2021; Doering & Veletsianos, 2008). A more fundamental reason can be that it is easier to discuss theoretically than to apply in specific learning contexts (Wehr, 2022).

Some recent studies have made explicit efforts to apply specific frameworks and outline practical strategies learning experience designers can use for this purpose (e.g., Abramenka-Lachheb & de Siqueira, 2022; Elkhoury & Usman, 2021; Gachago et al., 2022; Sirkhotte & Vilakazi, 2022). To contribute to this endeavor, I position two design cases for greater emphasis on collective praxis as a way of meeting learning experience design goals: (1) actively engaging learners' social identities in the construction of meaning within their learning space, (2) representing practice in ways that reflect the real-world conditions in which meaningful learning takes place, and (3) increasing the possibility for knowledge transfer beyond their learning space. I select these cases that do not just introduce students to declarative knowledge or procedural skills so they can pass the appropriate exams at the end of the learning program (i.e., poiesis); instead, they were designed to transform learners in a way that enables them to be socially responsible and capable of actively contributing to their communities at all social levels (i.e., praxis).

Case 1. Design for Faculty Development Program "Centering Justice"

This case describes the design of a faculty training course titled "Centering Justice," focusing on the period of 2018 – 2020. The purpose of the design was to convert an existing face-to-face, a half-day workshop about inclusive and socially just teaching and learning in higher education into a 4-module online course to provide flexibility in terms of time and location, access to resources, self-paced learning, enhanced collaboration, and data-driven insights. This case demonstrates how various user experience methodologies were used not only to create a faculty training course to help incorporate the concepts of privilege, oppression, diversity, and social justice (PODS[1]) in teaching but also to examine and realize those concepts within their practices. As a result, the course aims to bridge theory and practice to drive change in both spaces.

Course Description

“Centering Justice” runs as a fully online course through the Canvas learning management system at the University of Michigan School of Social Work. As shown in Table 1, the course features four modules. The faculty participants are required to complete the program over 15 weeks as a cohort. The activities feature individual learning activities and assignments (interactive, animated texts, graphics, videos) and peer-based interactions. One faculty member was internally selected as a subject matter expert for creating the content and designing the activities. One educational program manager (with a social work teaching background) was a facilitator for offering guidance, clarification on assignments and instructions, and follow-up consultations for course design and implementation.

Table 1

The Structure and Content of the Four Online Modules

Module	Topic	Teaching Principles & Resources	Discussion
1. Introduction to Centering justice	• Why centering justice • Key approaches to centering justice • Methods for centering justice	• PODS intensive course design • Checklist for PODS integration in class • Samples for PODS intensive course	• Define socially just teaching and learning • Describe your implementation of PODS (concept & pedagogy)
2. Diversity and positionality	• Why diversity matters • Positionality • Critical awareness of positionality	• Positionality wheel • Implicit bias • Inclusive teaching strategies and examples	• Discuss cultural humility in a real-world scenario • Share and reflect positionality wheel
3. Privilege, oppression, and intersectionality	• Domains of power • Privilege and oppression • Intersectionality	• Anti-racism pedagogy • Transparent assignment	• Create transparent assignments • Discuss equity-focus assessments
4. Social justice	• Perspectives on social justice • Factors influencing perspectives on social justice • Frameworks of social justice	• Universal design for learning • Web accessibility • Checklist for accessible course design • Samples for accessible course design	• Discuss different perspectives on social justice • Discuss activities for student reflection on their positionalities

Each module contains core tenants of PODS-related theories and the relationship of those tenants to the principles of diverse, equitable, inclusive, and socially just teaching and learning. This structure is repeated in other modules. The faculty participants were encouraged to read audio-narrative texts/images, watch videos, and take interactive activities (e.g., interactive timelines/maps, matching games, role-play scenarios, etc.). Once they finish a lesson, they are asked to complete quizzes, short essays for self-reflection, and cohort discussions for action planning.

Building Mutual Understanding Through Participatory Design

The target audience for Centering Justice consists of social work instructors (all level tenured professors, non-tenured instructors, and graduate teaching assistants) who are subject matter experts in social justice and human rights but are not prepared to teach effectively and mentor students by realizing equitable and just learning in their classrooms. They established a project team, including twelve members: one faculty subject matter expert, one learning experience

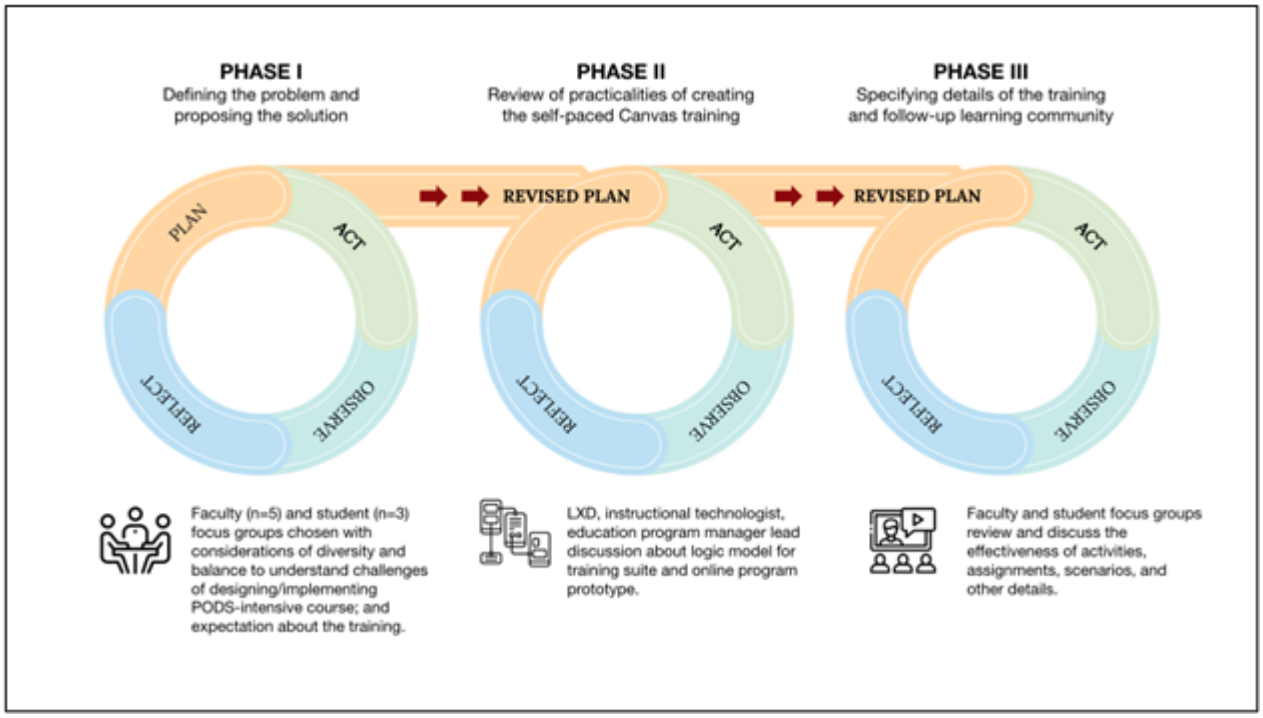
designer, one instructional technologist, one education program manager, a faculty focus group (five instructors with disciplinary expertise), and a student focus group (three graduate students). In this case, the learning design team consists of all participants except for faculty and student focus groups.

The participatory design approach was implemented to democratize design processes to empower our target trainees and give them a voice in the design process. Development and improvement were accomplished through a concurrent process of action and study, informed by user participation, and regulated by critical reflection. The process comprised multiple focus groups for feedback, reflection, and critical evaluation, each of which was facilitated by the learning experience design lead (Cumbo & Selwyn, 2022; Könings et al., 2014).

Prior to each focus group, the learning design team created the meeting's agenda, and collaboration guidelines and summary notes were shared after each meeting. The focus group participants were encouraged to produce feedback by including a set of suggested actions prioritized for the next stages of action and implementation. As shown in Figure 1, the learning design team outlined the three participatory design phases.

Figure 1

The Iterative and Incremental Cycles of Three Participatory Design Phases



Phase I - Establishing a Common Language

The faculty focus group was invited to openly discuss the issues they encountered in their classrooms, what they believed would cause or influence these, and any helpful activities. During the first meeting, the learning design team found discrepancies in understanding the core concepts of the course. To address this, they used the positionality wheel (also called social identity map) activity (see Figure 2) with the faculty focus group so that every participant could check their own positionality considering their potential biases, experiences, and understanding of the PODS concepts. The learning experience designer shared one's own social identity map as a reflexivity tool to explain how to practice positionality in critical learning design explicitly. The learning experience designer highlighted the fluidity of my ever-changing social identities, the abstract, intangible nature of my social identities, the difficulty of knowing which facets are more influential over time and place, and how my social identities impact the design process (Jacobson & Mustafa,

2019). This helped us contextualize our definitions and allowed for an inclusive dialogue about the nuances of each term. Also, it led the entire team to explore how to make ideation and decision-making processes equal, ensuring all ideas are considered equally and presenting a defensible strategy, which could be explained to each other, to condense many ideas into a few concepts while ensuring fair representation.

Figure 2

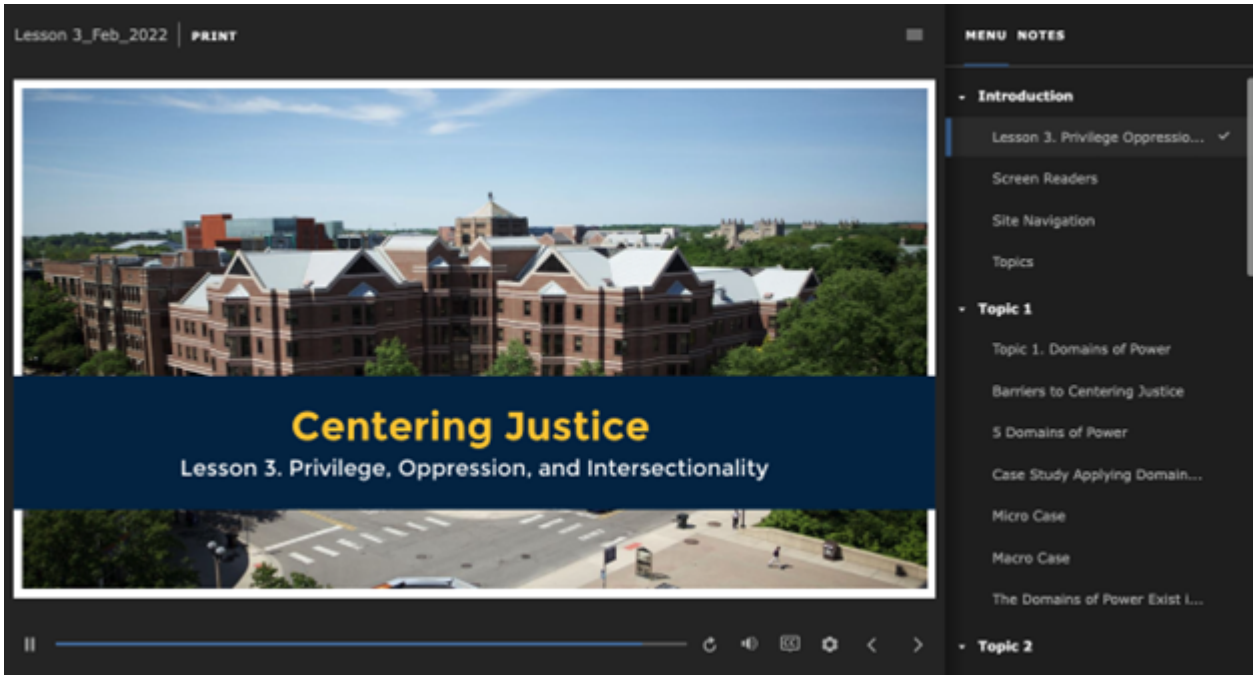
Example of Social Identity Map

Phase II - Technology and Accessibility

Midway through the project, the learning design team presented the prototype that contained the training program backbone, for example, its structure, primary click-through navigation, and layers of more complex interactions (scrolling, dropdowns, menus, various effects, etc.; see Figure 3). The instructional technologist employed a cognitive walkthrough method with the faculty focus group, who actively navigated the course prototype while the learning design team observed their interaction, to identify potential technology-related challenges. They iterated the design based on their feedback, and this practice exemplified the inclusivity that our course aimed to promote. One notable suggestion was to provide alternate media options for those with difficulties using audio-narrated interaction or who prefer paper-based activities. This engendered a question for the learning design team “What would be maximally instructive for as many trainees as possible?” which led the team to utilize a learner persona activity (see Figure 3).

Figure 3

Lesson Homepage Prototype



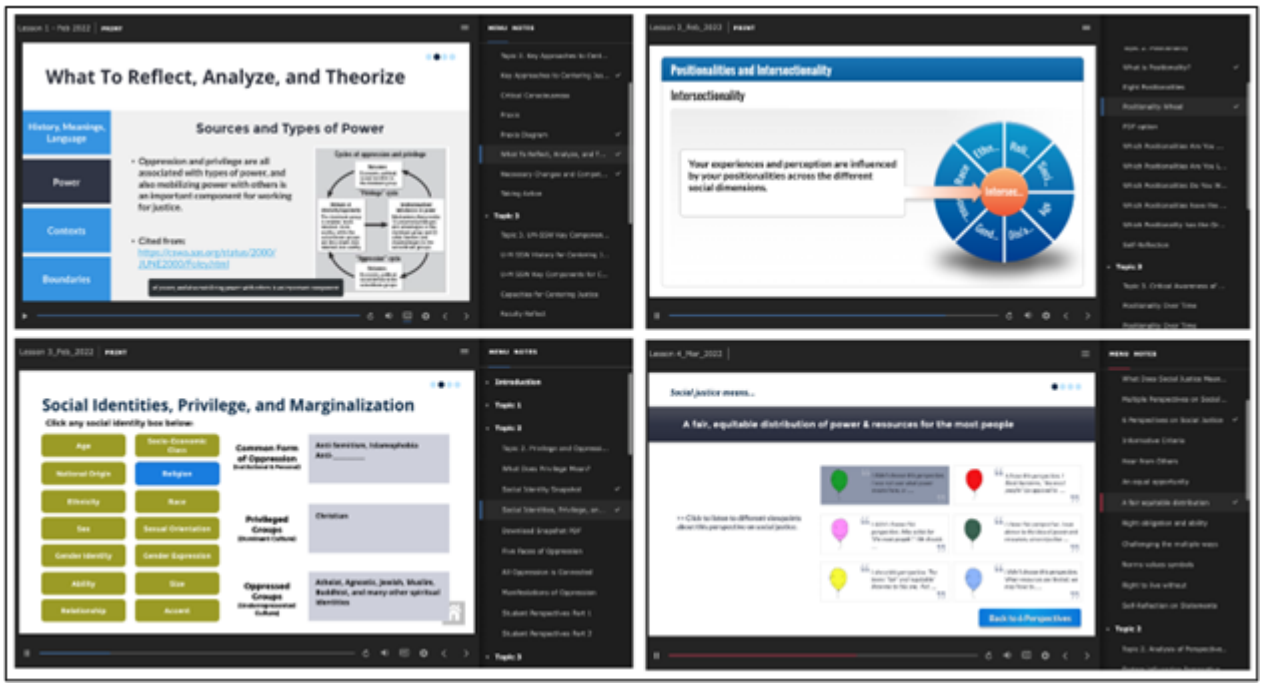
Phase III - Usability Testing and Iterative Design

For Phase III, the Canvas training site was presented to show the faculty focus group (*n*=5) and the student focus group (*n*=3). All participants had the opportunity to review this site in advance (see Figure 4) and submit feedback by completing a survey about visual design, layout, and information architecture, interaction design, responsiveness, accessibility, and consistency.

In this final phase, concerns emerged about how to practically apply the course content to different teaching contexts. They used a participatory design method, inviting faculty members to co-design discipline-specific scenarios and case studies. This process democratized our course design and ensured that the course content was grounded in the realities of various academic fields.

Figure 4

Screenshots of Interactive Activities



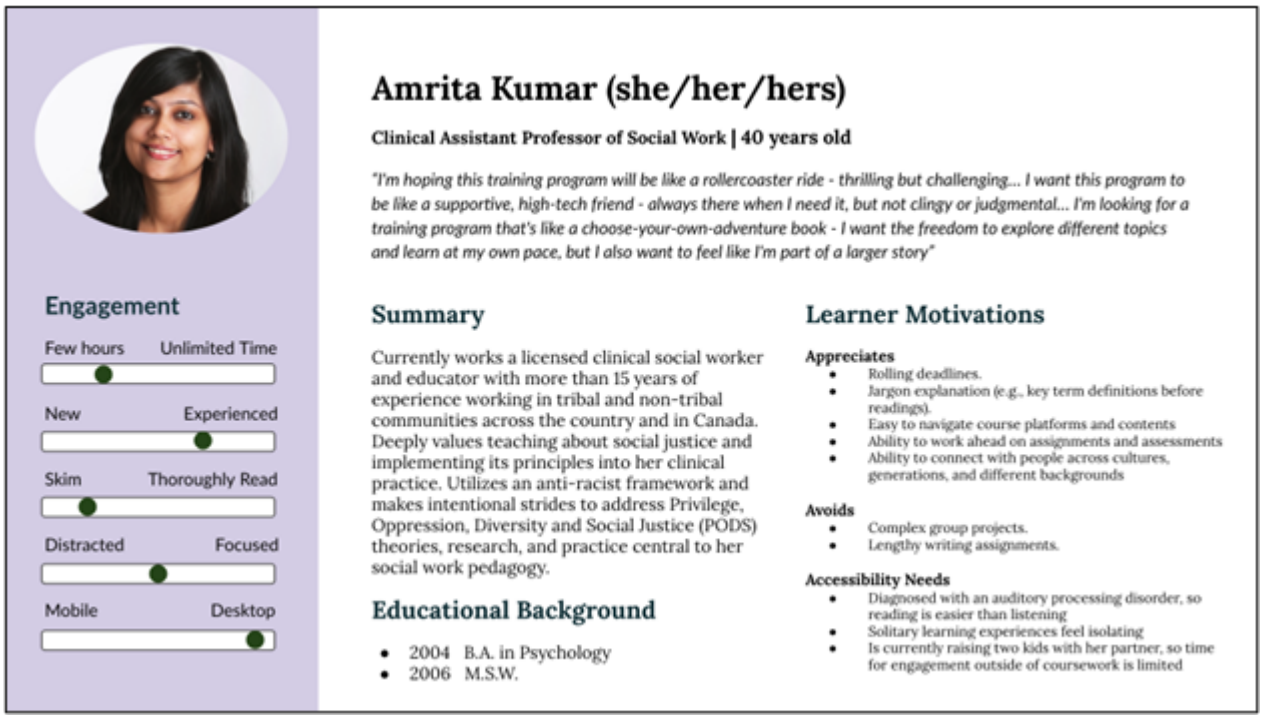
Using Persona for Agency and Autonomy of the Learner

Originally, personas were designed to enable designers to focus on people other than themselves (i.e., creating for actual users rather than their own needs). Thus, they were supposed to be reflective of the target user groups or a specific user within those categories (Bowen et al., 2020). Research shows that personas can enhance the agency and autonomy of the learner by customizing the training program to meet the individual needs of each learner (personalization), providing more relevant learning experiences that make learners more engaged and invested in the training (relevance), providing multiple options and allowing learners to choose the methods that work best for them (flexibility), and helping designers to understand learners challenges and opportunities (empathy) within a context (e.g., Ferreira et al., 2015; Harley, 2015; Krueger, 2022; Wang et al., 2022).

Using the three categories of persona established by Quintana et al. (2017), the learning design team constructed an assumptive, aspirational, and data-informed learner persona to spark a conversation about ways to more consciously incorporate socio-cultural perspectives into the learning design processes (Schmidt et al., 2020). An instructor's perception of a student's interests and values in a course forms an *assumptive persona*, often informed by the faculty's residential teaching experience. Our assumptive persona was created in this project based on the aforementioned positionality wheel (social identity map) activity (see Figure 5). Instructors create *aspirational personas* to attract a certain type of student: for example, STEM instructors may want to attract female students. Our aspirational persona was established based on the expected learning outcomes of the training, which was designed to equip participants with the necessary skills and knowledge to improve their teaching practice. Finally, *data-informed personas* reveal potential learners' demographics, motivations, and backgrounds using survey and interview data. To create this persona, the learning design team used the annual faculty survey results and relevant meeting documents that provided insights into faculty members' training preferences, interests, and needs. They also conducted individual interviews with the faculty focus group (n=5) to gather more specific and nuanced information about how faculty members engage with training and use it to inform their teaching practices.

Figure 5

Example of Assumptive Learner Persona for the Faculty Training "Centering Justice"

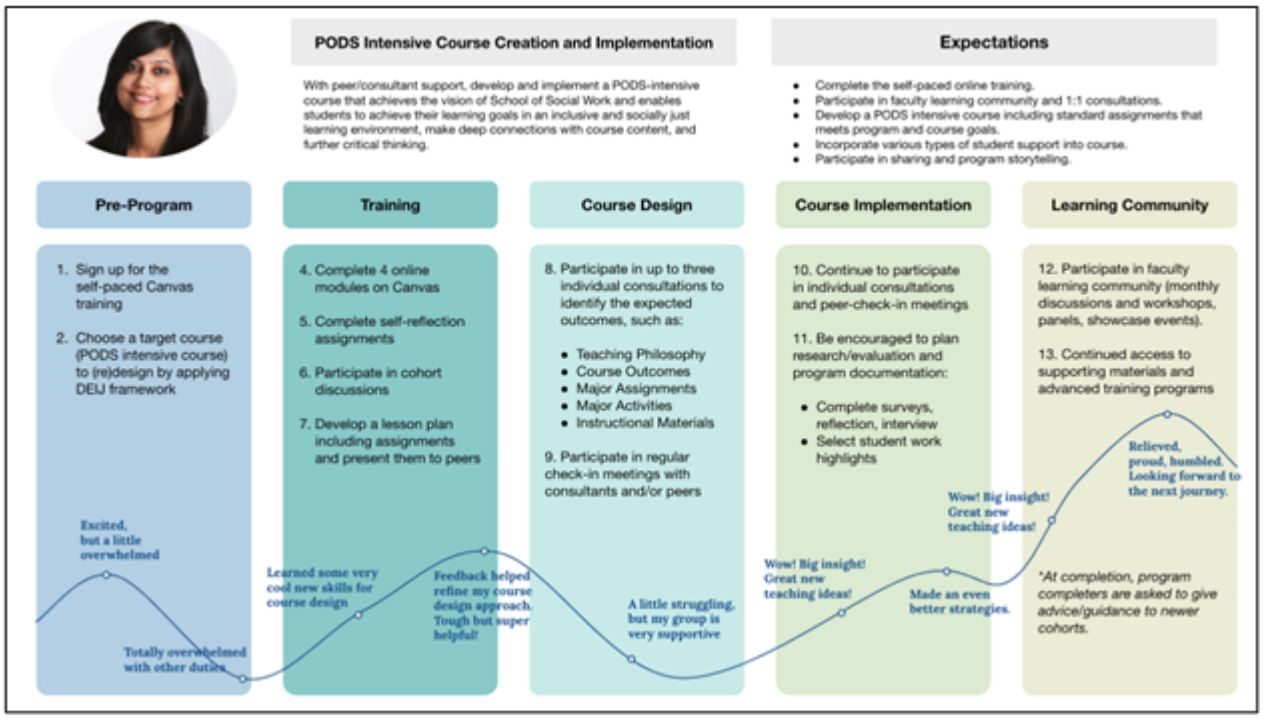


Journey Map and Cognitive Walkthrough for Inclusion and Accessibility

Another design issue raised by the participants was inclusion and accessibility. Using a learning journey map[2], the learning design team attempted to spot pain points and learner frustration and identify potential support (see Figure 6). It helped better understand the learner's needs, motivations, and goals. After creating the first prototype based on learner persona and journey map methods, the faculty focus group reviewed it individually to provide improvement areas for multiple engagement and representation options.

Figure 6

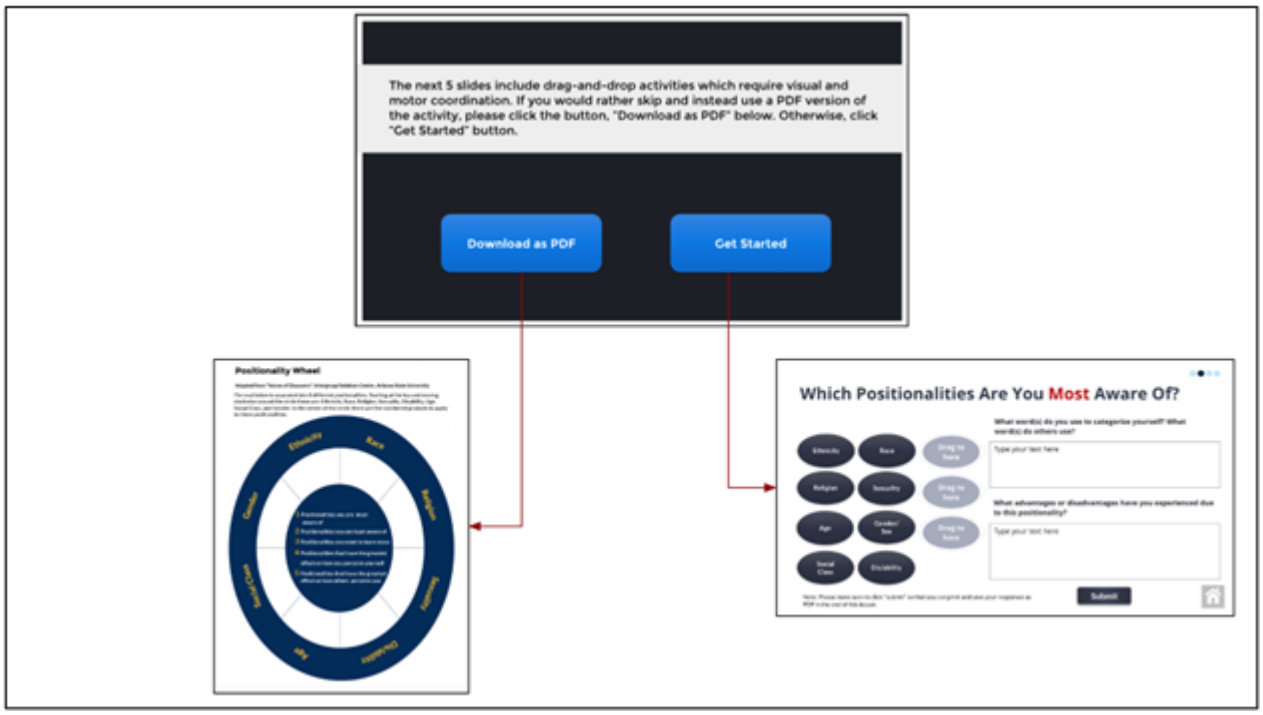
Learner Journey Map



One notable suggestion emphasized the importance of examining accessibility for diverse learners, highlighting that "designing with" people with disabilities or special needs is more effective than "designing solely for" them. Thus, the learning design team revised the first prototype to make it screen-reader-friendly and facilitated a cognitive walkthrough with one participant from the student focus group with visual impairment. In addition, they decided to provide alternative means of engagement for all interactive activities. For example, trainees can choose whether to take an interactive drag-and-drop quiz or download an equivalent PDF version of the activity to experience offline or use it in their classroom.

Figure 7

Example of Providing Multiple Means of Engagement



Case 2. Design for Massive Open Online Course "Intimate Partner Violence"

The second case describes another example of learning experience design as collective praxis in developing a massive open online course (MOOC). The MOOC title is “Intimate Partner Violence (IPV): Interprofessional Strategies for Prevention and Response, " launched on the edX platform in 2021. The following section explores the MOOC design and practices, centering on contextualization, with input from the interdisciplinary group of faculty members, IPV field practitioners, and survivors.

Course Description

The project team was established as a partnership between the University of Michigan and the University of Maryland to utilize the extensive faculty expertise from these two institutions. The subject matter expert group consists of nine faculty members, including four social work professors, two nursing professors, one medicine professor, one law professor, and one dentistry professor. Three learning experience designers, one instructional technologist, one project manager, and one software developer served as the learning design team.

The driving force for the MOOC development was the absence of interprofessional education opportunities focused on strengthening clinicians’ awareness of IPV and designing and implementing interprofessional care for patients experiencing IPV. Therefore, the course consists of five modules covering IPV key concepts, definitions, and theories from public health and legal perspectives. Learners are expected to use interprofessional ways to detect, screen, and respond to IPV in clinical practice settings, including social work, law, nursing, dentistry, and medicine. Once completed, learners can claim one-credit continuing education in their discipline.

Table 2

The Structure and Content of the Five Online Modules

Module	Topic	Voices from Real Life People	Role-Play Simulation
1. Defining and Contextualizing Intimate Partner Violence	• What is IPV? : Definitions, Prevalence, Risk and Protective Factors • Indicators & Consequences • Theories about the root causes of IPV	• 4 Survivor's Voice • 1 Practitioner's Voice (Social Worker)	Physical Abuse
2. Person-Centered Responses – Screening and Interprofessional Care	• What is Interprofessional Care? • Screening Tools and Methods • Trauma-informed, Patient-centered Care • Personal and Professional Competence • Interprofessional Response	• 2 Survivor's Voice • 4 Practitioner's Voice (Medicine, Nursing, Social Work, Law)	• Economic Abuse • Financial Abuse
3. Person-Centered Responses – Legal and Community-Based Interventions	• What is Safety Planning? • Legal Interventions • Healthcare Interventions • Community Resources & Responses • Interventions for Partners who use violence	• 2 Survivor's Voice • 2 Practitioner's Voice (Law, Medicine)	• Adolescent tech-facilitated IPV • Stalking? • Sexual violence
4. Underserved Populations and Special Considerations	• Social and Historical Context of IPV • Population and Culturally-specific Screening • Community Responses & Strengths • Responding in Context	• 1 Survivor's Voice • 2 Practitioner's Voice (Social Work, Nursing)	• Undocumented partner's immigration status as means of control
5. Prevention: Looking Ahead	• IPV & Public Health Prevention • Self-care in Clinical Practice	• N/A	• Critical reflection and action plan

Each module contains a variety of learning resources, including readings, lecture videos, quizzes, and simulation activities. Age, gender, gender identity, race, ethnicity, immigration status, socioeconomic status, and sexual orientation are among the cultural factors and social inequalities covered in this MOOC.

Persona Co-Development for Interdisciplinary Design of MOOC

The project began with the challenge of ensuring an inclusive representation of IPV from diverse professional perspectives. Faculty members from social work, nursing, medicine, law, and dentistry were all involved, each bringing unique insights but also discipline-specific biases.

Recognizing the importance of inclusive collaboration and *epistemic fluency* (the ability to navigate different fields of knowledge), the project team sought to foster understanding among diverse disciplines. Through active listening and open dialogue, the learning experience designer created a safe space for faculty members to share their disciplinary expertise while also encouraging them to explore and appreciate the insights and viewpoints of others. Initiating team-building activities, actively valuing diverse expertise, and facilitating structured discussions, the learning experience designer nurtured an authentic and inclusive environment. Reflective exercises were thoughtfully designed to prompt

individuals to critically examine their biases and assumptions, creating an atmosphere conducive to open-mindedness and personal growth. By continuously emphasizing shared goals and collective responsibility, the learning experience designer nurtured an authentic and supportive space where faculty members felt empowered to explore ideas and actively contribute to the inclusive interdisciplinary design of the MOOC.

To prevent oversimplification or overlooking aspects of IPV's complexity, participatory design methods for persona development were employed. Challenging traditional power dynamics, the activity aimed to ensure that every voice was heard, resulting in personas that resonated with each discipline. Initially, the learning experience designer presented assumptive and aspirational personas as models. Then, each discipline created personas and shared their learning design ideas to meet their unique needs and preferences. This process sparked intense discussions, exposing deep-rooted disciplinary biases while providing an opportunity for transformative learning that shaped the course's development.

Figure 8

Examples of Learner Persona Learning Experience Designers Presented

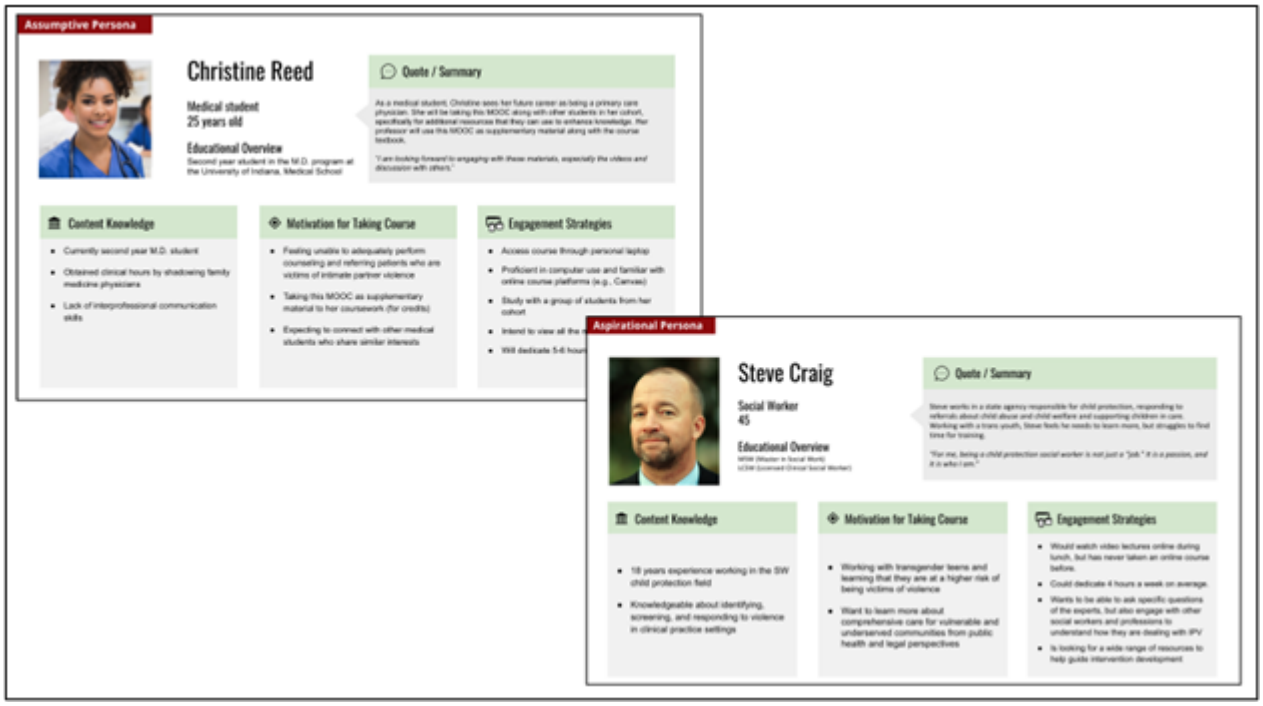


Figure 9

Examples of Learner Persona Subject Matter Experts Developed

Assumptive Persona

Justin Smith

Dentistry student

Justin, a 3rd-year dental student, has been awarded the national scholarship for his pre-doctoral dental study.

Justin helped an oral health component for the multidisciplinary program for homeless children and adults and is currently organizing a 5K run/walk to benefit "Give Back a Smile", which assists victims of intimate partner violence. These experiences made him want to learn more about interprofessional responses to IPV.

Justin is very **proficient** in using online learning platform (Canvas) and would like to explore **external resources** to expand his general knowledge as well as enhance his CV.

Justin is willing to dedicate **3-4 hours a week** for study to view all modules in the course.

Anika Burgess

Law School Student

Anika is a registered social worker who has developed a strong interest in criminal law and mental health, working towards bringing them together.

Anika is well practiced in crisis intervention, group work and basic counselling. Anika in intrinsically motivated to learn about the IPV, looking for **up-to-date practical skills** that will apply to her future career.

Anika has been taking various MOOCs, but due to limited time, Anika usually **skips through videos and lectures**.

Anika is interested in **connecting with learners from other disciplines** to learn new perspectives.

Aspirational Persona

Susan Wang

Graduate Student
Coach, Writer

Susan, herself a **domestic violence survivor**, is currently pursuing her Master's Degree in Couple and Family Therapy at Adler University in Chicago and holds an undergraduate degree in Psychology.

Susan has written extensively on sex and relationships for several websites, is the former host of two internet broadcasts and web properties, and is a sex educator. Susan is founding a new facebook community, which focuses on raising awareness about domestic violence while supporting and inspiring survivors.

Susan would like to **engage with fellow learners** through online discussion forums and peer-reviewed activities to get new ideas for her new book. Susan has completed a few online courses in her Master program.

Ashley Mayson

Professor of Counseling
Founder of "See the Triumph"

Ashley is the founder of social media campaign for survivors of IPV. Ashley is **teaching graduate-level courses** in family counseling, family violence, sexuality counseling, and counseling research.

Ashley is a licensed clinical mental health counselor and a Licensed Marriage and Family Therapist in North Carolina. Her primary research interest relates to the bridging the gap between research and practice in the area of domestic violence.

Ashley is in charge of curriculum innovation at her department, which will include completely online degree and certificate programs. Ashley wants to learn best practices, get new ideas, and put questions to online education experts in her field. Ashley will be watching the videos closely with an eye towards **"What works"** and **"What doesn't work"** in an online setting.

Listening to the Unheard Voices of IPV Survivors

Building on the authentic representation of IPV, a significant step was to incorporate IPV survivors' voices. This decision, however, posed ethical challenges. We needed to ensure that these narratives were shared in a respectful, non-exploitative manner that protected the survivors' identities and emotional well-being. Balancing authenticity with sensitivity was critical.

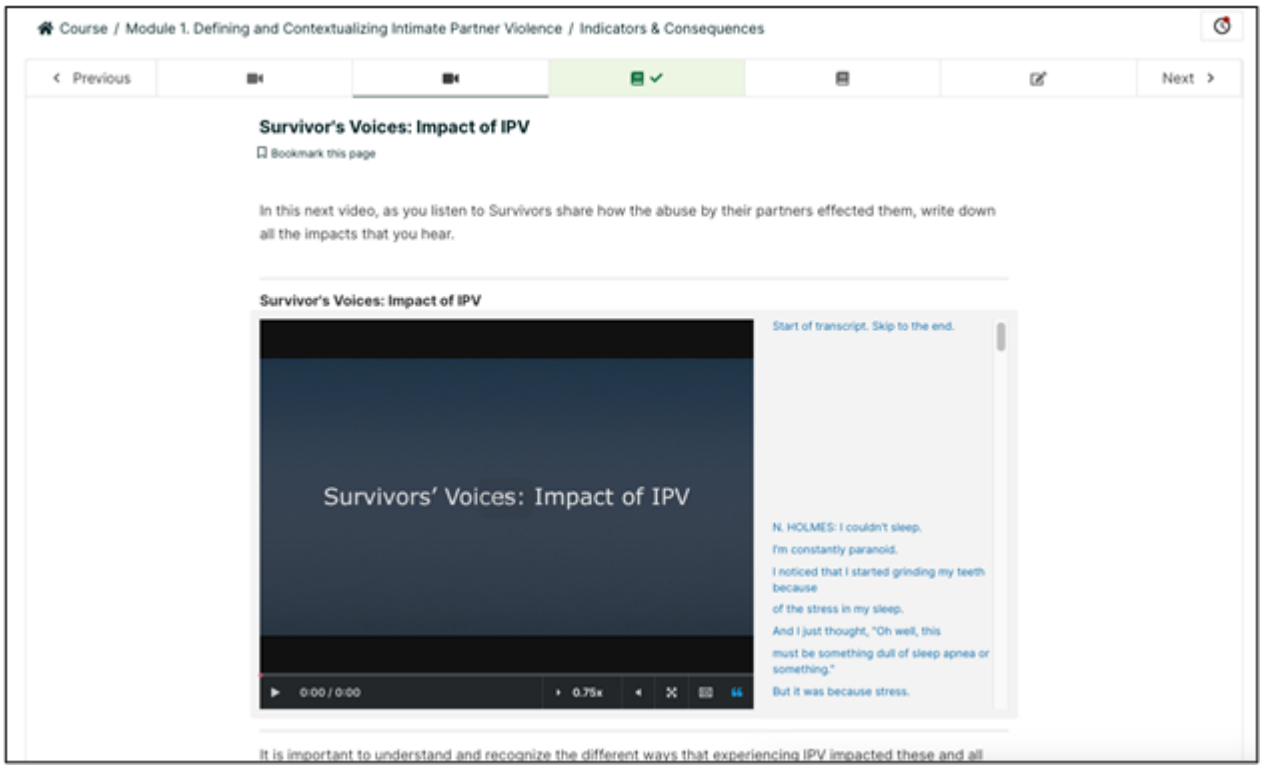
To address these concerns, we reached out to several IPV survivor support groups. Through informed consent, we recorded survivor testimonials, carefully considering their inclusion in the course. These narratives were thoughtfully integrated, accompanied by trigger warnings and support resources for students who may be affected. By presenting

the raw, unfiltered stories of IPV survivors, we aimed to provide a powerful learning experience that exemplified critical pedagogy. Centering marginalized voices and fostering empathy among learners were core principles guiding this approach.

By listening to these narratives, learners acquired a deeper understanding of the complex factors that contribute to IPV, such as power dynamics, trauma, and systemic issues like poverty and racism. The stories also emphasized the barriers survivors face when seeking help, including fear of retaliation, lack of trust in service providers, and limited access to resources. To ensure safety and accommodate preferences, we provided multiple means of representation, including text, audio, and video formats. Figure 10 illustrates an example of a video interview with an IPV survivor, offering a glimpse into their experiences.

Figure 10

Survivor's Voice (Video)



Role-Play Simulation: Putting Yourself in Someone Else's Shoes

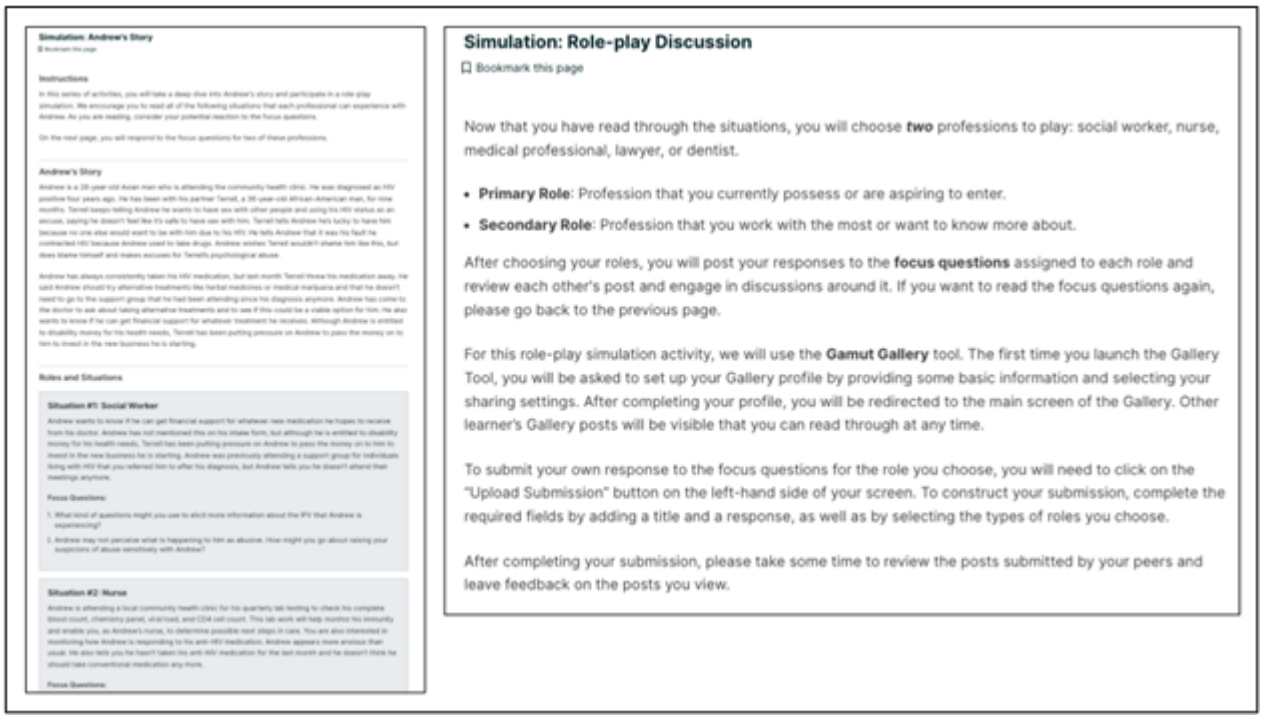
As we continued to strive for an immersive, empathy-driven learning experience, the team developed role-play simulations for learners to effectively address IPV in healthcare settings. These simulations enable learners to navigate complex situations, manage conflicts, and cultivate trust and mutual respect with colleagues. Moreover, learners develop empathy and gain a deeper understanding of other professionals' perspectives, preparing them for real-world scenarios that necessitate interprofessional collaboration.

Designing these simulations required sensitivity and expert guidance to accurately represent IPV without reinforcing harmful stereotypes or causing distress. Faculty members from various professions contributed their expertise to develop victim and abuser personas, as well as interactive scenarios based on these personas.

In each simulation, learners choose their own profession to engage in the role-play, followed by selecting another profession they anticipate collaborating closely with in the future. This design allows learners to gain insights into the challenges and opportunities of working with different professions, fostering the necessary skills for effective interdisciplinary teamwork.

Figure 11

Selecting Primary and Secondary Roles in Simulation



Ensuring Accessibility and Ease of Use

As the course content began to take shape, we turned our focus to ensuring the MOOC's accessibility. Given our diverse learner demographic, we needed to ensure that the platform was intuitive, user-friendly, and universally accessible.

To ensure a seamless learning experience, we carefully examined the interoperability between the MOOC platform and the third-party tool utilized for role-play simulations and collaborative reflection activities. Conducting a comprehensive cognitive walkthrough, we proactively identified potential barriers that learners might encounter. Complex navigation and unclear instructions for these activities emerged as key concerns during the evaluation. Additionally, we discovered that some video content lacked appropriate captions, posing challenges for students with hearing impairments. Recognizing the significance of accessibility, we promptly addressed these issues by streamlining navigation, providing clear instructions, and ensuring that all videos were properly captioned. These modifications reflect our commitment to inclusivity, by making the learning experience more accessible and equitable for all participants.

To rectify these issues, we simplified the navigation, made instructions more explicit, and ensured all videos were captioned, thereby aligning with the principles of inclusivity and accessibility inherent to critical pedagogy. This process was a testament to the crucial role user experience (UX) methodologies play in democratizing education and making learning experiences universally accessible.

Discussion

This study illuminates the multifaceted role of learning experience designers in navigating the intricacies of collective praxis within two distinct design projects, thereby actualizing the principles of critical pedagogy in the creation of transformative educational experiences. The methods employed and the challenges encountered provide key insights into the practical application of critical pedagogy within the realm of learning experience design.

The first case, “Centering Justice,” presented a fundamental change—bridging the divergent perspectives of the faculty, institutional administration, and students to create an inclusive and socially just teaching framework. The learning experience designer guided the design team, faculty, and student focus groups to navigate nuanced power dynamics, potential resistance, and the concept of PODS, employing a participatory design approach that actively involved all stakeholders in the process.

To better understand the needs and perspectives of faculty, we collaboratively created user personas that represented the diverse range of faculty experiences. Additionally, we employed journey mapping techniques to visualize the faculty's learning progression and anticipate potential obstacles in embracing the PODS concepts.

The inherent sensitivity of these topics posed a significant challenge. As expected, we encountered resistance, primarily driven by an underlying fear of not "getting it right." However, we recognized this as an opportunity to foster open dialogue, encourage self-reflection, and cultivate empathy among all stakeholders. These efforts were aimed at guiding the collective toward a comprehensive understanding of the necessity and value of centering justice in the educational context.

The practical application of PODS concepts presented another significant challenge. Our solution was to use a participatory design approach. Collaborating with faculty members to co-create discipline-specific scenarios and case studies ensured the course content was relevant and easily applicable. This not only increased the course’s effectiveness but also democratized our design process, embodying the principles of social justice we sought to instill.

In the second case, the MOOC project titled "Intimate Partner Violence (IPV): Interprofessional Strategies for Prevention and Response,” learning experience designer’s role expanded beyond design to include effective change management and facilitation of interprofessional collaboration. Here, the cognitive walkthrough method proved invaluable in discovering any implicit disciplinary bias and ensuring an equal voice to all professions in the course content.

One of the central principles of critical pedagogy is that learning should not be a passive act of information transmission but an active process of knowledge construction. This philosophy was realized in this project through role-play simulations and real IPV survivor testimonials. Role-playing is not new in learning design; however, its use in an online, interprofessional context to simulate IPV scenarios is a pioneering approach that contributed significantly to an empathetic understanding of IPV. Additionally, including survivor voices not only made the learning experience more authentic but also served as a potent reminder of the reality and urgency of IPV. These innovative instructional strategies significantly bridged the gap between theoretical knowledge and practical, empathetic understanding, which has often been a shortcoming of traditional online courses.

The practical application of knowledge was a key challenge in both design projects. In the "Centering Justice" course, this was addressed through participatory design, where faculty members co-created discipline-specific scenarios and case studies. Similarly, the IPV response program incorporated role-play simulations, making the learning experience more practical and empathetic.

The learning experience designers of these two design projects faced numerous challenges. First, achieving a balance between interprofessional integration and profession-specific customization was a delicate act. While personas and journey maps facilitated this balance to a significant extent, it was a constant iterative process. Second, ensuring the course was user-friendly and accessible for a diverse set of learners required meticulous attention to detail and frequent course iteration based on learner feedback. Third, incorporating role-play simulations and survivor testimonials demanded a high level of sensitivity and care. The designers had to ensure that these elements were realistic and informative without being triggering or distressing. Finally, a significant challenge was the iterative nature of a praxis-centered, critical pedagogical approach. It demanded that the learning design team be open to constant course revision and improvement based on learner feedback. It meant relinquishing a degree of control and being responsive to the needs and experiences of the learners, which can be challenging in a tightly-scheduled academic environment.

In summary, these case studies offer critical insights into the application of UX methodologies and critical pedagogy in learning experience design. They underscore the potential of these approaches in addressing challenges like ensuring a

shared understanding, navigating digital literacy barriers, managing emotional discomfort, and bridging the gap between theory and practice. They also demonstrate the potential for these methods to create more relevant, accessible, inclusive, and empathetic learning experiences. These insights hold substantial promise for future endeavors in both traditional and interprofessional online education, contributing to the evolving discourse on best practices in learning experience design.

Limitations and Suggestions for Future Studies

The current study, while contributing to the field of learning experience design through two innovative case studies, is not without its limitations, and these provide opportunities for future research.

Firstly, the study's scope was limited to the development and implementation stages of the two learning programs. An in-depth examination of the long-term impact of the programs on learners' behavior and attitudes was beyond the study's reach. Future research could focus on a comprehensive evaluation of the outcomes of such pedagogical approaches. Longitudinal studies could be employed to measure the sustainability of the learning impact and changes in attitudes or behaviors over time. Such studies would also help identify any delayed effects or potential benefits of these innovative approaches that were not immediately apparent in the short term.

Secondly, our study was confined to the role of learning experience designers in implementing UX methodologies and critical pedagogy principles within higher education settings. Therefore, the findings might not be directly applicable to other learning environments, such as K-12 education, professional training, or informal learning contexts. Future studies might consider exploring the application and impact of similar strategies across a broader spectrum of educational settings. Comparative studies examining how these methods and principles play out in different learning contexts would add valuable insights to the field.

Additionally, the study heavily relied on qualitative methods, which, while essential for in-depth understanding, may lack the generalizability of quantitative approaches. Future research could consider employing mixed-methods designs that combine the strengths of both qualitative and quantitative research. This could enhance the robustness of the findings and offer more comprehensive insights.

Lastly, the study was predominantly practitioner-led, with learning experience designers deeply involved in both the design process and the research. While this approach has its advantages, including insights from the "front lines," it may also introduce bias, as the researchers have a vested interest in the outcomes. Future research could benefit from involving independent researchers in the process to bring a fresh perspective and further validate the findings.

In conclusion, while this study offers valuable insights into the role of learning experience designers in integrating UX methodologies and critical pedagogy in designing inclusive learning experiences, there is still much to explore. Future studies building on this work could focus on longitudinal impacts, broader educational contexts, mixed-methods designs, and the inclusion of independent researchers. In this way, we can continue to expand our understanding and further advance the field of learning experience design.

Conclusion

The presented cases highlight the transformative role of learning experience designer in higher education, guided by critical pedagogy and informed by UX methodologies. Learning experience designers successfully integrate stakeholders, navigate sensitive topics, and bridge theory-practice gaps for relevant, accessible, and empathetic learning experiences. They employ UX methodologies to adopt a user-centered approach, understanding learners' experiences and needs through techniques like persona creation and journey mapping. UX methodologies also address complexity and sensitivity, facilitating nuanced conversations and promoting practical application of knowledge through role-play simulations. Learning experience designers function as agents of collective praxis, embodying critical pedagogy by facilitating collaboration, open dialogue, and continuous feedback from all stakeholders. Despite

challenges, the successes and insights derived from this approach demonstrate its potential in diverse educational contexts. These experiences contribute to the ongoing dialogue in learning experience design, sparking further exploration of critical pedagogy and UX methodologies in education.

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[1] This is the abbreviation used internally in the school.

[2] Based on customer journey mapping (Flom, 2011), a learning journey map helps understand touchpoints, challenges, and opportunities in a context. By tailoring a course to meet specific learner needs, it enhances the learner experience and ensure alignment with real-world demands.

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Learning LXD Through LXD: Applying Conceição and Howles' Framework for Designing Online Learning Experiences

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Learning experience design (LXD) builds upon instructional design by incorporating user experience design, user-centered design, and design thinking. While instructional design focuses on creating instruction that meet specific learning objectives, LXD takes a more holistic approach by considering learners' needs, goals, and motivations to create engaging e-courses. Despite e-learning's growing popularity, many online courses employ outdated approaches and technologies that fail to engage modern learners. Using a cognitive apprenticeship approach and Conceição and Howles' (2021) Integrated Framework for Designing the Online Learning Experience, this design case chronicles the redesign of an online course whereby faculty and students experience LXD through LXD.

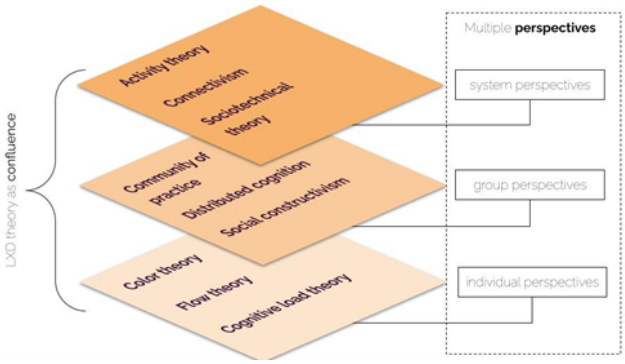
Introduction

While the term *learning experience design* (LXD) may seem like a relatively new concept, it has its roots in the field of instructional design, which has been around for several decades. Niels Floor is credited with coining the term "learning experience design" in 2007, and his characterization of LXD as "a combination of two domains: design and learning" emphasizes the importance of applying design principles to the development of effective and engaging learning experiences (2017, para. 3). Floor defined learning experience design as "the process of creating learning experiences that enable the learner to achieve the desired learning outcome in a human centered and goal-oriented way" (2016, para 1). Schmidt and Huang (2021) expanded on this definition, describing LXD as "a human-centric, theoretically-grounded, and socio-culturally sensitive approach to learning design, intended to propel learners towards identified learning goals" (p. 141), while drawing insights from user experience design methods.

Weigel (2015) observed the diverse interdisciplinary nature of learning experience design, highlighting that LXD, influenced by the learning sciences, pedagogy theory, and neuroscience, also took inspiration from UX to enhance the learning experience. The term “user experience” coined by Donald Norman in 1993 refers to all aspects of a person’s experience when interacting with a product or service (Lyonnais, 2017). While both LXD and UX follow similar practices, such as starting with broad concepts and refining iteratively, engaging in discovery and brainstorming, conducting research on user preferences and experiences, and testing ideas to align with user needs, they diverge in their focus on the user, specifically the learner, whose unique characteristics influence the content and ideal design approach for their individual learning experiences. Jahnke et al. (2022) provide further clarification on the distinction between users and learners. They emphasize that LXD specifically focuses on learners who engage in distinct learning tasks and employ specialized learning technologies, in contrast to the broader scope of encompassing any user, any task, and any technology that is typically associated with UX. In light of the expanding field of LXD, Tawfik et al. (2021) noted the absence of a unified theory in this area. To address this gap, Jahnke et al. (2022) proposed a comprehensive theory of LXD that integrated multiple disciplines, including user experience, learning design, and educational technology, and encompassed three key dimensions: social/sociocultural, technological, and pedagogical. They observed that learning experience design represents the convergence of various theoretical perspectives. Figure 1 by Jahnke et al. (2022), provides a visual representation of the converging perspectives, including theories referenced in user-centered design (UCD), human-computer interaction (HCI), usability research, cognitive load theory, the sociotechnical disciplines, and theories of change. The diagram categorizes the various theoretical perspectives into three planes: system, group, and individual. The system plane encompasses theories such as activity theory, connectivism, and sociotechnical theory. The group plane includes community of practice, distributed cognition, and social constructivism. The individual plane incorporates theories related to color, flow, and cognitive load.

Figure 1

Learning Experience Design is a Confluence of Multiple Theoretical Perspectives by Jahnke et al. (2022)



Jahnke et al.’s (2022) theory underscored the significance of social and sociocultural factors in learning, such as sociality, social presence, and cultural influences on communication and collaboration, while also considering the technical aspects of learners' interactions with digital technologies and the pedagogical aspects of digital learning, including the learning space, goals, activities, assessment, and learner controls. This inclusive approach provides a robust framework for understanding and describing the individual and perceptual aspects of technology-mediated learning, ultimately guiding the practice of learning experience design.

Despite these developments and the rapid growth and popularity of online education in recent years, awareness and acceptance of learning experience design principles by faculty and instructional designers in higher education has been slow. Even with improvements in digital technologies and instructional practices, many of today’s online courses still lack effective design, which can lead to disengagement, poor learning outcomes, and a lack of motivation among learners (Lodge et al., 2022). On the plus side, “the commoditization of online learning” as Kilgore (2016) described it, caused “colleges and universities to think differently about how they construct digital courses” (para. 3). As Alvarado

observed (2020), “digital learning can meet the demands of today’s students, but only if it is created with best practices in mind” (Conclusion, para. 1).

Using Floor’s (2016) characterization of learning experience design as a combination of both *design* and *learning,* this design case will, (1) describe the redesign of a fully online educational technology graduate course to create an environment where faculty and students work together to learn about learning experience design *through* learning experience design; and (2) document how the students in the re-designed course applied LXD principles through a *cognitive apprenticeship* approach to design their own instructional design learning product using evidence-based LXD principles.

An Integrated Framework for Designing the Online Learning Experience

There are several notable conceptual models available to LXD designers, including Reigeluth and An's (2021) *Holistic 4D model*, the *Design Thinking* approach popularized by IDEO and the d.school at Stanford University (Dam, 2023), and Conceição and Howles' (2021) *Integrated Framework for Designing the Online Learning Experience*.

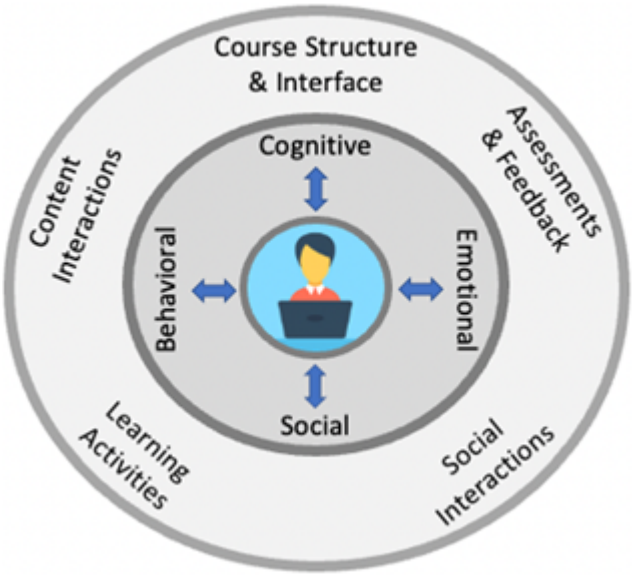
Reigeluth and An's comprehensive 4D model, encompassing the stages of *define, design, develop,* and *deploy*, provides a valuable framework for enhancing the instructional design process's effectiveness and efficiency. Their book, *Merging the Instructional Design Process with Learner-Centered Theory: The Holistic 4D Model* (2020), along with its accompanying website, offers templates and examples to support instructional designers, catering to both emerging and experienced practitioners.

Similarly, the *design thinking* approach, championed by David and Tom Kelley and Tim Brown at IDEO (Szczepanska, 2019), emphasizes user collaboration to address complex problems in human-centric ways. With its five stages of *empathize, define, ideate, prototype, and test*, it is a solution-based approach that emphasizes collaboration between designers and users to address complex or undefined problems by reframing them in human-centric ways and prioritizing the users' needs and goals (Dam, 2023).

However, for this design case, Conceição and Howles' (2021) *Integrated Framework for Designing the Online Learning Experienc*e was selected due to its multidisciplinary nature, drawing from user experience design, human factors design, human-centered design, and design thinking. Their book, *Designing the Online Learning Experience: Evidence-based Principles and Strategies* (2021), provides a roadmap for enhancing each phase of the learning experience, offering practical examples and guidance to improve learner interactions and overall learner experience. They assert that when designing online courses, instructors and course developers need to “cultivate a learner-centered mindset, always being sensitive to the cognitive, emotional, behavioral, and social learning needs of learners” (p. 33). Their integrated framework (see Figure 2) provides a conceptual model “for achieving learner-centered design goals, resulting in the design of deeper, more meaningful and engaging learning experiences for online learners” (p. 23).

Figure 2

Visual Representation Adapted from Conceição and Howles’ Integrated Framework for Designing the Online Learning Experience (2021, p. 22)



With the learner situated in the innermost circle of the framework, four interrelated learning dimensions, fundamental to the learning needs of learners, are positioned in the middle circle. Conceição and Howles (2021) describe them as:

1. **Cognitive Dimension**. This dimension relates to the "mental activities and processes" (p. 7) needed to understand and process new information. It includes "perception, memory, classification, reasoning, critical thinking, and problem solving" (p. 7). Incorporating the cognitive dimension into the learning experience involves being attuned to the cognitive processes and demands imposed on learners during the online learning experiences.

2. **Emotional Dimension**. This dimension is "associated with learner motivation, and encompasses positive emotions" (p. 8), like delight, curiosity, interest, and enthusiasm, as well as adverse feelings such as confusion, frustration, and disillusionment. According to Conceição and Howles (2021), "online learners want their learning experiences to be enjoyable, engaging and interesting" (p. 27). Therefore, incorporating the emotional dimension into the learning experience involves being cognizant of the learners' "emotional journey" and "incorporating motivational elements" throughout the learning experience (p. 28).

3. **Behavioral Dimension**. This dimension focuses on "observable learner actions… or what learners 'do' in the online environment…" to engage with "…content, people, and course-related software" (p. 28). It involves cognitive actions like studying, practicing, participating in discussions, and completing assignments, as well as physical activities that involve interacting with the learning management system, such as opening pages, and submitting documents. To incorporate the behavioral dimension in learning involves designing interfaces and activities that are easy to use and learn.

4. **Social Dimension**. This dimension focuses on the relationships and sense of community learners experience in the online learning environment. The social dimension of learning involves learner interactions with peers, as well as with instructors. Lehman and Conceição (2010) recommend that incorporating the social dimension in learning involves creating a "perceptual experience" or sense of "being there" and "being together" with members of the online learning community (p. 7).

Conceição and Howles (2021) propose that each of the four interrelated dimensions come "into play in various degrees through learner interactions within the online environment" (p. 23) as learners encounter the following five essential design aspects of online learning environments:

1. **Course Structure and Interface.** *Course structure* refers to the way in which the course content is organized and presented to the learners. This typically involves breaking the course down into smaller units, such as lessons or modules, and organizing them in a logical sequence that helps learners build their understanding of the subject matter. The *course interface* refers to the visual and interactive elements learners use to engage with the course content.

2. **Content Interactions.** According to Conceição and Howles (2021), *content interactions* refer to the ways in which course content is created, organized, structured, and presented to learners. This can include a wide range of activities, such as creating videos, designing interactive exercises, developing assessments, and organizing course materials in a way that is easy for learners to navigate.

3. **Learning Activities**. *Learning activities* are the exercises and experiences learners engage in to achieve their learning objectives. According to the U.S. Department of Education (2017), "technology can be a powerful tool to reimagine learning experiences" (p. 9). For example, multimedia resources like videos and animations can activate learners' cognitive and emotional dimensions of learning, while interactive exercises and simulations can promote the behavioral dimension. Similarly, collaborative online activities like group projects and discussions can engage learners in the social dimension of learning.

4. **Social Interactions**. *Social interactions* refer to the communication and collaboration between learners, instructors, and other members of the learning community. They may involve modeling, coaching, and scaffolding to support learning and engagement of learners in discussions and collaborations with fellow classmates (Conceição & Howles, 2021). According to Rajabalee and Santally (2020), "activities that encouraged online and social presence, enhance and build learner confidence and increase performance" (2.5 Student Performances, Satisfaction, and Their Engagement in Online courses, para. 1).

5. **Assessments and Feedback**. *Assessments* are an important part of the online learning experience as they provide learners with opportunities to demonstrate their learning and receive feedback on their progress. *Feedback* is an integral part of the assessment process, as Conceição and Howles (2021) observe, it helps learners understand their strengths and areas for improvement (p. 122). "Assessments not only determine if students are meeting the learning objectives, but they also can engage students as they learn" (Major & Miller, 2020, Redesigning Assessments for Course Quality, para. 1).

Using the integrated framework as a guide, instructors and instructional designers can design the course structure and interface, content interactions, learning activities, social interactions, and assessments and feedback with the learners' needs and preferences in mind. The next section describes how a fully online graduate course was redesigned based on the integrated framework.

Redesigning an Online Course Based on the Integrated LXD Framework

Designing effective learning experiences for online environments "entails taking advantage of new digital tools and pedagogies and using design thinking to shift the focus of online course content structures from information-centric to more learner-centric" (Conceição & Howles, 2021, p. 42). Using their integrated framework for designing the online learning experience, a fully online graduate course was fundamentally redesigned to incorporate LXD principles to demonstrate how a well-structured, engaging, and effective learning experience looks and feels.

By experiencing such a course, it is hoped that current and future learning experience designers will gain a deeper understanding of the importance of employing LXD principles in course design and apply those principles to their own design efforts. In the revamped course, students used an evidence-based rationale for: selecting, creating, and utilizing technologies for e-learning; identifying a real-world instructional need or opportunity in their work environment; and building an online course using a free version of the Canvas learning management system. Throughout the course

students experienced and practiced LXD through LXD. The following sections describe how each essential design aspect of the online learning environment was reimagined.

Designing the Course Structure and Interface

Chang and Tung (2008) suggest that online learner motivation or behavioral intention to use an online learning space is influenced by "perceived usefulness, perceived ease of use" and "perceived system quality" or design (p. 71). Based on this observation, Conceição and Howles (2021) recommend several design considerations when creating the course structure and interface:

- **Interface Design.** The interface design should convey quality to learners. This can include using high-quality graphics, clear and consistent formatting, and intuitive navigation.
- **Content Organization.** The content should be organized in ways that appear relevant and useful to learners. This includes using clear headings, subheadings, and bullet points to help learners quickly identify and access the information they need.
- **Interactions.** The interactions should be user-friendly and simple to use. This includes designing activities that are easy to understand and complete, providing clear instructions and feedback, and using technology that is reliable and accessible.

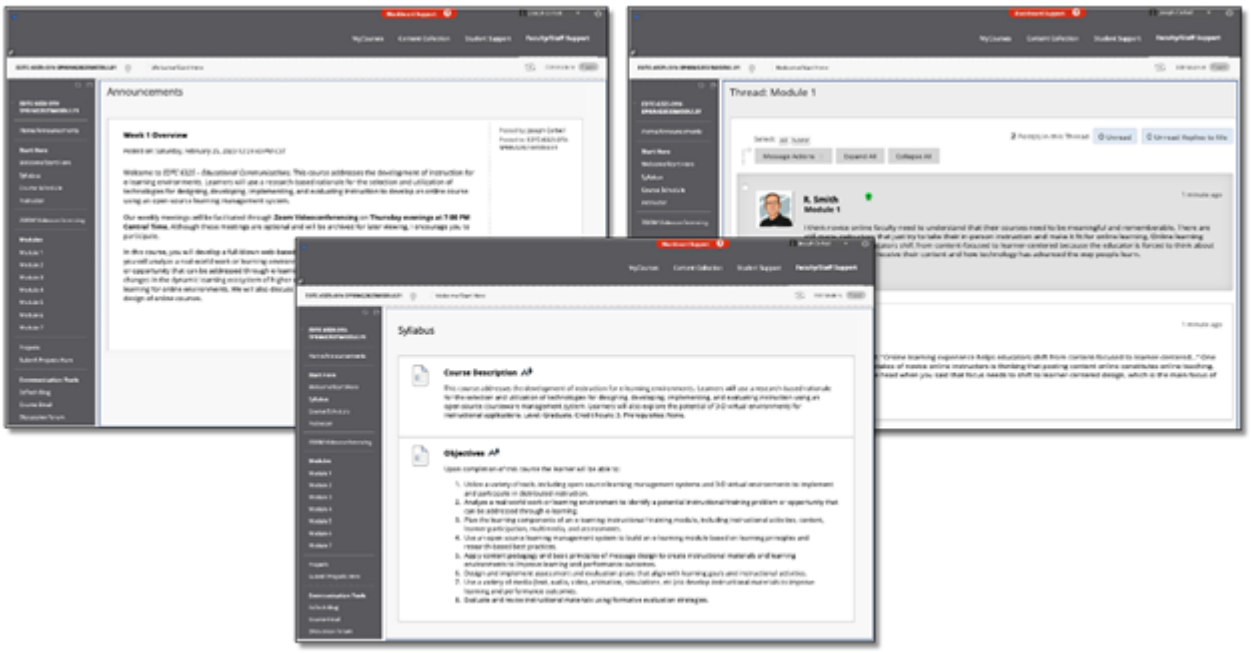
The first step in the redesign project was to consider the LMS interface from the learners' perspective. Learning management systems are usually effective at the "*administration* of learning" (Kellen, 2017, p. 55), which, according to Conceição and Howles (2021), facilitates "institutional and instructor course management needs" (p. 6), but can "impose limitations for the design of learning" (p. 4). A student in the redesigned course agreed, noting in a course discussion post,

> *the LMS is not very user friendly. Developers should learn from and adopt aspects of social media to improve their appearance and function. Most learning management systems have the vibe from the early 90s web sites that relied on too much text.*

This criticism of the LMS by the student quoted above is not too far off from the current reality, and ironically, is echoed by Hampson (2014) nearly 10 years ago, who shared, "one aspect of online higher education has remained virtually unchanged since the 1990s: the way that traditional colleges and universities go about designing, creating, and financing in-house online course development" (para. 3). As shown in Figure 3, not much has changed in LMS design to improve the look and feel of the user interface from the learners' point of view.

Figure 3

Screenshots of Typical LMS Content Pages as Seen by Students

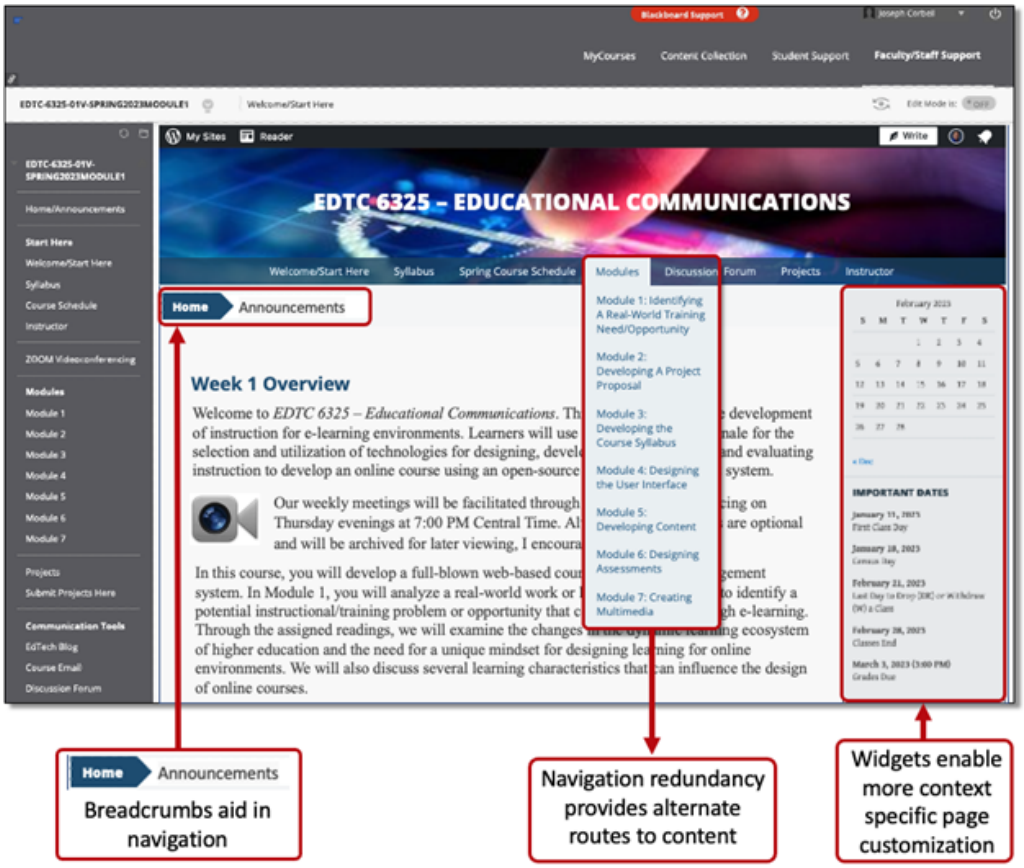


To address the look and feel of the course, we took a cue from the student's recommendation of adopting aspects of social media to improve the appearance and function of the user interface. By *wrapping* the LMS around a WordPress content management system, we were able to create an interface that was familiar, usable, and satisfying to work with.

We started by transferring all the course content into the WordPress content management system. Using professional-looking templates, custom widgets, and high-quality graphics, we were able to create a user interface that was aesthetically pleasing, used clear and consistent formatting, and provided intuitive navigation (see Figure 4). The level of customization afforded by the blog enabled us to do things not currently possible in most LMS platforms, such as integrating context-specific widgets into pages, embedding multiple media types from a larger library of sources, and having more precise control over the look and feel of the content.

Figure 4

A Screenshot of a WordPress-Enhanced LMS Announcements Page Illustrating Features That Aid in Usability, Navigability, and Customization



To embed the Wordpress pages into the LMS, we created a series of course menu items for blank pages that would be used to hold the content. We used an HTML <iframe> tag to embed the pages into blank LMS pages. The resulting pages were designed to be beautiful, user-friendly, accessible, and easy to read, which were intended to fulfill Conceição and Howles' (2021) conveyance of a sense of course quality to learners. As a faculty colleague observed in a peer evaluation of the revised course,

> *This is one of the most organized, well designed, and integrated courses I have ever seen. The structure and friendly design invites anyone to navigate and engage in a real online learning experience. The integration of external websites and online applications is so smooth that one can barely realize they are not part of the LMS (Faculty Annual Peer Evaluation of Online Course, August 24, 2022).*

Although the conspicuous new look and feel of the course became quickly obvious, most students were not aware that they were interacting with content that resided outside of the LMS. As far as they were concerned, they were interacting only with the LMS. Designing the course experience as a single integrated system helps to provide students seamless access to all course content and tools.

Content Interactions

Conceição and Howles (2021) recommend designing *learner-content interactions* that consider the affordances of digital media and technologies to positively impact how students interact with the materials. They recommend several design considerations when creating learner-content interactions:

- **Use Pedagogical Wrappers**. Use pedagogical wrappers as activities to prepare learners for the interactions they are about to engage in. According to Conceição and Howles (2021), pedagogical wrappers explain the "rationale, relevance, and learning goals" (p. 74).
- **Create Rich Media Content Interactions.** To create more meaningful learner interactions with the content, integrate "hybridized" media content (i.e., blogs, wikis, digital notice boards, video discussion boards, etc.) that "interweaves multiple media formats and instructional methods" (Conceição & Howles, 2021, p. 76).
- **Increase Engagement and Motivation Through Emotional Design.** To "arouse and sustain learner attention" and motivation, Conceição and Howles (2021) recommend "activating the emotional dimension to improve cognitive engagement" (p. 77). They observe that motivation is usually left solely up to the learners, adding however, that "in learning experience design, it is also the instructor's responsibility" (p. 77).
- **Add Context to Content.** Add context to content by making real-world connections through stories, case studies, and scenarios learners can relate to. Engage all four learning dimensions (cognitive, emotional, behavioral, and social) by designing opportunities for learners to interact with the content, allowing them to draw on their own knowledge and experiences.

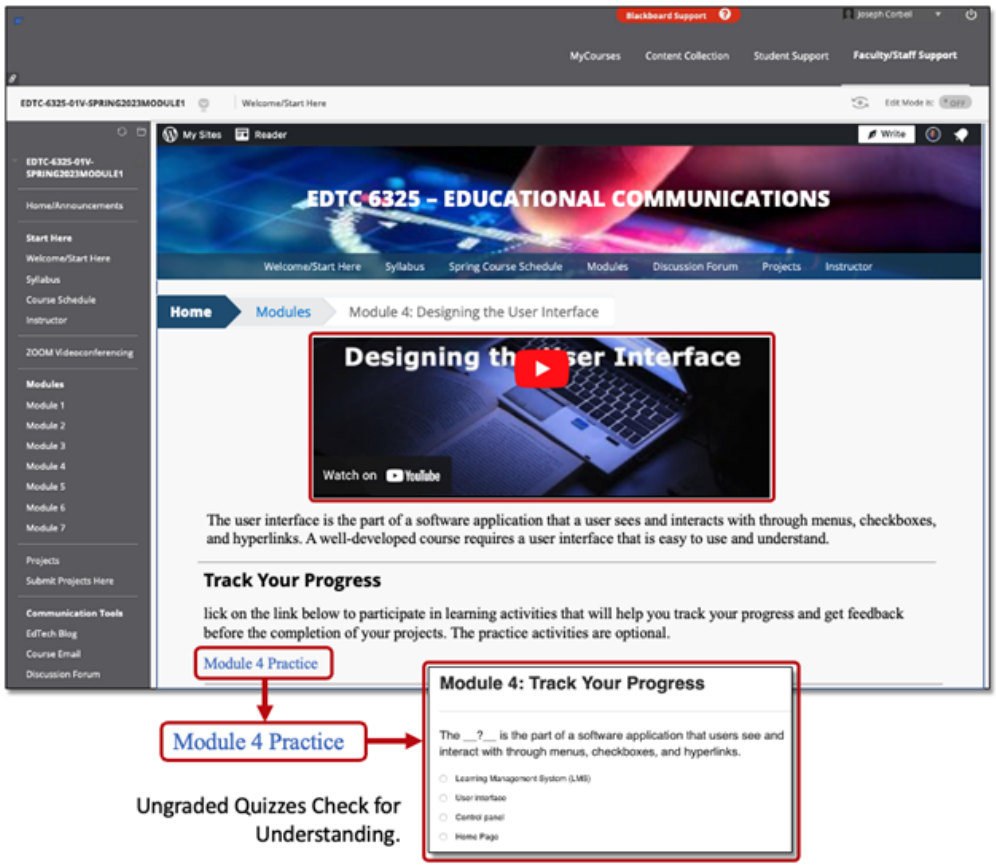
According to Conceição and Howles (2021), the integration of these techniques necessitates moving away from simply presenting course material to developing strong interactions between learners and content that prioritize the learners' viewpoint in a pedagogically sound manner. Therefore, the next step in the course redesign involved evaluating existing course content to identify where pedagogical wrappers, rich media content interactions, and content contextualization would be appropriate. Through it all, we sought to build learner-content interactions that "aroused and sustained" (Conceição & Howles, 2021, p. 77) learner attention.

We started with the weekly announcements. They are the first point of contact instructors have with students at the start of the week. Taking into consideration the emotional dimension of learning (Conceição & Howles, 2021), we began by presenting an aesthetically pleasing *Home/Announcements* page, which is the first thing people see when they log in to the course. Figure 4 above presents a screenshot of the Home/Announcements page. The tone of each message is welcoming and uplifting. The weekly announcement serves as a priming activity, or pedagogical wrapper, to prepare the learners cognitively and emotionally for the activities and interactions they are about to engage in during the week. A short video with an overview of the weekly topics and major assignments was recorded for each week. Each announcement ended with a summary of the weekly activities, due dates, and reminders of upcoming projects.

In a similar way, the weekly *Module* and *Project* pages were revisited and revised to enhance the learner-content interactions (see Figure 5). Each assignment started with an introduction that included a pedagogical wrapper to explain the goal, rationale, and relevance. A short video went over the project deliverables and provided examples of exemplary products. Non-graded practice quizzes were embedded into the module pages as a self-assessment of knowledge "to engage learners with the content and encourage deep learning" (Conceição & Howles, 2021, p. 131).

Figure 5

A Screenshot of a WordPress-Enhanced Modules Page Illustrating Some of the Interactive Elements to Facilitate Content-Interactions



Hybridized media content, as recommended by Conceição and Howles (2021), in the form of *course-specific* discussions were facilitated through a blog-enhanced class discussion forum that focused on learning experience design issues and how learners would address them in their own course design. *Discipline-specific* discussions were facilitated through *The EdTech Blog*, a forum where graduate students in the EdTech master's and doctoral specialization programs discussed emerging issues impacting the Educational Technology field. Using blogs to facilitate these conversations enabled learners to interact with other learners inside and outside of the online classroom.

As a primer for the weekly synchronous sessions, each week, we posted a fun *Pre-Class Padlet Activity* to the meeting reminders to get students to start thinking about and share their thoughts about interesting things happening in the EdTech world. Padlet is an example of a free hybridized social media app for creating private notice boards for sharing text, audio, and video messages within groups. Sometimes the activities were fun, like students sharing photos of themselves doing something goofy or amazing during the first week of class or describing their remote/lockdown business attire for synchronous, web-based meetings using Zoom. Other times, students were asked to share project-related media, such as screenshots of the home page of the course they were developing. Then, during the first few minutes of the weekly synchronous sessions, we shared and discussed our submissions to the *Pre-Class Padlet*. Students seemed to enjoy these social, mostly non-academic activities to get to know their fellow classmates, and instructor better. As one student observed in a course evaluation comment, "I really enjoyed the weekly Padlet activities. They're mostly silly but they also make a point, like when we were making fun of our remote work attire during the pandemic" (Course Evaluation Summary, Summer 2022).

Learning Activities

Learning activities refer to the processes through which learners create new knowledge, develop abilities, practice more advanced cognitive thinking, and establish links between what they learn and their "academic, professional, and personal lives" (p. 85). When designing learning activities, Conceição and Howles (2021, pp. 96-100) recommend:

- **Apply the 4Cs of empathetic design.** To more fully engage learners in the learning activities, apply the 4Cs of empathetic design: "(1) caring about the learner's experience, (2) curiosity about how learners are thinking, (3) conversations with learners to better understand their course experiences, and (4) changing or correcting deficiencies in the course design" (p. 11-12).
- **Use digital technologies to create integrated and impactful learning activities.** Supplement the LMS tools with a variety of third-party digital technologies including hybridized media to enable learners to "interact with content, instructors, and other learners" more fully (p. 98).
- **Integrate multiple learning tasks into inclusive learning activities.** Combine multiple tasks that entail learning, applying, and connecting new knowledge and experiences to learners' academic, professional, and personal lives.
- **Use pedagogical wrappers to prepare learners cognitively and emotionally**. Use pedagogical wrappers to set the stage for the learning that is about to begin, provide context and relevance, provide closure to the activity, and connect the learning to the course and module learning goal and objectives.

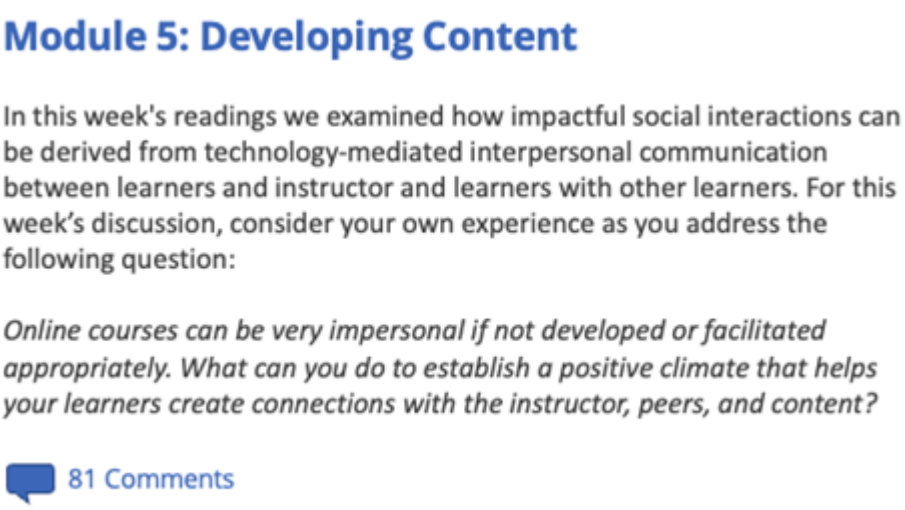
Keeping these recommendations in mind, in the redesigned course, there were three main categories of learning activities: (1) acquiring new knowledge, (2) applying new knowledge, and (3) connecting new knowledge and experiences to learners' academic, professional, and personal lives.

Learning activities included a variety of self-directed and collaborative/social learning engagements. The self-directed activities included reading the assigned texts, watching short videos, and reviewing project instructions, tutorials, and rubrics. In the redesigned course we were careful to make the activities integrated and inclusive. Pedagogical wrappers were used to introduce the activities, provide context, and relevance, and to help learners see how they fit into the big picture. The language and tone were adjusted to encourage students to connect cognitively and emotionally with the learning tasks.

Applying and *connecting activities* transpired through the weekly synchronous and asynchronous discussions and were designed to engage learners in applying and connecting new knowledge to prior knowledge and experiences while discussing their e-learning design projects with classmates and the instructor. As illustrated in Figure 6, the questions began with a pedagogical wrapper that situated the question within the context of the module and connectedthe conversation to the culminating project being developed in the course. Empathetic design was incorporated into the question by enabling students to draw on prior online learning experiences to explain how they will make their online courses better.

Figure 6

A Screenshot of a Revised Discussion Question Tying New Knowledge to Existing Knowledge and Experience



The synchronous discussions continued the forum conversations via weekly, hour-long videoconferencing sessions. Though optional, participation in these sessions was usually high, indicating that students found practical value in them. Instead of lecturing, a typical session involved a short discussion of the project deliverables for the upcoming phase of a project, an explanation of the instructor's expectations for each deliverable, and tips on how students can ace the project. The remainder of the time was dedicated to students taking turns sharing drafts of their work. Acting as a moderator, the instructor asked guiding questions to help students focus on certain aspects of the project. After examining several project drafts, students were able to visualize, through the formative feedback given by the class, the kinds of modifications they will need to make on their own projects. Though the weekly sessions were planned and targeted specific objectives, the atmosphere was casual and friendly, and the feedback was always positive to encourage students to take chances by sharing their work with others.

The third *applying* and *connecting activity* was the e-learning design project itself. As mentioned earlier, students identified a real-world instructional need or opportunity in their own work environment and developed a short course in a popular learning management system.

The e-learning design project was broken up into 6 parts:

- Part 1: Developing the Project Proposal
- Part 2: Developing the Course Syllabus
- Part 3: Designing the User Interface
- Part 4: Developing Content (Overviews, Assignments, and Discussions)
- Part 5: Designing Assessments
- Part 6: Creating Multimedia

For this project, students were tasked with building an online course that embodied the best of instructional design and learning experience design principles and practices. They were encouraged to draw on their experiences with the content and discussions of the re-designed course, as well as their own experiences as online learners. Through the e-learning design project, students were able to make connections between the learning, applying, and connecting activities.

Social Interactions

When designing learning activities, Conceição and Howles (2021, pp. 112-118) recommend:

- Setting the stage for a positive climate
- Creating emotional connections
- Using personalized communication
- Promoting deep learning through social engagement
- Building learner involvement into the flow of the course

Keeping these recommendations in mind, we set out to design social interactions that set the stage for a positive climate. We started with the user interface for the discussion forum, perhaps one of the most criticized features of most LMS platforms. As Rachel Koblic (2020), a blogger who talks about online learning, shared in her experiences as a student with discussion boards:

> *The design of the interface is somewhat confusing, making it easy to reply to the wrong thread. The mobile app is impossible to navigate once there is any significant number of posts. You can't @ mention anyone, which seems to be a common feature in other communication technologies these days. The notifications you get via email or on your phone are so decontextualized that they are rendered useless. There are examples of technologies out there that foster dynamic and engaging conversation—can online education discussion boards move in that direction, please? (para. 9)*

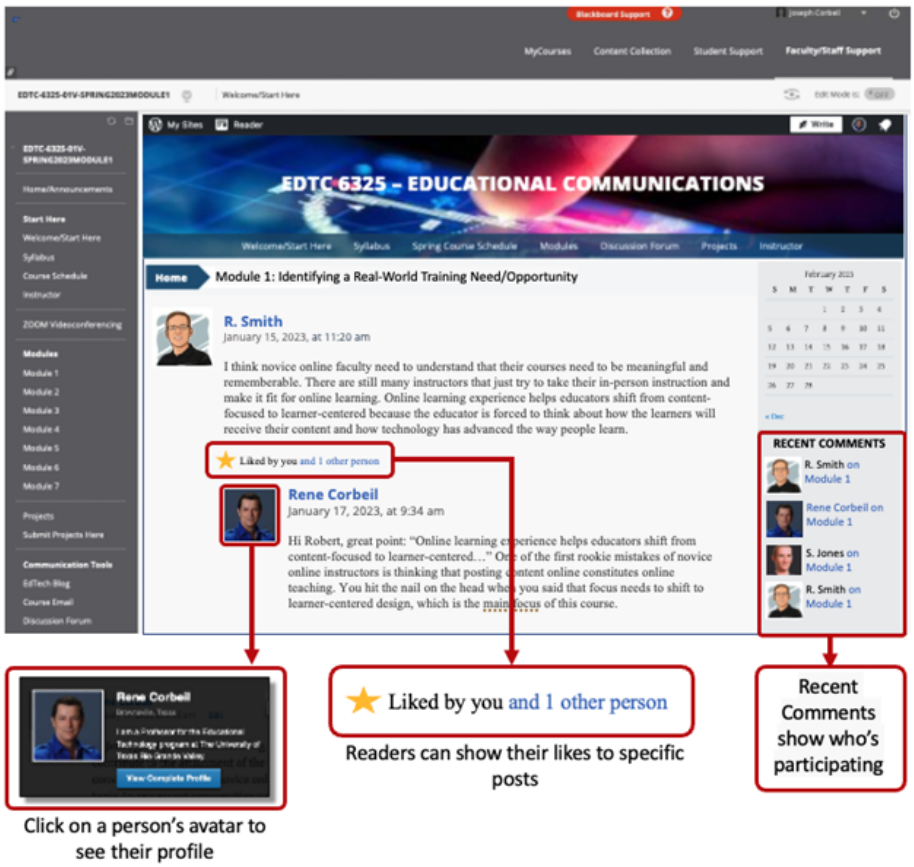
Her sentiments were recently echoed by a student in the re-designed course who reflected on LMS discussion forums in a recent class discussion, noting

> *My wish list for the LMS would be better discussion forums. On social media, if someone is addressing me, or mentions me in a post, I am immediately notified and can easily respond. I would like for notifications to be sent directly to me, and in a manner where I can immediately respond with ease. (EdTech Blog, February 26, 2023)*

By replacing the LMS discussion forum with a blog embedded into a discussion page on the LMS, we were able to create a learning environment that was aesthetic, accessible, usable, and friendly (see Figure 7). These enhancements to the look and feel of the discussion forum helped to create a positive climate by integrating social media elements that enable students to share social cues with each other. The social media enhancements to the look and feel of the discussion forum set the stage for a positive learning climate where learner engagement is valued and promoted. Empathetic design, incorporated into the development of the questions, enables students to draw on prior online learning experiences to explain how they will incorporate essential design aspects of the learning environment into their course design. The friendly interface also facilitates co-presence, or the sense of being and learning together, which contribute to creating emotional connections between the topics being discussed and the people discussing them.

Figure 7

A Screenshot of a Blog Enhanced LMS Discussion Forum with Social Media Enhancements



Through a combination of redesigning the discussion forum and questions and actively engaging in discussions, we successfully integrated learner involvement into the course structure, promoted a stronger sense of community and connection within the learning community, and established student and teacher presence to promote greater social engagement among learners.

Assessments and Feedback

Instead of visualizing assessments and feedback as "terminal judgments" (Conceição & Howles, 2021, p. 123) of academic achievement, Conceição and Howles (2021), recommend we rethink assessments and feedback as learning experiences. As learning experiences, they can guide students in "constructing, connecting, and applying knowledge" (p. 127). When incorporating assessments and feedback into learning experience design, Conceição and Howles (2021, pp. 128-130) recommend:

- Designing assessments and feedback on a learner growth mindset
- Incorporating emotional and cognitive elements into assessments and feedback to infuse interest, challenge, and curiosity
- Embed assessments and feedback into the learning experience to promote engagement and deep learning

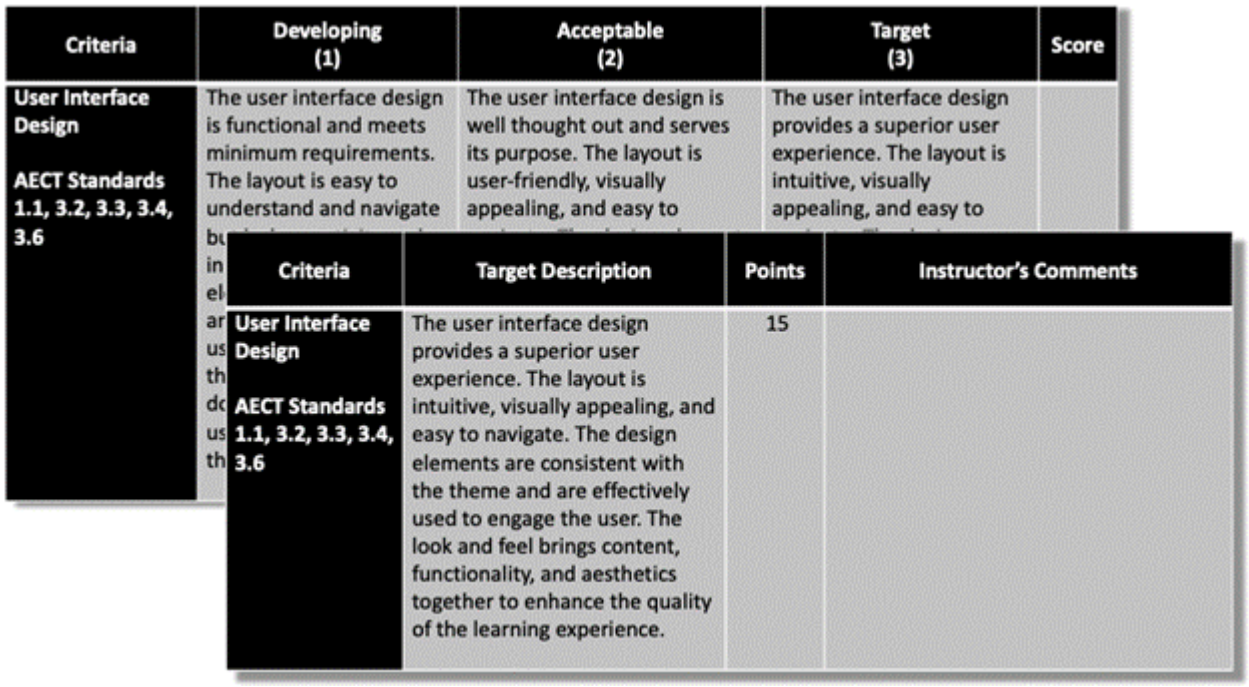
To reimagine assessments and feedback as learning experiences, we reexamined the major assessment of the course, the six-part e-learning design project, from the learner perspective. By placing the learner at the center of the task, we were able to identify opportunities where subtle, but important improvements could be made.

One obvious place to begin were the rubrics. To shift the focus of the rubrics from terminal judgments to formative learning experiences, we redesigned the rubrics to allow more space for instructor input (see Figure 8). Instead of a typical three-performance level (i.e., Developing, Acceptable, Target), we adopted a single "target" performance level that described the ideal or desired optimal outcome. By eliminating the other two performance levels, we were able to

include an “Instructor’s Comments” section to provide more individualized feedback for each criterion. This change enabled us to focus on the learning rather than the product (i.e., final grade).

Figure 8

Before and After Images of an Assessment Rubric



Criteria	Developing (1)	Acceptable (2)	Target (3)	Score
User Interface Design AECT Standards 1.1, 3.2, 3.3, 3.4, 3.6	The user interface design is functional and meets minimum requirements. The layout is easy to understand and navigate	The user interface design is well thought out and serves its purpose. The layout is user-friendly, visually appealing, and easy to	The user interface design provides a superior user experience. The layout is intuitive, visually appealing, and easy to	

Criteria	Target Description	Points	Instructor’s Comments
User Interface Design AECT Standards 1.1, 3.2, 3.3, 3.4, 3.6	The user interface design provides a superior user experience. The layout is intuitive, visually appealing, and easy to navigate. The design elements are consistent with the theme and are effectively used to engage the user. The look and feel brings content, functionality, and aesthetics together to enhance the quality of the learning experience.	15	

We added pedagogical wrappers to each assessment to introduce the project, explainthe purpose and goal of the activity, and infuse emotional elements like challenge, interest, relevance, and curiosity. Introducing the *challenge* element, assessments were re-designed to allow students to build upon their existing skill set while challenging them to learn and apply new technologies or strategies. Both *interest* and *relevance* were fostered through the thoughtful writing of discussion forum prompts that catered to the diverse professions and specialties of the students, making the content personally meaningful. Furthermore, we cultivated *curiosity* by providing flexibility in the assessments, empowering learners to pursue topics and develop skills aligned with their individual interests. Throughout the project development process, continuous feedback and support were also provided, enabling students to refine their learning strategies and access additional resources when necessary.

Taking into consideration the learner growth mindset, which is the belief that intelligence, abilities, and talents can be developed and improved through effort, effective strategies, collaboration, and perseverance (Dweck, 2016), in addition to revising the rubrics, we also revisited how we provided the feedback itself. The feedback was presented as “coaching” to explain to learners what they were doing well, as well as where they could improve. The language and tone, to support a growth mindset, were moderated to help learners accept the feedback as opportunities to expand their knowledge, improve the quality of their products, and learn from their mistakes. The emphasis of the revised assessments and feedback shifted from product to process, in this case an instructional design process, that is iterative and includes multiple cycles of feedback along the way. Hence, the new focus of the assessments and feedback, as Heick (2022) observed when discussing the primary function of any assessment, was to answer the question, “What now?” (para. 1).

Teaching Learning Experience Design Through a Cognitive Apprenticeship Approach

Using Floor's (2016) characterization of LXD as a combination of both *design* and *learning,* the first part of this design case focused on the design aspect to chronicle the redesign of a fully online graduate course to create an environment where faculty and students could work together to learn about learning experience design *through* learning experience design. To address the *learning* aspect of the learning experience, we adopted a cognitive apprenticeship approach to learning that emphasized active participation, social interaction, and the development of metacognitive and problem-solving skills.

Grounded in constructivist and cognitive-social learning theory (Collins et al., 1989), cognitive apprenticeship emphasizes the importance of social interaction and active participation in the learning process. Developed by Collins et al. (1989), cognitive apprenticeship focuses on "learning-through-guided-experience on cognitive and metacognitive skills and processes" (p. 457) to engage learners in activities that allow them to observe, practice, and apply skills and knowledge under the direction of an expert. These activities are designed to help learners develop the technical skills required to perform a specified task, as well as the metacognitive and problem-solving skills needed to navigate unfamiliar or complex situations. Collins et al. (1989), describe six core strategies in their cognitive apprenticeship model:

Modeling. Modeling involves demonstrating how to perform a task or solve a problem. To model evidence based LXD principles during course design, the redesigned course was reimagined around the five essential design aspects of Conceição and Howles' (2021) LXD framework: course structure and interface, content interactions, learning activities, social interactions, and assessments and feedback. By applying learning experience design core concepts that put learners at the center of the design process, we were able to create a course that was more "personalized, engaging, and meaningful for online learners" (p. 23).

Using the course as a model, learners were able to gain a deeper understanding of how to design effective online learning experiences that put the learner at the center of the design process. This approach aligned with the modeling dimension of cognitive apprenticeship, as it provided learners with the opportunity to experience an LXD designed course from the learners' point of view. In addition to using the course as a model of LXD design, we also made some modifications to how we engaged with the learners to model evidence based LXD teaching principles. For example, at the beginning of each live session, we employed pedagogical wrappers to clarify the session's objectives, its relevance to the course materials, and to their course design projects. Also, during the live sessions, we actively employed modeling techniques by presenting examples and non-examples of effectively designed course content.

Coaching. Coaching involves providing feedback and guidance as learners practice a task. It also entails modeling behaviors you want to instill in your learners. We demonstrated key LXD processes related to the portion of the project students were working on, highlighting key concepts, strategies, and techniques. Then, students took turns sharing drafts of their projects with the class. Assuming the role of expert, we guided the conversations by asking questions, inviting students to weigh in on key aspects of the design, and encouraging the presenters to reflect on their thinking and design strategies. Coaching was exemplified through iterative rounds of formative feedback, wherein students took turns playing the role of the expert to identify and address gaps in their own understanding of LXD processes or design strategies, as well as those of their peers.

Scaffolding. Scaffolding is an instructional approach that offers learners temporary assistance while they strive to grasp new concepts or skills. The support progressively fades as learners gain proficiency, ultimately enabling them to independently accomplish the task (Mcleod, 2023). Scaffolding in the form of detailed instructions of project deliverables, non-graded practice quizzes, instructional videos, checklists, sample projects, rubrics, step-by-step tutorials, and coaching, demonstrating, and mentoring through asynchronous and synchronous channels were built into the flow of the course. Scaffolding was also integrated into the design of the course modules and projects through the sequencing of tasks of increasing complexity. As students became more proficient and gained confidence and their

skills, they were able to take the lead on demonstrating and modeling learning experience design principles through their own teaching and project drafts. We also observed collaborative mentorships occurring in the asynchronous discussions as students took turns being the experts. Throughout the redesigned course, scaffolding structures provided appropriate assistance to help students complete each task. For example, each phase of the course design project included step-by-step instructions with screenshots of the various steps as well as a video describing the purpose and scope of the assignment, accompanied by examples of completed products for reference. The scaffolding structures helped students to complete tasks more effectively and efficiently, without overwhelming them with too much information.

Articulation. Articulation entails being able to discuss and defend one's thought processes and design decisions with others. Articulation through a variety of synchronous and asynchronous channels was also built into the flow of the course. Synchronous sessions allowed for real-time discussion and feedback, while asynchronous conversations through the class discussion forum provided opportunities for more reflective and in-depth articulation. Articulation was exemplified during the synchronous sessions as students explained and justified their design choices, demonstrating a deeper comprehension of the subject matter and actively engaging in critical thinking.

Reflection. Related to articulation, reflection challenges students to reflect on their learning experiences, recognize their strengths and weaknesses, and identify areas for improvement. The feedback presented as "coaching" on students' design projects presented an excellent opportunity for them to reflect on the strengths and weaknesses of their course designs and positioned the learners to be able to answer the question, *What's next?* Because the feedback was iterative and included multiple cycles, students had multiple opportunities to make improvements on their products. Reflection becomes apparent through the quality of the final product. By the time students got to the final stage of production, most projects were of very good quality.

Exploration. The exploration phase refers to the process of testing and refining ideas and skills by applying them to new problems or situations. This phase typically followed the initial instruction or modeling provided by the expert and involved the learners actively engaging with the material and putting their knowledge into practice. By exploring and testing their understanding in different contexts, the learners were able to develop a deeper and more flexible understanding of the subject matter. The exploration phase was often observed in future classes when students applied learning experience design principles in future instructional design projects. For example, exploration is commonly observed in the Educational Technology practicum course, taken during the students' final semester. In this course, a significant number of students choose to create their instructional solutions in the Canvas Learning Management System (LMS) and integrate LXD design principles into their design products. This example of exploration showcases their willingness to experiment and engage in innovative approaches to enhance the learning experience.

The cognitive apprenticeship approach is based on the idea that learning is most effective when it takes place within authentic contexts and is guided by an expert in the field. Through modeling, coaching, and scaffolding, our aim was to provide learners with hands-on experience in a real-world context while receiving guidance and support from an expert. Through articulation, reflection, and exploration, our design sought to challenge learners to discuss and defend their thought processes and design decisions, reflect on the strengths and weaknesses of their course designs, and test and refine their design skills by applying them in new instructional contexts.

Limitations to Embedding Wordpress Content into LMS Pages

While leveraging an iframe-embedded approach to develop LMS pages can significantly enhance their visual appeal, it is important to acknowledge potential limitations and implications, which can impose additional work on faculty when it comes to course maintenance and facilitation. One significant limitation is the lack of seamless integration between the Wordpress content management system and the LMS, which can complicate grading class discussions. Instead of conveniently accessing students' posts from the gradebook, instructors will need to search the comments for each individual student, resulting in increased grading time. Similarly, the absence of integration between the LMS announcements page and the email system necessitates manually copying, pasting, and reformatting of

announcements for class emails. This duplication of effort extends the time needed to post and email announcements. To fully capitalize on the Wordpress content management system's robust social features, like adding profile photos or avatars, creating bios, subscribing to discussion threads, and liking students' comments, students will need to create a separate user account, which can add an additional layer of complexity and potential confusion when participating in the discussion forum. Compatibility issues may arise when accessing iframe-embedded blog pages on various operating systems and devices, including tablets and smartphones. Such issues can impact page rendering and compromise the user experience. Lastly, creating content within a blog differs from developing it within an LMS. Faculty who are not technologically proficient may encounter challenges when it comes to navigating the complexities associated with integrating Wordpress pages into the LMS interface. Faculty will need to weigh the aesthetic benefits against these limitations and consider the additional effort and potential complications involved in employing an iframe-embedded approach within the LMS.

Summary and Next Steps

In the fall of 2021, the newly designed course was launched, and, to-date, has been offered three times with a total of 75 students. The course was redesigned based on principles of learning experience design, with a focus on improving the course structure, interface, activities, interactions, and assessments to make it more aesthetically pleasing, accessible, user-friendly, and engaging. The redesign also incorporated effective online teaching and engagement strategies, including social interactions and learner-centered discussions that took into account learners' "cognitive, emotional, behavioral, and social learning needs" (Conceição & Howles, 2021, p. 33). To further reinforce the principles of learning experience design, the e-learning design project was modified to allow students to develop their own online courses and practice applying the principles learned in class.

The emphasis on LXD in the course redesign and facilitation appears to have had a positive impact on students' learning experiences. Throughout the academic year, the course received an exceptional overall student evaluation rating of 4.98 (99.6%) out of 5.00, which is the highest rating it has received in a single year. Previous year evaluation results ranged between 4.68 (93.6%) to 4.85 (97%). The feedback provided by students was overwhelmingly positive and emphasized the significance of designing and teaching online courses that consider the cognitive, emotional, behavioral, and social aspects of learning. The following student comments help to illustrate the point:

> *"Thank you so much for delivering clearly organized, extremely effective, superior instruction each week. I thoroughly enjoyed the activities you set up for us. Thank you also for your responsiveness, helpfulness, and exceptional communication skills."*
>
> *"This was a fascinating course. It was a great exemplar to follow when creating student-centered lessons."*
>
> *"The course and instructor were super organized. All material was presented in a way that was easy to follow. The friendly interface and activities made the class engaging."*
>
> *"This was a great course. I learned so much from how you designed the course and taught it. I truly appreciate how you made this such a great learning experience. I will take everything you have taught me and apply it to all my future projects and interactions with others."*

In summary, redesigning an online graduate course based on LXD principles and practices and teaching it, using a cognitive apprenticeship approach, could potentially help students learn about LXD through LXD in several ways:

Emphasizing the principles and practices of learning experience design could potentially help students gain a deep understanding of LXD by experiencing it firsthand. By seeing these principles in action, students could potentially better understand how they can be applied in the design of their own learning experiences.

Using a cognitive apprenticeship approach could potentially help students develop their own skills in learning experience design by working alongside experts who model effective practices. This approach involves giving students tasks and projects that challenge them to think like designers and to develop their skills and knowledge in a supportive learning environment.

Redesigning the course using LXD principles and practices could potentially also create a more engaging and effective learning experience for students. By designing the course with the learners' needs and preferences in mind, students could potentially be more likely to be motivated and invested in their learning, leading to better outcomes.

What this experience has shown us is that redesigning an online course based on LXD principles and practices, and taught using a cognitive apprenticeship approach, could potentially create a more effective and engaging learning experience for students, which could help them to better understand and apply the LXD principles in their own work. We will continue to explore the efficacy of learning experience design as a subset of instructional design in the coming years and expand our design efforts across all online courses in the program.

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Using Learning Experience Design (LXD) to Promote Decreasing Stigma in Creating a Video Series about Syringe Services Programs (SSP)

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Despite being a vital resource for persons who inject drugs (PWID), syringe services programs (SSPs) often face stigma from the general community and medical profession. To de-stigmatize and illustrate the collaborative practices of SSPs, the authors collaborated with three syringe services programs across Connecticut to create an animated video series called "Syringe Services Programs: Community Building, Testing, and Stigma." This design case describes how the aspects of the learning experience design (LXD) were used to create the animated videos. In addition, the authors discuss how the theory of intersectionality was used to inform the video design.

Introduction

Syringe services programs (SSPs) play a key role in the public health response to the current opioid crisis, which resulted in 91,799 overdose deaths in the United States in 2020 (CDC, 2019). SSPs are community-based prevention programs that provide services such as access to and disposal of sterile syringes and injection equipment and linkage to substance use disorder treatment programs that can provide medication-assisted treatments such as methadone (Martin et al., 2013). Decades of research show that SSPs are safe, effective, and cost-saving and play an important role in reducing the transmission of infectious diseases such as HIV (CDC, 2019). Despite these benefits, SSPs often face stigma from the medical profession and the general community due to the inherent negative societal attitudes towards persons who engage in active substance use. Public opinion and awareness of these programs remain poor, and many states limit or prohibit those programs (Broz et al., 2021).

Promoting awareness and acceptance of the vital role played by SSPs is an essential component of public health efforts to deal with the opioid epidemic. Various public health campaigns, such as the CDC's Rx Awareness campaign

that tells the stories of people impacted by prescription opioids, have been initiated primarily through state and local health departments with variable degrees of uptake by medical providers and patients. The subject matter is inherently challenging to depict, given that persons served by SSPs, namely, persons who inject drugs (PWID), commonly experience difficult life circumstances such as homelessness, food insecurity, unemployment, or concomitant illnesses such as Hepatitis C Virus (HCV), HIV, mental illness, and self-harming behaviors (Rosenthal, 2020). Given heightened sensitivity as well as politically charged polarization about these subjects, there is a tendency to avoid public depictions of sensitive subject matter. Therefore, it is important that any educational materials around the role of SSPs be designed carefully. It is crucial to portray the programs, their services, and the clients who use those services in a way that de-stigmatizes the processes of needle exchange and substance use disorder treatment and prevention.

Context

Design Team and Stakeholders

The four-person development team (training development specialist, AETC (AIDS Education and Training Center) coordinator, HIV physician, and data manager) created a video series entitled "Syringe Services Programs: Community Building, Testing, and Stigma" to better educate the public, including PWID (persons who inject drugs), and medical professionals about SSPs. We partnered with three SSPs across Connecticut. Those programs were: AIDS Connecticut, Hartford, CT; Greater Bridgeport Area Prevention Program (GBAPP), Bridgeport, CT; and The Yale Healthcare Van, New Haven, CT. Feedback from the staff at these SSPs was solicited from five focus groups during design and development stages; these staff included substance use counselors, case managers, and clinicians. Selected SSP staff members also viewed the videos for further input on the final design.

People Who Inject Drugs (PWID)

PWID are a heterogeneous group of individuals who often share a background of various types of trauma. Our videos aim to deconstruct interlocking systems of oppression by promoting social equality rather than perpetuating mono-categorical frameworks such as rich/poor, old/young, female/male, and others (Collins, 2019). Unfortunately, cultural norms and expectations significantly perpetuate these binary opposites and place vulnerable populations as persons who inject drugs within their structure, leading to more marginalization and intensifying trauma experiences (Bryant-Davis, 2019).

Using Learning Experience Design

While the design of videos traditionally encompasses aspects of multimedia following the application of multimedia principles (Mayer, 2017), learning experience design (LXD) adds important considerations to video development. Donald Clark devotes sections of his book "Learning experience design: How to create effective learning that works" to the question of how LXD improves learning through media. Clark (2021) upholds the idea that LXD offers a new way to achieve desirable and lasting learning outcomes by inserting a cognitive learning theory into a design process and incorporating scenarios that reflect learners' backgrounds and experiences:

> *Learning Experience Design moves us from the old to new in three ways. First, injecting learning theory, especially cognitive science into the design process. Second, designing for learners in their world. Third, seeing experiences as more than just flat pieces of media but a whole world of learning experiences that motivate and result in lasting change to long-term memory. (p. 10)*

In this design case, the elements of graphic design (emphasis, hierarchy, use of white space), motion graphics (transitions and animations), language choice, and color theory were carefully developed and applied to portray the inclusive culture of SSPs and their clients often experiencing stigma and marginalization. Applying LXD, which emphasizes the learner's socio-cultural background, such as their needs, desires, and emotions (Raza et al., 2020), and the context of learning allowed our team to reflect on the instructional design elements mentioned above during the

development process. More specifically, we asked the question of how these elements can support goals we set for the animations, which we defined as follows:

Goal 1: Expand knowledge about SSP services

Goal 2: De-stigmatize the syringe exchange process and the services provided by the SSPs

Goal 3: Combat preconceptions about persons who inject drugs (PWID)

Numerous researchers emphasize that LXD is a "result of integrating design practice from other fields (e.g., HCI, architecture, product design, software design, etc.) into instructional and learning design" (Schmidt & Huang, 2022, p. 148). The instructional design strategies used in this case constitute a framework for creating a meaningful and lasting learning experience.

The videos are available on the Connecticut New England Aids Education Training Center (NEAETC) Connecticut Regional Partner's website (www.aetcct.org) and are a free resource for programs, clinicians, and clients. The authors created the videos as part of the HRSA- 17-047-funded grant entitled "Curing Hepatitis C among People of Color Living with HIV."

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Learning Experience and Trauma-Informed Design

It is important to note that the trauma-informed methodologies are rooted in two foundational design approaches: the human-centered design (HCD; Boy, 2017; Cooley, 1987), which centers around the idea that instructional design should be intuitive and respond to human needs, and universal design for learning (UDL), which tailors the instruction to the needs of every learner (Carr-Chellman, 2022).

Learning experience design expands on both: the universal- and the human-centered design by adding additional aspects such as the cultural backgrounds of the users, the choice of graphics and media, the human-computer interaction (HCI), and technology use (Chang & Kuwata, 2020; Jahnke et al., 2022). A specific, single definition of LXD does not exist since LXD as a theoretical model relies on multiple theories and instructional design methods (Chang & Kuwata, 2020). To design and develop effective learning, the LXD designer needs to utilize analytical and problem-solving skills, choosing the best design methods from different disciplines such as instructional and software design, learning pedagogy, behavioral sciences, data analytics, and others such as:

- usability research (Lu et al., 2022),
- cognitive load theory (Sweller et al., 1998),
- distributed cognition (Hollan et al., 2000),
- activity theory (Engeström, 2000; Kaptelinin & Nardi, 2018)
- theories of change (Bowen et al., 2020),
- flow theory (Nakamura & Csikszentmihalyi, 2009),
- and color theory (Kimmons, 2020).

Since the main goal of the videos is to create a stigma-free awareness of SSPs' work and activities, it is essential to discuss how instructional design decisions that inform the learning experience relate to trauma-informed design. Trauma and stigma are inherently intertwined (Frieh, 2020); thus, a trauma-informed pedagogical framework is relevant

for designing stigma-free media. Particularly in healthcare settings, more examples of media and software designs can be observed in recent years that aim at stigma reduction. Some approaches to stigma-reducing designs include a website created for women with endometriosis-associated dyspareunia developed by a group of medical professionals. The website's usability and its stigma-free approach to design were tested during interviews with 12 women with endometriosis. The inclusiveness and the accurate, empowering, and non-judgmental content constituted the foundational design. To address stigma, the respondents suggested allowing privacy settings, building trustworthiness, and providing an opportunity for engagement (Abdulai et al., 2022).

Another impactful stigma-free design is the "Stigma Free Worcester" mobile application, created to support the Worcester Department of Health and Human Services, United Kingdom, in addressing access to substance abuse and mental health care (Wood et al., 2019). The app has four main categories of resources: substance use, housing and shelter, mental health and support, and food and clothing. In addition, the outreach materials like flyers, posters, and cards demonstrate such design characteristics as reduced saturation, pastel colors, and the use of non-stigmatizing, personalized language.

Intersectionality and Stigma-Free Content

Considering intersectionality as a theoretical framework within the medical field for developing stigma-free content has been considered an essential instructional design practice. For example, a recent study proposes an innovative approach called a trauma-informed computing framework to minimize technology experiences that can be trauma-inflicting or exacerbating to individuals impacted by trauma (Chen et al., 2022). The framework is based on SAMHSA's (Substance Abuse and Mental Health Services Administration) six fundamental principles of trauma-informed approaches to technology design and development: safety, trust, collaboration, peer support, enablement, and intersectionality. The article then explains that intersectionality goes beyond gender and race identities and is intertwined with people's different identities, often entrenched in generational trauma. Intersectionality is then a logical approach to understanding these identities:

> *Intersectionality goes beyond accounting for identity in the form of "checking the boxes for gender, race, or class" and considers how power relations at different levels of social structure are intertwined and mutually constructed. Since trauma is intimately tied to people's identities, lived experiences, and historical and generational traumas, computing must contend with intersectionality to create trauma-informed spaces. (Chen et al., 2022, p. 8)*

Developed by the social justice and human rights scholar Kimberlé Crenshaw (1989) in her seminal work "Demarginalizing the Intersection of Race and Sex: A Black Feminist Critique of Anti-discrimination Doctrine, Feminist Theory and Antiracist Politics," intersectionality defines how various facets of an individual's social identity overlap to create and preserve societal disparities and bias. Due to the intersecting identities defined by gender, race, class, sexual orientation, religion, and social status, individuals are often marginalized within specific social groups and organizations. Intersectionality then encourages marginalized groups to find their voice and to produce knowledge grounded in their own experiences rather than promulgate prevailing interpretations of their societal roles within the existing power structures (Collins, 2019).

Julia Seng and colleagues argue that "intersectionality is an important lens for understanding health outcomes in relation to marginalized identities" since the intersections of race, gender, class, and other identifiers constitute social identity and affect health, often leading to trauma (Seng et al., 2012, p. 1). Therefore, understanding patients' cultural backgrounds is vital to restoring their sense of belonging (Comas-Diaz & Bryant-Davis, 2016). For example, psychologists working with sexual minorities demonstrating post-traumatic stress disorder symptoms should study discrimination experiences. Likewise, psychologists counseling Black and Latina women should bring emancipation, creativity, spirituality, self-development, activism, and resistance to internalized oppression (Bryant-Davis & Comas-Diaz, 2016). Treatment would include raising awareness, building connections with others, redefining oneself, self-expression, resistance to internalized oppression, and activism.

The intersectionality approach to stigma and trauma that addresses issues of inclusion, equity, and access can change marginalized communities' cultural framework and perception, leading to less exclusion and feelings of powerlessness, particularly if the medical community (such as SSP personnel and medical providers who refer to those programs) work together to combat these preconceptions.

Other researchers highlight other stigma reduction approaches to substance use, such as creating blended eLearning courses that include reading, self-reflection exercises, and skills practice on communication and stigma (Clair et al., 2022). A few studies have shown that eLearning can effectively decrease the stigma around substance use (Finkelstein & Lapshin, 2007; Griffiths et al., 2004; Kilian et al., 2021). Other stigma-reducing approaches relate to communication strategies such as telling positive stories about overcoming the disorder and motivational interviewing (Clair et al., 2022). Although there is evidence that online learning around substance use yields positive results in reducing stigma, there is little literature on applying learning experience design methodology. This case study is an attempt to fill this gap.

Design and Development Process of the Videos

Application to Video Design

To bring the marginalized identities of people who inject drugs (PWID) to the forefront of the videos, our development team decided to touch upon their socio-economic backgrounds and describe the support they receive from SSPs and the medical community. PWID often come from vulnerable communities, including sex workers or former inmates. The programs offer support to all clients regardless of their background through establishing such roles as client advocates and community leaders. Sometimes, the staff employed in these programs are former clients.

To promote de-stigmatization, the videos describe how the medical staff and providers who often refer their patients to those programs can facilitate non-intimidating conversations with their patients about their health and their lifestyle. The programs stay in close contact with their clients, sometimes suggesting places where clients can stay, have a meal or a shower. In addition, the animations portray the support services that assist clients, such as those provided by Ryan White funding, and how they are kept confidential.

The animations were designed for providers (primary care, HIV), staff (SSP and primary care), and clients. Through a multilayered composition, diverse content, the choice of graphics, and de-stigmatizing language, the videos' main goals are to break the stereotypical notions and beliefs about persons who inject drugs and the services provided. The section below describes the LXD elements such as technology, user's background, content development, language choice, and motion and graphic design.

Formative Work

The primary motivation for creating this series resulted from identifying of the knowledge gap about the services provided by the syringe services programs among the medical personnel within HIV clinics based in Connecticut. The development team conducted one-hour interviews with three programs' staff members, after which the content of the animations was carefully scripted in collaboration with the syringe services programs. During interviews, the development team inquired about the program's activities, the needs, and the demographics of their clients.

The team sought to collect information about the processes around syringe exchange and the struggles that the SSP staff encounter when they distribute supplies and needles on a weekly basis and provide access to other supplies. We were interested to learn about PWIDs, specifically their needs, daily struggles, how the SSP staff tries to engage with them to offer help in additional testing or housing options. This information would further inform our design decisions: how many episodes we would like to produce, who should narrate them, what colors to choose to represent this community best, and what information to emphasize on the screen to portray this community in a de-stigmatizing, inclusive way. During interviews, we asked follow-up questions and inquired about stories or interactions with clients to

understand the nuances of SPPs' work to accurately represent SSPs' socio-cultural settings and communities. Some of the questions we asked were:

1. What is your role in the syringe services program?
2. What information do you collect when a client comes to the syringe services program for the first time?
3. What supplies are available for clients?
4. What are some barriers to testing for HIV and Hepatitis C? How can testing be improved?
5. What improvements to your work could be made?
6. What does the process of needle exchange look like?
7. What are the most common barriers to treatment?
8. What do your clients mostly struggle with?
9. What precautions do you take during COVID-19?

Our team recorded interviews to ensure we captured all information and transcribed the recordings. Based on the transcriptions, our team created scripts that were reviewed by our team and stakeholders.

Choice of Animation

Our team chose an animation format to represent the syringe service programs' activities and the clients based on prior experiences and products that have used animation (Sims et al., 2022). One advantage of using animations is that animated videos communicate ideas in a more engagingly, leaving designers with a free choice of color and graphics.

According to Clark, learning experience design advances the idea of a short multimedia format to create "opportunities for effortful learning" (Clark, 2021, p. 22). LXD also promotes use of other short-format media such as social media, GIF (Graphics Interchange Format), and micro-learning that meet users' needs (Clark, 2021). In the case of our animations, the short form - up to 5 minutes - allows for better retention and dissemination on social media platforms.

Animations can communicate controversial and sensitive content in an approachable way through character creation, motion graphics, and diverse color palettes. Effective use of animation techniques can help injecting emotions (fun, excitement, pleasure but also empathy or sadness) into the design, which is one of the facets of LXD (Clark, 2021; Norman, 2004).

Development of Episodes

> *LXD is strong on the word 'experience.' Single experiences are often commissioned but are often the only first step in the learning process. LXD should push us towards seeing ongoing experience as the key to good learning, not the one-off experience. (Clark, 2021, p. 21)*

Based on the subject matter experts' feedback about the lack of knowledge about these programs within the medical community, we divided the content into four episodes. Dividing the video content into four episodes creates an opportunity for such "ongoing" learning experience. Episode screening can happen periodically to promote retention. To motivate the learner to watch further, each episode ends with a recap and with a foreshadowing of the next episode. Each episode was narrated by a staff member from a different syringe service program to ensure the diverse voices from different organizations and the inclusion of the communities addressed in the videos.

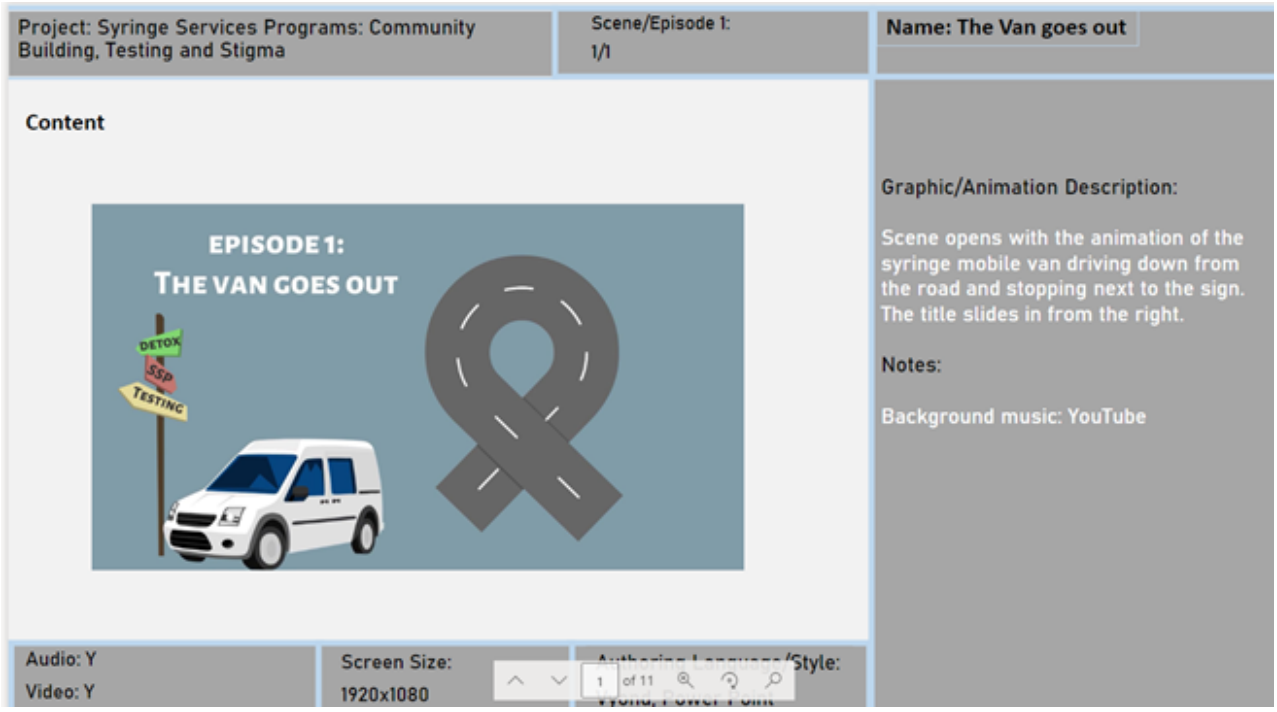
Episode One, entitled "The Van Goes out" describes services provided on the syringe services mobile vans, such as the distribution of needle supplies, the process of syringe exchange, syringe disposal, and the home delivery option. Episode one also describes the new client registration. Episode Two, called "Harm Reduction Model" explains various

approaches to harm reduction, such as safer use, abstinence, outreach, and support programs. It discusses referrals to health and support services and how the programs engage in community outreach through client advocates, community leaders, and secondary distribution. The episode outlines the syringe services programs' organizational structure and highlights staff responsibilities and prospects of professional development. Episode Three, “Testing and Referrals” describes testing for infectious diseases and linkage to care. Specifically, it illustrates how testing is performed on the mobile van and how clients are referred to medical care. Episode Four, “Barriers and Stigma” describes some barriers clients who use the syringe service exchange face. This includes stigma from the general community, resulting in a pushback against the van's presence, provider biases, and clients' concerns about confidentiality.

Storyboards for each episode were created (Figure 1). The development team used the animation software Vyond as the main animation tool. Other programs included PowerPoint, Adobe Premiere Pro, After Effects, and Adobe Illustrator.

Figure 1

Example Storyboard for the Opening of Episode 1: "The Van Goes Out"



Incorporating Destigmatizing Language

The stigmatizing language used to describe persons with substance use disorders can create barriers to accessing health care, employment, education, and affordable housing for individuals who want to contribute to society (Jackson-Best & Edwards, 2018; Zwick et al., 2020). Therefore, throughout the development process, the SSP staff instructed the development team on using de-stigmatizing language.

People with substance use disorders (SUDs) are often referred to as “dope fiends,” “pot heads,” and “addicts” who “abuse” drugs and have “dirty” urine tests (Earnshaw, 2020). De-stigmatizing this language assisted in the accurate representation of the values of the programs, their shared beliefs, and the programs’ history. For example, instead of the term “dirty needles,” authors used the term “used needles” or instead of the word “addict” - “a person suffering from substance use disorder.” The use of de-stigmatizing terminology created an opportunity to shift public thinking from

exclusion and rejection to acceptance and inclusion into the public community. Persons referred to as “addicts” are frequently seen as more deserving of blame than people referred to as “having SUD” (Kelly et al., 2015). Using de-stigmatizing language can help gain public support for changing policies around substance use that promote the well-being of individuals in recovery (Earnshaw, 2020).

Use of Visual Design and Motion Graphics

The authors used authentic photographs that show street scenes as backgrounds (Figure 2) instead of animating the backgrounds or using abstract images. The photographs let the viewers better relate to the environment, where the syringe services programs operate, such as the settings where the needle exchange occurs. In addition, the viewers gain an understanding of some of the client’s living circumstances, like housing and access to food. The authors also used the photographs provided by the SSPs, like the different supplies distributed to clients. The black and white backgrounds blend well with fictional elements like animated characters and objects, and the whole multilayered composition offsets the seriousness of the topic, engaging the viewer further through acquired depth and perspective.

Figure 2

Sample Black-White Backgrounds Showing Street Scenes

To prevent redundancy and reduce graphic overload, the authors applied graphic design principles when composing individual frames and staging elements within the frames. These principles are alignment, hierarchy, proximity, repetition, similarity, emphasis, space, balance, and contrast. Adhering to these principles ensures that the objects are positioned in a single frame so that the visual elements communicate ideas effectively and accurately, enhancing retention. For example, Figure 3 shows the animation excerpts outlining the needle exchange process. Here, graphic design elements have helped communicate the message about the supplies distributed to clients. The alignment creates an order between the elements on the screen (the supplies are organized in the back of the van). The more important elements, like the syringe service staff and the bucket with used syringes, are in the foreground, and the van with additional supplies stays in the background (hierarchy). The camera movement highlights the importance of the supplies and the staff member, which are placed close to one another and on the same axis (emphasis, balance, and proximity). There is a continuity in the scene, where the same supplies in the van stand outside the van in the second frame (repetition). The white and black photographs contrast the animated characters (contrast). The colors in the

second scene are the same as in the first one (similarity), and there is enough distance around the characters and above the elements (space).

Figure 3

Application of the Design Principles on the Example of the Needle Exchange Sequence

Another important aspect of learning experience design is the choice of colors. Colors carry meaning, help process information, and impact people's behavior (Elliot & Maier, 2014). In addition, research shows that different colors impact individuals' moods (Rider, 2010). Depending on the application area and the intensity, colors can be overwhelming and produce anxiety. In his chapter, "Color Theory in Experience Design" (2020) Kimmons suggests that learner's emotional reactions to colors originate from their cultural backgrounds and life experiences:

> *Colors elicit various emotional and physiological reactions from users that are important for designers to understand, and these reactions are determined by various factors associated with the colors themselves (e.g., hue, saturation, brightness) as well as the cultural and experiential backgrounds of users (e.g., this color reminds me of X). (p. 103)*

Kimmons further states that brightness and saturation account for "two-thirds to three-fourths of the detected variance in users' feelings toward color" (2020, p. 110). While it is not always possible to account for users' cultural backgrounds or experiences, it is possible to influence users' emotional response to the training content by changing saturation and hue. For example, different saturations and brightness of blue might elicit various feelings, ranging from tranquility, amazement or awe (Kimmons, 2020). Positive emotional reactions translate into enhanced learning outcomes.

In the case of our design, all our backgrounds have been transformed to white-black. We changed the saturation by adding more white for better contrast. Through the application of black and white backgrounds, our team's goal was to encourage the user to reflect on the situation of PWID.

Certain colors are used more often in specific settings. For example, blue is commonly used in healthcare since it builds trust and confidence and is non-threatening; green, also non-threatening, symbolizes renewal and clarity and is used in social services and the service industry; yellow is often used in non-profit organizations and cleaning products. The authors used predominantly shades of blue and green. Red and orange indicate danger, mistakes, and unwelcome behaviors.

In addition to the graphical elements, each episode has a narrator who is a medical staff working in one of the syringe services programs in Connecticut that the team collaborated with. Each episode starts with a short overview video presented by the medical staff appearing in person. Subsequently, the animated version of the staff member narrates the episode, occasionally appearing on the screen as an animated figure. Other animated characters (clients, pedestrians, counselors) have been carefully designed to show diversity, ethnic background, and racial diversity.

Implementation of the Video Series

The videos were completed in eight months (February 2020-September 2020). The videos are available on the Connecticut New England Aids Education Training Center (NEAETC) Connecticut Regional Partner's website (www.aetcct.org) and are a free resource for programs, clinicians, and clients. One of the privacy settings implemented on the website is password protected. Website visitors who wish to view the animations are asked to create an account. By accessing their account, they can view all the password-protected content available on the website, including animations. The videos can be accessed independently, asynchronously, and included in various educational settings as, for example, structured training in clinics. As a stand-alone resource, videos promote recovery among people who inject drugs and address stigma manifestations from some healthcare workers (Earnshaw, 2020).

Design Reflection and Limitation

This article describes the process for creating the video series “Syringe Services Programs: Community Building, Testing, and Stigma” with essential design principles embedded in LXD and intersectionality viewpoints. While we do not have formal quantitative or qualitative results to demonstrate the effectiveness of this approach, we have had preliminary feedback from early viewers (patients, providers) that suggest acceptability and utility.

Our video series attempted to address the trauma-based experiences of PWID. An essential aspect of trauma-informed instruction includes understanding users’ backgrounds, recognizing the importance of acknowledging their social identities and sociopolitical context, and discussing issues within safe and inclusive settings (Bozkurt & Sharma, 2020; Carr-Chellman, 2022; Pica-Smith & Scannell, 2020; Watermeyer et al., 2020).

Existing research often focuses on the investigation of stigma on the individual level, with much less understanding of how to address the issue of stigma at the cultural and organizational levels (Smith et al., 2022). Through design techniques such as animation, choice of graphics, and colors, we aimed to promote accessibility and de-stigmatization and ultimately better understand the culture of care promoted in SSPs. Thus, more research is needed to understand the role and impact of how culturally responsive learning experience design can change public perception of marginalized communities and the stigma surrounding them.

There is also a need for more research on the effectiveness of the application of LXD to reduce stigma in the medical field and, specifically, on how the learning designers make the decisions to deliver a product that is stigma-free and results in long-lasting behavioral changes.

Considering our design, a significant limitation was the need for specific survey questions to evaluate if the videos successfully promoted de-stigmatization and intersectionality approaches to education on SSPs. The original questions we created in the pre- and post-survey were focused on knowledge assessment. Measuring the effectiveness of the videos on stigma reduction would require additional data study best conducted within a qualitative research format. The videos were created during the COVID-19 pandemic, when data collection, in-person or online, was challenging due to changes in work modalities, overall work uncertainty, and other issues. Future research will focus on assessing the

impact of the video series on decreasing stigmatizing attitudes towards persons who access SSPs and increasing favorable attitudes towards SSPs in general.

Conclusion

The authors created four animated video series entitled “Syringe Services Programs: Community Building, Testing, and Stigma,” partnering with three syringe services programs (SSPs) across Connecticut as a novel approach to raise public awareness about the syringe services, which can lead to a better understanding of their client's needs and life circumstances, and consequently improve the health outcomes of those who inject drugs. The videos used LXD theory to emphasize the importance of stigma-free culture to address underlying issues such as trauma and intersectionality of identities faced by individuals suffering from substance use disorders. Specific application of LXD principles, following the user-centered design process, including elements of graphic design (emphasis, hierarchy, use of white space, and more), motion graphics (transitions and animations), language choice, and color theory can create a compelling and well-accepted platform with the potential to raise awareness about marginalized communities such as syringe services programs and their clients. Applying theories and methods from learning experience design can increase learner’s knowledge about stigma, and it is a first step towards shifting public’s perception about people who inject drugs and the importance of services they use.

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Going Through the Motions? Asynchronous Online Course Discussions Considered Within a Learner Experience Design Framework

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User Experience | Learner Experience Design | Asynchronous Online Course Discussions | Online Higher Education | New LXD Model

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Despite extensive research into asynchronous online course discussions (AOCDs), there remain unsettled areas and a gap of in-depth qualitative approaches. This study investigated learners' AOCD experiences throughout their asynchronous online graduate program using an LXD lens. Data included 26+ hours of interviews and think aloud observations with eight participants; four instructor interviews; two course design reviews; and a review of posts. Data were analyzed using reflexive thematic analysis and it was found that (1) participants largely experienced their AOCDs as low quality and not "real" discussions; (2) participation requirements were overly prescriptive, constraining authentic dialogue; (3) instructor involvement in the AOCDs was crucial and largely experienced as insufficient; (4) the AOCD user interface was inconvenient and not aesthetically appealing and impeded conversation; and (5) most surprising, all but one participant felt in spite of these challenges that the program should keep AOCDs. Study findings informed a new model for considering AOCDs through an LXD lens comprised of five components: academic culture, course design, AOCD UX, student traits, and time-bound dynamics. This model can be easily modified for other technology mediated educational activities.

Introduction

Asynchronous Online Course Discussions (AOCDs) continue to be an omnipresent educational activity within online higher education (Fehrman & Watson, 2021). Often compared to in-person class discussions that are spoken and in real-time, AOCDs are typically assigned to span one or two weeks and primarily involve students posting text-based messages to which other students in the course are expected, often required, to read and respond to asynchronously. Originally hypothesized as having potential benefits over in-person discussions as they were "freed of the constraints imposed by time and space" (Henri, 1992, p. 118), AOCDs were later described by critics as "over-cultivated factory farms, in which nothing unexpected or original is permitted to flourish" (Morris & Stommel, 2018). The research conversation about how to best design, implement, assess, and evaluate AOCDs has been taking place at least since Henri's excitement about the "gold mine of information" they make available (1992, p. 118).

Much AOCD research relies on content analysis. Content analysis assumes that AOCD discussion forum transcripts are an exteriorization of learning processes and that latent variables like critical thinking (Newman et al., 1995), cognitive presence (Garrison et al., 2000), and collaborative knowledge construction (Gunawardena et al., 1997) can be identified and coded in the AOCD message text (de Wever et al., 2006). Research using this approach has measured levels of cognition (Al-Husban, 2020), explored language indicators for students' feelings of belonging (Zengilowski et al., 2023), compared AOCD content quality between different interfaces (Hou et al., 2015; Z. Sun et al., 2018), and observed the impact of different course design and instructional interventions (Giacumo & Savenye, 2020; Wise et al., 2012). While there are exceptions (Galikyan & Admiraal, 2019), much of the content analysis research has found that when AOCD posts are coded against a taxonomy of low to high quality of thinking, students' posts tend toward the lower levels (Bai, 2012; Ertmer et al., 2011; Garrison et al., 2000; Gunawardena et al., 1997; Kanuka et al., 2007; Shearer et al., 2015; Wise & Chiu, 2014).

As LMS data has become more accessible (Psaromiligkos et al., 2011), researchers have been able to better consider learners' behaviors within their AOCDs. Studies conducted within this realm have used social network analysis (SNA) to explore levels of interaction (da Silva et al., 2019) and degrees of closeness as related to knowledge construction (Ye & Pennisi, 2022). LMS trace data analysis has shown that participation requirements significantly shape learners' AOCD posting behaviors (Lee, 2012) and that habitual learner behaviors informed by the design of the AOCD interface itself can create unanticipated results wherein certain threads persist and others are ignored regardless of discussion quality or learner intent (Hewitt, 2005). Using LMS data to investigate what learners do in their AOCDs has expanded how researchers conceptualize AOCD behavior, moving beyond a singular focus on the text of message posts to also include the construct of "listening," correlating to the active reading of other messages (Chai et al., 2020; Wise & Hsiao, 2019).

In exploring learners' perceptions of their AOCDs, researchers have relied largely on quantitative surveys and open-ended text-based questions. The Community of Inquiry (COI) validated quantitative survey (Arbaugh et al., 2008) designed to measure students' experiences of social presence, cognitive presence, and teaching presence in their AOCDs has been widely deployed (Stenbom, 2018). Such studies often consider the impact of various course design and instructional interventions on measures of one or more of the three COI presences (Sadaf et al., 2021). Others have combined quantitative surveys with open-ended text-based questions to glean more nuanced information on learners' perspectives regarding their AOCDs (Ebrahimi et al., 2016; Scott & Turrise, 2021; Tibi, 2018).

Despite the proliferation of research into AOCDs, except for the need for structure in online discussions, there are relatively few "settled" areas or agreed upon best practices for their design and implementation (Fehrman & Watson, 2021). Additionally, the bulk of research on AOCDs is conducted without asking learners themselves to describe how they actually experience their course discussions (Rourke & Kanuka, 2007; Sullivan & Freishtat, 2013). Notably, this insufficient attention to learners' lived experiences has also been observed in online learning overall (Veletsianos, 2013) as well as education more broadly (Seidman, 2013). While useful information about

what learners' do and experience is provided by content analysis, learner analytics data, and surveys, in-depth investigation of learners' experiences with all the attendant complexity requires qualitative methods like interviewing.

Learner Experience

Considering education through the lens of learner experience goes back at least to Dewey (Dewey, 1938) who articulated a full theory of experience and advocated for its central importance. Learner experiences for Dewey (1938) were always a transaction between the learner and their environment:

> *An experience is always what it is because of a transaction taking place between an individual and what, at the time, constitutes his environment, whether the latter consists of persons with whom he is talking about some topic or event, the subject talked about being also a part of the situation . . . The environment, in other words, is whatever conditions interact with personal needs, desires, purposes, and capacities to create the experience which is had. (pp. 43-44)*

While Dewey wrote well before online education, his experience framework was later built on by instructional design scholars who asked "What would instructional design be like if we gave more attention to how people really encounter and engage in instruction-both learners and facilitators alike?" (Parrish et al., 2011, p. 16). Like Dewey, they emphasized the idea of experience as a transaction between designed elements and individual characteristics.

Most recently within the field of learning, design, and technology conversations are taking place regarding an emerging line of inquiry into learner experience (LX) and learner experience design (LXD) (Schmidt, Tawfik, et al., 2020; Schmidt & Huang, 2022). This developing LXD framework, similar to Dewey (1938) and Parrish et al. (2011), emphasizes experience as a transaction, taking place at the intersection of multiple factors. Schmidt, Tawfik, et al. (2020) state:

> *LX is not only concerned with the effectiveness of designed learning interventions, but also with the interconnected and interdependent relationship between the learner- (or the teacher-/instructor-) as-user, the designed technology, novel pedagogical techniques or instructional strategies, and the learning context. (n.p.)*

There are several diverse areas being considered within an LXD framework including, but not limited to, appropriate research methods (Schmidt, Earnshaw, et al., 2020), socio-technical pedagogical usability considerations (Jahnke et al., 2020), theories of change (Bowen et al., 2020), and the role of needs assessments (Stefaniak & Sentz, 2020). Additionally, the theories in which LXD is grounded emphasize both individual learning experiences (i.e., cognitive load theory) and the collective nature of learning (i.e., activity theory, distributed cognition) (Schmidt, Earnshaw, et al., 2020).

When it comes to considering AOCDs within an LXD framework, there are two takeaways from the broader conversation that should be emphasized. The first is that we need to dedicate more attention, both in instructional design and research, to the user interface and usability of the technology tools with which learners are interacting. This requires adopting and adapting methods from fields like human computer interaction (HCI) and user experience (UX) research, because for too long we have neglected the impact these technologies inevitably have on learning experiences. Secondly, though, an LXD focus cannot stop with UX considerations as our concerns necessarily go beyond the intuitiveness and ease of use of the interface. Consider, for example, a course in which the AOCD interface is pleasing to use, easy to navigate, and facilitates a seamless exchange of messages between its users. Yet, that same course has poorly written discussion prompts, an instructor communication style many students experience as off-putting, and a grading structure that disincentivizes deep thinking. In this example case, the UX might be excellent while the overall LXD is poor. Ultimately, investigating AOCDs through an LXD framework requires simultaneous attention to the variety of elements including, but by no means limited to, the UX of the mediating tool.

Research Focus

For at least the foreseeable future, ACODs will remain a staple of online higher education. And, despite a proliferation of empirical research, there remains much to learn from in-depth qualitative explorations of the learners' own experiences. LXD offers a useful framework in ensuring that the multiple relevant factors impacting learners' experiences receive necessary attention. Toward that end, this paper reports on an in-depth qualitative study, made up of over 26 hours of interview data including think-aloud observations, investigating the following:

> *When considered within an LXD lens, how do online students experience their required course AOCDs and which are the most salient elements mediating those experiences?*

This paper then proposes a new conceptual model for future LXD investigations into learners' experiences of other technology-mediated educational activities.

Study Design

To investigate learners' experiences with their AOCDs using an LXD lens, this study employed a strategic integration of established interpretative qualitative methods (Creswell & Poth, 2016) and UX evaluation methods (Schmidt, Earnshaw, et al., 2020). The study employed the well-established three-interview sequence designed to facilitate increasing depth and nuance into the participants' experiences of their AOCDs (Seidman, 2013). In Seidman's (2013) framework, each of the three interviews is semi-structured, loosely guided with topics but also evolving naturally between the participant and researcher (Brinkmann & Kvale, 2015). In Seidman's model, the first interview, focused life history, is intended to build rapport between the researcher and participant and establish the relevant context of the participant's life involving the phenomenon. The second interview, details of the experience, is intended to draw out in as much detail as possible the participant's experience with the phenomenon. Finally, the third interview, reflections on the meaning, allows for the participant to reflect on their experience of the phenomenon and provide additional insights into it (Seidman, 2013). Because qualitative interviewing alone, however, was not sufficient to access the "design" elements of LXD, the second interview, details of the experience, was extended to also include think aloud observations (TAO) (Gregg et al., 2020; Schmidt, Earnshaw, et al., 2020).

As an interpretative qualitative inquiry, this study did not aim for statistical generalizability but rather transferability wherein readers should be able to transfer relevant findings of the research to their own contexts (Tracy, 2010). The responsibility of phenomenological interviewers is to "come as close as possible to understanding the true 'is' of [the] participants' experience from their subjective point of view (Seidman, 2013, p. 17)." To ensure quality throughout the study, the researcher adhered to established methods within qualitative research for rigor, trustworthiness, and quality. This included extended time with participants and commitment to analytic coherence (Nowell et al., 2017).

Study Setting

This study relied on criterion sampling (Creswell & Poth, 2016), which is recommended for phenomenologically motivated research inquiries (Englander, 2012). The setting was a fully online, asynchronous Master of Professional Studies (MPS) program that was offered by a large state university. This program was selected as the study site because each course included required AOCDs, with participation comprising a non-trivial part of the students' final grades (typically worth 10% - 20%).

Participant Recruitment

All students who had completed the first course in the recommended program sequence were invited to participate in the study. Participants were offered a $10 gift card for each interview they completed and enrolled into a $50 lottery for completing all three interviews.

Data Collection

Three sequential semi-structured interviews, with the second interview including a TAO, were conducted with eight individual graduate students (see Table 1).

Table 1

Student Participant Cases With Course History

Name*	Demographics**	Home context	Profession	*Foundations* course	*Consultations* course	Other courses
(1) Carmen	44 y/o; F; White	Married w/ children Lives in PA	Staff Assistant	Completed	In-progress***	N/A
(2) Russ	49 y/o; M; Asian-Indian	Married w/ children Lives in PA	Financial Planner	Completed	Completed	Completed: 2 other courses; In-progress:2 other courses
(3) Abby	29 y/o; F; White	Married w/ children Lives in PA	Quality Improvement	Completed	Completed	Completed: 2 other courses; In-progress:2 other courses
(4) Susan	45 y/o; F; White	Married w/ children Lives in MA	Training Coordinator	Completed	Completed	N/A
(5) Thomas	48 y/o; M; White	Married w/ children Lives in PA	Prison Guard (3rd shift)	Completed	Not yet taken	Completed: 1 other course
(6) Mary	45 y/o; F; White	Single no children Lives in MD	Training Manager	Completed	Completed	N/A
(7) John	57 y/o; M; Other	Married w/ children Lives ½ in PA; ½ in N. Africa	PT as NGO Consultant	Completed	Completed	Completed: 4 other courses
(8) Adele	51 y/o; F; White-ish	Married w/ children Lives in Western Europe	Executive Coach	Completed	Completed	Completed: 2 other courses; In-progress:1 other course

*Pseudonyms

**All demographic data was self-described

***In-progress refers to courses being taken at time of interviews

In total 24 interviews were conducted and over 26 hours of interview data were captured. All interviews were conducted through web conferencing, fully recorded, 45 to 90 minutes long, and scheduled roughly one to two weeks apart. Examples of topics discussed in the first interview, *focused life history*, included: "Tell me about yourself." "What's your typical week like?" "How did you come to be in this graduate program?" "Please talk about your past education experiences." "What were your previous experiences with discussions?" "If a friend were to describe the type of student you are, what would s/he say?" "What are the strengths & weaknesses of online learning?"

During the second interview, *details of the experience*, a TAO was conducted wherein participants shared their computer screen with the researcher and demonstrated their AOCD participation. They were first asked to open a specified lesson in a specified course and to verbalize their internal dialogue while responding to prompts such as: "Walk me through how you approach a lesson in general." "Let's look at the discussion for this week – How do you post, read, and respond?" "How did you interact with your instructor?" "How do you feel in the LMS interface?" They were also asked to demonstrate specifically how they would read and write their responses, including opening Word if that is how they initially drafted their AOCD postings.

Examples of the types of questions asked in the third interview, *reflections on the meaning*, included: "In an ideal situation, what would your course discussions be like?" "How have your experiences in the program compared to this ideal?" "How do you think instructors define discussion quality?" "If you were an instructor in the program, would you require discussions?" "What is the most important thing you want instructors to know about your experiences with online course discussions?"

Student interview data were contextualized with individual interviews with four of the program instructors (see Table 2), two online course design analyses, and participants' AOCD forum postings. All data were collected for this study prior to the global COVID pandemic.

Table 2

Instructor Interviews

Instructor Name*	Role w/in the Program
Robert	Program LeadAuthored & teaches *Foundations* course Teaches other program courses
Bethany	Program InstructorAuthored & teaches *Consultations* course
Barry	Program CoordinatorAuthored & teaches other program courses
Jessie	Program InstructorAuthored & teaches other program courses

*pseudonyms

Data Analysis

All the interviews, both student and instructor, were fully transcribed and qualitatively coded using holistic and in vivo coding (Saldaña, 2013). The Community of Inquiry framework (Garrison et al., 2010) guided the design analysis of two of the courses. The forum postings provided additional context to the participants' descriptions of their experiences. Researcher analytic memos were written throughout the process to identify patterns, connections, and points of divergence in the participants' experiences (Saldaña, 2013). Reflexive thematic analysis (Braun & Clarke, 2006, 2021) was used to analyze the whole data set and the six steps of the data analysis process were: (1) familiarization with the data; (2) generation of initial codes; (3) identification of preliminary themes; (4) review of preliminary themes against the data and each other; (5) refining and naming of themes; (6) production of the final report. Themes that best capture learners' experiences, both the how and the why, of their AOCDs considered holistically within an LXD framework are presented below.

Findings and Discussion

The MPS program in which the participants were enrolled focused on workplace leadership with an emphasis on practical skills attainment, where what students learned in their coursework could be readily applied to their work environment. It was marketed as relevant to those already working in the field of study as well as those new to it. Robert, the program lead faculty member, who is also a leader in the broader international field, explained that,

> *there is value in studying and doing at the same time. In other words…we like the idea that you could take what you learned in class, apply it on the job and then come back with good questions based on that experience.*

While students did not go through the program as part of a strict cohort, there was a recommended sequence of courses and at the time of the interviews, all but one of the participants had already taken, or were taking, the first two suggested courses. The first course, referred to here as Foundations, was an overview of the field, described by Robert, the instructor for that course, as "miles wide and inches deep," with an emphasis on concepts, skills, and approaches. The second course, referred to here as Consultations, was a deeper exploration of a particular relationship-based methodology for working with clients and described by Bethany, the instructor for that course, as a "next generation" approach in the field. The Foundations and Consultations courses had a consistent visual look and feel and were structured in consistent ways in terms of weekly lessons, inclusion of required AOCDs, similar types of activities and assignments, and the use of video and textual materials.

A key difference between the courses was that in the Foundations course, all the discussions had a predefined instructor prompt to which the students were required to respond. In contrast, the discussion prompts in the majority of AOCDs in the Consultations course were student-generated and these discussions themselves were student-facilitated. The course instructors also had very distinct practices and views related to AOCDs. While they were required in the Foundations course that he taught and throughout the MPS program that he led, Robert did not regard the AOCDs as very useful for interactions. He himself did not read all the posts or actively participate in the discussions, he felt that overall, they were "just not very good," and believed them to be of low quality: "the students, even when they're given what I consider a pretty tough question, often they give a minimalist answer." When asked for his perspectives on why these interactions were poor, he discussed concerns about having things in writing and how that potential risk factor might limit people's willingness to share authentically.

Bethany, in contrast, in the Consultations course she taught described being very diligent about reading the AOCD posts daily and stated that she was "committed to the idea that in an online format, the instructor needs to be present, and if they're not, then the student-- it's a crap shoot whether the student gets the concepts or not." While she did not participate directly in the student facilitated discussions, she gave individual feedback in her discussion grading comments and broader discussion feedback in her course emails and announcements. For Bethany, the pedagogical purposes of the discussion were the "confirmation of learning, clarification of learning, and three, would be rapport-building."

Student Participant Cases

All the student participants except for one worked full-time and were somewhat geographically distributed. While one worked full time in Europe, another part time in Africa, and two in different states, the remaining half lived and worked in the same state (see Table 1). All described a primary reason for participating in the program as the potential for career advancement. The following participant case overviews have been intentionally ordered from the most (Carmen) to least (Adele) positive in terms of their AOCD experiences.

Carmen

Carmen was in the program to facilitate a career shift, explaining that she did not want to be a "staff assistant like my mother" for the rest of her life. She saw her professional experiences as very limited compared to that of her classmates and when describing the benefits of the AOCDs said this:

> *I'm amazed at what we've learned from our classmate in China and how things in China work as compared to our practices here. I think you're really getting-- even across the country, things are different. So, I think the discussion is good, because it's giving everybody's viewpoints, all these different experiences that they have, and it opens our eyes to somebody like me who's barely been out of central and northeastern Pennsylvania to see how the world is really working.*

She was by far the most enthusiastic about her AOCDs and appreciated her experiences getting to interact with her classmates through them: "I have fun when I'm online, 2:00 in the morning, sometimes on the discussion board and some of my classmates are up then too." Notably, when asked explicitly about the quality of dialogue taking place in the AOCDs, Carmen did admit that except for her experiences in the Consultations course, she "wouldn't say there was a tremendous amount of critical thinking. The discussion boards were always sort of going through the motions." Carmen was the only participant who confidently stated that she read every single AOCD post.

Russ

Russ previously served in the military and described how the program immediately connected to his life in that he applied the skills gained from his courses to the fraternity he advised. Russ, like Carmen, described his AOCD experiences in largely positive terms and regarded himself as being a part of a learning community facilitated by the AOCDs. His biggest critique of the program pertained to instructors he viewed as insufficiently engaged. Russ approached and experienced his discussions through the lens that he described the entirety of his academic career: that of relational connections. More than once he talked about the AOCD experience with his peers, who he also referred to as his "teammates," by saying "we're all in this together." Russ remarked that "I think discussion forums are great. I think it gives us an opportunity to be prompted, to really think, and it gives us a stage to think at a higher level." In spite of the fact that he spoke positively about his AOCDs, his actual participation was minimal compared to his classmates.

Abby

Abby was doing the program in hopes of career advancement but also felt that even without that possible promotion, "it's stuff that I could use to make where I work better." She was largely positive about the AOCDs and explained that "to put into words, things that you're thinking, re-enforces the concepts that you're learning, and it kind of makes you feel like, 'I get it,' that you can have a coherent thought on whatever the topic is." In spite of the positives she experienced with the AOCDs, she also commented on the fact that "most of them are kind of low quality" and "lots of times people are just pretty much like 'Oh that's a great post, that's a great thought.'"

Susan

Like some of the other participants, Susan appreciated connecting her course learning to her professional world: "I could take what [instructor] gave me and immediately apply it to my job, which was huge." Susan had a mixed analysis of her AOCD experiences and was the most outspoken in contrasting her AOCDs in the Foundations course with those in the Consultations course. She spoke very positively about the student-facilitated AOCDs in the Consultations course as well as the instructor Bethany. When commenting on critical thinking across her AOCDs she said that while it was low in Foundations, in the Consultations course she "absolutely was using critical thinking skills and what have you to answer the questions and participate in a dialogue." That said, when ranking her class activities in terms of impact on her learning, she put the AOCDs as the least impactful of all of the activities across the courses she'd taken. Consistent with this, she felt that the discussions were potentially "very valuable, but the current state is not a value add."

Thomas

Thomas was pursuing this degree as he contemplated "what's next" in his career. Like Susan, he described his discussion experiences in a mix of positive and negative terms. He explained that the quality of discussions really varied by the course and the types of students. He explained that in some courses they could be great while in others "a waste of time." He elaborated saying that "When you get a whole bunch of people that don't want to be involved with the discussion, the discussion board basically goes flat. It's almost lifeless, you know what I mean?" The consistent issue Thomas raised related to instructors who he experienced as taking a hands-off approach in both the course overall and the AOCDs specifically. As he saw it, "You can't just put it in cruise control…you got to steer them [the discussions]."

Mary

Mary enrolled in the program out of a desire to take her career "to the next level." Overall, she did not evaluate her online discussion experiences very positively in terms of her learning, though she did see discussions in face-to-face classes as a definite "value add." She described the requirement to participate as a form of "busy work" that would not be a factor if she were in a "bricks and mortar program." Regarding what she hoped her instructors would understand about the AOCDs, she explained that "From my perspective, I understand what they're trying to affect with the discussions, but I don't think it's having the effect that they want it to have."

John

John's motivation for the program was in part to gain more practical knowledge for his job and also because the country in which he worked part-time had a high regard for higher education degrees. John was quite critical not only of his AOCD experiences but ultimately of the overall expectations for dialogue and critical thinking throughout the program. John also recognized, as did others, that the AOCDs could be mechanistic in that "you can copy and paste from the outline, the summary, and more or less copy and paste that in a Word document, and reformat a little bit and nobody's going to mark you off for not submitting that discussion." Despite his critiques, John also suggested that "the discussion forum has the potential of being the most important part of the course and I would just say that it's not reaching its full potential." John believed the discussions were so common in the courses because the instructors felt compelled by protocol to include them.

Adele

Adele explained that part of her motivation for the program was the monetary increase she would get on completing the degree but that she was also inherently interested in the curriculum as she was "curious about how things work and how they don't work and why they don't work." Adele was the only participant who had nothing positive to say about her AOCD experiences and remarked that she "was and continue[s] to be underwhelmed by this method of interaction." Notably, at the time of her interviews, she was enrolled in an elective course from a different program that did not require discussions and remarked in regard to the absence of discussions that "I have to say, Andrea, I do not miss it. Oh my God. I so don't miss it." Importantly Adele also craved meaningful connections and dialogue with her classmates that arguably, in large part, should have been taking place in the AOCDs.

Experiential Themes

While there was some range in valence in the participant cases presented above in terms of their AOCD experiences, overall, they were generally weighted more towards the negative. What follows here, then, are salient themes that showed up across participants and provide more depth as to the how and why of these AOCD experiences. The first theme addresses the key ways in which participants felt that their required AOCD activities were not actually authentic engagements with their peers.

Not "Real" Discussions

Rather than being experienced as an interaction taking place with others in their course, participants often positioned their AOCDs as individual assignments to complete and move on from. Several participants noted that they did not approach the discussions as being "real." For example, Susan stated, "the way that I typically approach the discussion is I'm checking off the box to make sure that I've satisfied the criteria for the week." Adele agreed with this, stating, "this feels like ticking the box to me." Similarly, Abby stated that "I think a lot of times the discussion experiences are just going through the motions," or as Mary stated, it "seems to me a little bit like busywork." Even Carmen, the most positive among the participants, explained that except for the Consultations course, her other AOCDs were "sort of going through the motions." There was also explicit discussion about how their AOCDs were not real discussions. Adele noted that "a lot of times it's not a dialogue." Susan concurred, "it's really not a discussion quite honestly." Mary also stated that "because it's not like you're chatting with each other… there's not really much of a synergy there in my experience."

Abby offered more detail as to how students were generally writing their replies to each other.

> *I think people have a standard response that they write to postings and the words are different but the general sentiment of the posting is the same, like, "Oh, great post. I've had this same experience in my blah blah blah." And, "Oh, I do that all the time. Thanks for sharing." It's just like this standard: change a few words in a post. It does signify, "Yes, I read your post and yes, I can relate that to an experience that I've had," but there's nothing meaningful.*

This tendency was recognized by at least one instructor. Jessie stated that "probably 20% [of students] see it as busy work and kind of checking the box, and it's just something that I need to do, so I do it." Based on the experiences of the participants in this study, Jessie's 20% is arguably a low estimation.

Adele explains her sense of isolation in the AOCDs in terms of not "knowing" her classmates:

> *[I]t's so bad that I don't even know who they are, but I know that I'm dismissing it. That's pathetic to me. That just doesn't feel very human to me...half the time I don't remember the names of these people that are in my class. I don't know what their names are. I have no idea what their life looks like. Honestly, I don't really care. And if I think about that, it makes me a little bit sad, because that's not really who I am. I'd rather have a real relationship with someone.*

Thomas, on the other hand, positioned himself as the unknown in the AOCDs, in contrast to his Facebook experiences.

> *They [audience on Facebook] are very familiar with me. In a college setting, that's not necessarily the case. If I have any discussion with you on the discussion board, you don't know me from Adam. Maybe you've seen my name on a couple posts. You don't know what I'm like. You don't know what I think is funny. You don't know what I think. You don't know when I'm serious.*

Both Thomas and Adele speak to a lack of social presence, where social presence is in part defined as students' ability to experience themselves, and by extension their classmates, as "real people" in the virtual environment (Garrison et al., 2000).

Deterministic Participation Requirements

In their positioning of their discussions as a deliverable, it is clear participants' experiences were shaped by the posting and response requirements wherein they typically had to post at least once and reply at least twice. As observed in the TAOs, all participants had an intentional way of authoring their initial post, with essentially two distinct approaches among the participants. Each approach suggested some of the learners' implicit views about the discussion's purpose.

The majority approach was to draft the post without looking at any others, which suggested that they saw part of the purpose as the articulation of independent thoughts. The second approach, described by three of the participants, was to rely heavily on the posts of others to determine how to craft their own. While on the surface the

second approach might seem a more passive approach, it aligns with the collaborative knowledge construction framework (Gunawardena et al., 1997) and is more akin to the experience of a face-to-face discussion, wherein before speaking a participant hears what others say and then ideally builds on it.

An important element of the participation requirement was that their minimum two replies had to be made to students who had not already received at least two replies. For some this completely determined how they read, and more importantly did not read, the discussion posts of others. Mary and Russ both described this common practice (see Figure 1 for the practices they describe below). Mary stated,

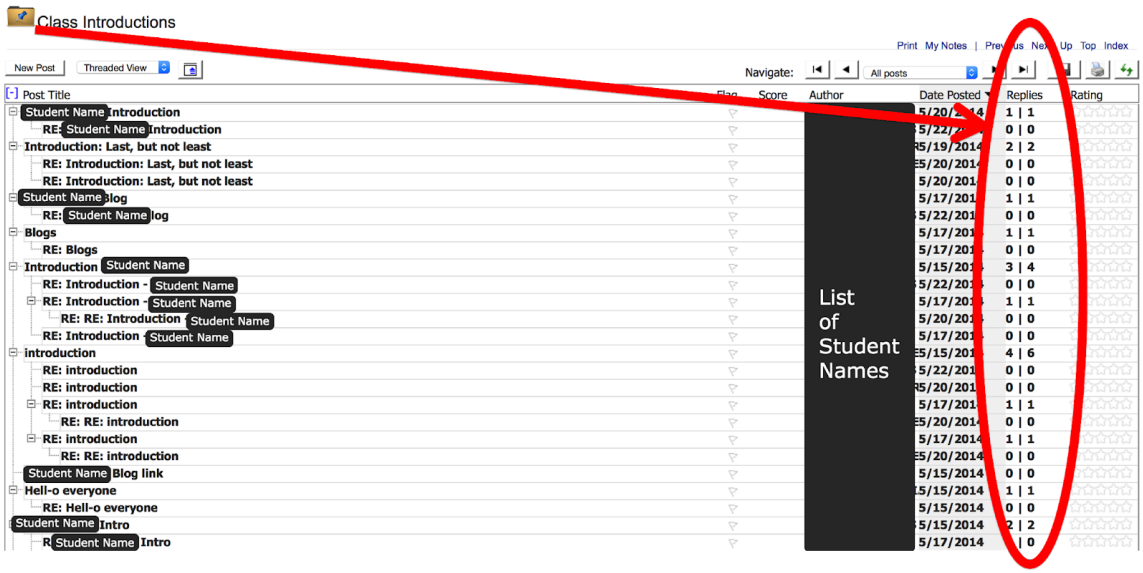
> *I know that I also have a responsibility to respond to two of my fellow teammates. What I do is I come over here to the replies, and would typically look to see who had not been replied to. If this person had four replies, I'd skip right over that and I'd probably go the ones that have one and/or zero, and I then I would try to reply to that.*

Russ stated,

> *In this case, you look to see how many posts there are. In this case, [student name] had two people respond to her already. It's clear that [instructor name] says if there were more than one-- if two posts had been made, you should try to find somebody who hasn't had any post or are less than two. So in this case, [student name] doesn't have two responses so I'd open up hers, with the thought is, what her thoughts are, click on reply.*

Figure 1

Intersection of Assignment Requirements and AOCD UX



John recognized that this habit ultimately stifled any authentic exchange. He stated,

> *If for example, somebody satisfies their criteria in this course that means they've made their post and they've commented on two other colleagues, you won't expect to hear from them because they've moved on and if you comment and ask them questions or whatever, you can't expect them to actually come back because they don't have to.*

Notably, not all learners participated this way. For instance, Carmen and Abby described in detail checking the posts every day and often having the LMS open to see if anyone had responded to them after initially posting. At the same time, though, just like with the other participants, Abby and Carmen did mention multiple times the required nature of the participation and how it shaped their practices. Abby stated, "It's like when you're forced to have conversation and you don't really have input into it...it's like it's so forced."

There is not yet a settled answer to how AOCDs should be structured in terms of requirements for posting and replying. Many who have taught and/or researched this topic recognize that there are challenges to either not requiring participation—in that it can lead to AOCDs with minimal contribution—or overly prescribing participation—which can lead to AOCDs with learners participating in rote, predictable ways as the above demonstrates.

Instructor Presence (Mostly) Lacking

The area in which participants were most outspoken and consistent was the importance of the instructor's active participation with their AOCDs. Both Susan and Thomas contacted me through email over a month after the interviews were over to share additional feedback about how important the instructor's role was to their experience. Thomas also spoke at length on this during the interviews. His sentiments encapsulated how most participants discussed it.

> *The instructor involvement is huge. That is by far, in my opinion, the number one determining factor of how well the discussion boards go, the instructor involvement. . . . If you have an instructor that's involved and they're telling you how much they appreciate your discussion and they talk a little bit about it, more people are going to be involved. When you have an instructor that doesn't pay any attention to the discussion board, simply gives you your ten points or whatever it is for discussing that week, well, then that tells you right from jump street he could care less whether I post five paragraphs or two sentences. That's number one in my opinion for a successful discussion board.*

The model participants consistently offered as the ideal for both AOCD structure and instructor participation was the Consultations course. As already described, the discussion prompts for and facilitation of most of the AOCDs in the Consultations course, unlike the others, were done by the students. In describing why the Consultations course was typically a better AOCD experience, a repeated reason was the role of Bethany, the instructor. Carmen stated, "I would say we have the most in-depth dialogue [in the Consultations course]. We have the best discussion boards. We get a long running conversation going about topics. We have engaged faculty, so that helps us." Susan goes further in making explicit how her level of effort aligned with her perception of Bethany's care. She stated,

> *I think I put more effort into it when the instructor was more visible. Because as long as I satisfied it in [course instructor's for Foundations course] world, I don't think it would have made a difference. So I think it was just the mere fact that I answered the question. If [the Consultations course instructor] was more visible then I should really be thoughtful how I'm managing this. . . .Because she cared. If she was taking the time to read it, she really cared.*

It is important to note here that instructor facilitation does not have to take place in the discussion forum itself to be impactful. In general, Bethany did not post anything in the AOCDs as she wanted to preserve that space for student dialogue. Instead, she gave feedback to students on their AOCD contributions in her individual grading and commented more broadly on the discussion in course announcements and emails to the entire class. The "where" of the instructor involvement was ultimately not what mattered to students. As an example, Susan had misremembered that Bethany was highly active in the AOCDs themselves. But when she went to show examples of Bethany's participation during the TAO interview, she realized that she was mistaken and that in actuality Bethany had not participated at all in the AOCDs but instead in her grading. This is good news for faculty committed to preserving the AOCD space for student dialogue but also demonstrates that instructor involvement very much impacts not only how students experience their AOCDs but also how much effort they put into them.

Notably, the Consultations course seemed to be the exception that demonstrated the larger rule of a lack of AOCD instructor involvement. "I feel like I'm writing for my classmates more than the instructor. I honestly, I don't even know if some of the instructors read these" (Abby), "I had one instructor that was absolutely absentee . . . But in this forum, you really need more" (Russ), and "I guess my take on it is if they don't respond to the post, then the post-- I mean, there are certainly learning opportunities, but they are just shy of busy work" (Mary). Many of the participants wanted more engagement with their instructors, and when asked what the one thing they would want instructors to know about their course discussion experiences, the responses again confirmed the need for more instructor involvement: "I think that the most important thing should be that during discussion has to in some capacity include the professor" (John) and "Involvement; they have to be involved in this process" (Thomas).

This lack of instructor involvement in AOCDs was confirmed by some of the faculty. Consider Barry's description: "I do try to read some of the posts, but it's a little overwhelming, because with 20 students in the class and everyone required to post, and not all the posts are that interesting" or Robert's explanation that he found "the discussions and blogs in the course to be mind-numbingly boring and unhelpful. I am not sure what to do to fix them."

While the importance of instructor involvement was one of the strongest points made by the participants, it did not fully explain their experiences of "checking the box" and "going through the motions" in their AOCDs. For instance, even those who acknowledged that Bethany's involvement in the Consultations course was far superior to that of their other instructors still ranked their AOCDs as having the lowest impact on their learning when compared with other course elements.

AOCD UX Limitations

As part of the second interview, participants were asked to open an AOCD from a course and describe their thoughts and feelings while looking at it. Russ described its lack of aesthetic appeal quite elaborately in comparison to the "most generic post-it note yellow, ugly one that you can find." He went on to add,

> *The discussion forum is black and white to-- it's a communication apparatus. It's very non-fuzzy. There's nothing warm about it. You press this button you go to here, you type in whatever, press this button, you're done. There is no room for your picture, there is no room for colors to make it warm and fuzzy and appealing. It's a wall that you're sticking something to for everybody to see, and then people all go to that wall and see it, and just stick other things on top of it until you got-- it's almost like post-it notes. The most generic post-it note yellow, ugly one you can find, and then you got a string of them that are all stuck together. That's what it's sort of like. I'm a visual person.*

Others described its frustrating interface in terms of seamless navigation. Abby stated,

> *On a discussion board, when people post on a discussion board in your class, you have to click through like a million times to get to that discussion board, and then you have to click through on that class, then you have to click on what's new, then you have to wait for something else to load, then you have to click a little plus sign and drop it down, then you have to click the specific forum. It's just a lot of clicks. Whereas on a Facebook news-feed it just comes up, or basically just comes up in your news-feed and it's maybe one click to see what people have said about something.*

Adele also noted,

> *So the one thing you have to be aware of is to find your way back; find your way back to the original question and make sure you're commenting on what you want to comment on rather than--things get to be red herrings. Not red herrings exactly, but you may end up commenting on something and it'll get lost. It'll just be mired.*

This sentiment was echoed by the instructor Robert as well.

> *Well, I have to go and click in [the LMS], click down through the threaded discussions, do all that kind of stuff. It's very tedious and it's a pain. That is a pain compared to in a classroom where they have the conversations.*

The UX will naturally impact how one experiences not just the tool itself, but also the learning activity taking place in the tool. While one might rightly inquire as to whether these experiences were unique to the specific LMS used in this program, Susan, Mary, and Carmen all had previous AOCD experiences at other universities that took place within different LMSs. When speaking about their experiences, they tended to group them together, regardless of LMS. This parallels prior research considering students' experiences writing in open spaces where it was purported that the experience of writing online in an asynchronous threaded environment transcends the specifics of the LMS (Adams & van Manen, 2017) Similarly, the discussion forum has been described as "a ubiquitous component of every learning management system and online learning platform from Blackboard to Moodle to Coursera" and marked by "one relatively standardized interface" (Morris & Stommel, 2018). One might surmise that some of these experiences are shaped by the UX of the AOCDs housed within industry standard LMSs. As with the previous themes related to the impact of instructor participation and assignment specifications, the UX alone is not sufficient to explain the complexity of learners' experiences with their AOCD.

Yet, AOCDs Still Important

The final theme to come out of this analysis is also the most surprising. Despite their strong feelings on the challenges and limitations with AOCDs, when asked directly as to whether they should be kept in the program, all but one of the participants felt they should not be eliminated. In terms of reasons given for why they shouldn't be eliminated. John described that

> *I think that discussion is the only opportunity you'll ever get to actually say something… It's a vehicle that creates an opportunity for that to take place, and if I took the time to present my weekly discussion comment, I learn from that.*

For others like Thomas, "it is the only activity really that you share anything with the other classmates" or like Susan, "So at least, the discussions give you a glimpse of maybe how a person thinks. But if you took that away, you're missing the diversity piece of the whole class learning from one another." Carmen's explanation was more nuanced and addressed the need for them to be "done correctly."

> *Because I feel, if they're done correctly and maintained by the faculty, interjecting when they see it stagnating. If it's done correctly, I think they can be a big learning tool, because we're learning so much about, not just the topics, but about each other, about how the different businesses work, how these ideas translate to other people's thinking, other cultures. So, I definitely think they're of value if they're done the right way.*

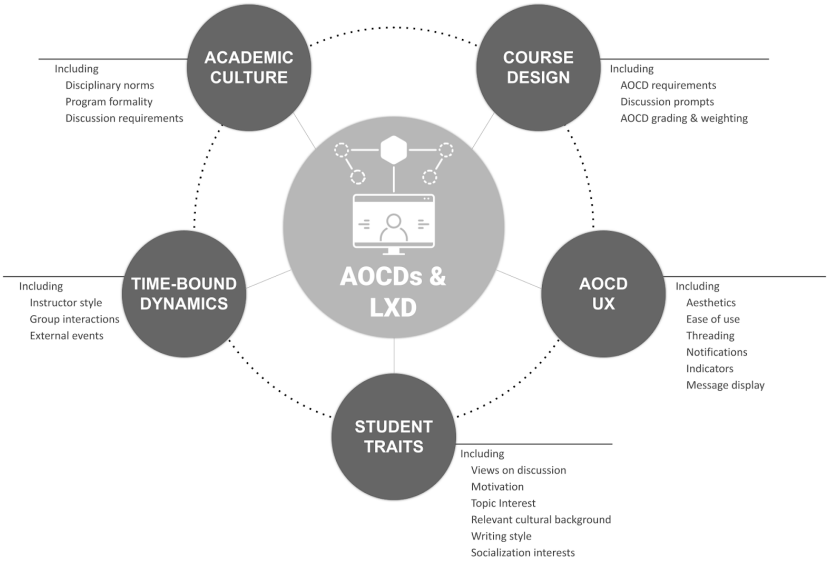
When asked to further reflect on how they should be structured, John and Mary felt they should be re-designed so that the emphasis was not on interactions with one's classmates but instead with the course instructor. Many of the participants, however, would not change much about the format of the discussions, including their value in the final grade, their typical format with an instructor-provided prompt, or the requirement that each student respond to two comments that did not already have two responses. Whether this was simply because they couldn't envision a better way to structure the AOCDs to be more effective or because participants believed the discussions were already ideally designed at present is difficult to say. This was an especially interesting finding given the sense of drudgery the participants often expressed regarding their AOCD experiences.

Implications

The findings of this study considered in the context of both the AOCD and the LXD literature to date suggest a potential new model for how we conceptualize and analyze AOCDs within an LXD framework. There are five key factors that intersect to ultimately shape learners' experiences of their AOCDs: academic culture, course design, AOCD UX, student traits, and time-bound dynamics (see Figure 2). With slight modification, this model can also be applied to the exploration of other technology mediated educational experiences.

Figure 2

LXD Model for Design and Research



LXD Model: Key Elements

In the following section, I will briefly describe the key elements of the model while also discussing it in the context of the specific findings from this study.

Academic Culture

Academic culture refers to elements that transcend but necessarily impact individual course design. For example, discussion norms will generally vary based on things like discipline (e.g., philosophy, mechanical engineering), academic level (e.g., first year, PhD level), and even type of school (e.g., small liberal arts emphasis, large state school). Considering academic culture in the context of analyzing the LXD of AOCDs also means accounting for things like similarities and differences across courses in the same program. For example, if discussions are not commonplace in a particular major, a course that includes them will be experienced differently than a course with AOCDs that is part of a major where AOCDs are ever-present. In the context of this study, the program itself was an MPS with a pragmatic emphasis that valued experience-sharing in the AOCDs. Additionally, the students were working adults, most of them in the same or a related field.

Course Design

Course design refers to the ways in which the course itself situates AOCDs. This includes the presence or lack of an explanation of the pedagogical purpose of the AOCDs. It also considers how the AOCDs are evaluated, how much they are worth, and other elements like discussion prompts, participation requirements, and role assignments. In the context of this study, the course design was largely consistent across the courses, using the same LMS, lesson structure, overall look-and-feel, language for different lesson pages (e.g., roadmap), and the inclusion of required AOCDs worth 10-20% of the final grade. An important difference was between the Foundations course and the Consultations course in the structure of the AOCDs. The prompts in the Foundations course were provided and students were to respond directly to them whereas in the Consultations course, the students rotated a leadership role in creating the prompt and facilitating the AOCD for that lesson.

Student Traits

Student traits are all the unique elements that individuals bring with them to their courses. These characteristics necessarily impact their experiences of AOCDs and include, among other things, areas like motivation, technology self-efficacy, socialization needs, writing abilities and style, beliefs about the purpose of course discussions, and cultural background regarding communication norms. In the case of this study, there were some key student traits participants had in common as they were all working adults interested in career advancement. There were also important differences pertaining to things like how they understood the purpose of the discussions, professional backgrounds, and approaches to their course requirements. As an example, John viewed the AOCDs as a site for productive disagreement where in contrast, due to her limited professional experiences, Carmen appreciated learning from the experience-sharing of others. Some of the participants diligently read everything that was assigned (Adele) while others only read if they found they couldn't complete the activities without reading (Susan).

AOCD UX

AOCD UX refers to all the elements that mediate the experience of participating in the discussion and requires accounting for the affordances and constraints of the mediating educational technology. Research has suggested that assigning discussions in spaces like Facebook (Hou et al., 2015) or social annotation tools (Y. Sun & Gao, 2017) lead to different outcomes than the standard LMS AOCD. Examples of features and functionality of the AOCD interface that can ultimately influence learners' AOCD experiences include aesthetics/look-and-feel, how messages are threaded, how messages are displayed, the use of images, and how the interface displays elements like read/unread and number of responses. In the case of this study, the way that the AOCD provided information about how many replies a message had impacted student reading behavior (see Figure 1). Participants' experiences of unnecessary clicking contributed to a sense that the discussion wasn't seamless.

Time-Bound Dynamics

Lastly, time-bound dynamics recognizes that there are elements of the course that will be unique each time the class runs. For instance, there will always be a new combination of students, unique instructor styles, and external events that can influence the context in which students participate in their AOCDs. As anyone who has ever taught the same course more than once can attest, no matter how much they hold constant in terms of their teaching style and course design elements, there will be always be some unique elements—whether a group of students that seems more engaged/disengaged, global external events, or more isolated internal events like a software upgrade—making the course different than the last time it was taught. The communication styles and patterns of the individual students and the instructor for that class will impact the discussion. In the case of this study, the different styles of Bethany and Robert as instructors in terms of how they facilitated, or not, the AOCDs clearly impacted students' experiences. If the students had taken the courses at a different point in time and they were being taught by different instructors, that too would have an impact.

Intersecting Elements

While the above five factors have been discussed distinctly, they necessarily come together to shape the learners AOCD experiences. For instance, the course design and the AOCD UX worked in combination to ultimately determine many of the participants' viewing, reading, and replying patterns (see Figure 1). Student traits interacted with academic culture to influence their overall attitude toward the discussions: John was frustrated while Carmen appreciated what she was learning. Also, students were required to post once, reply twice and because the overall emphasis was on experience-sharing rather than critical dialogue, students were not encouraged to go beyond the minimum expectations. Academic culture and course design interacted in that while the discussions were an important element of students' overall performance and were integrated throughout the online courses in the program, in a culture that respects faculty independence, individual faculty determined their own level of participation and in all but the Consultations course, it was experienced by the students as low to "nonexistent."

Using the LXD Model to Improve AOCDs

In using this LXD model to improve AOCDs, it is necessary to think through each of the model's elements while recognizing those which can be realistically influenced and those which instead need to be designed for. Whether or not one can influence a particular element of the model will, like many things, be largely dependent on one's position within the college or university. As an example, when it comes to the AOCD UX, some instructors will be required to use a particular interface, such as the one in the LMS, where others will have more flexibility in terms of which discussion platform they choose to implement. An educational technology division of a college or university might have a great impact on the AOCD UX if they determine which platforms the school adopts but have no impact on course design. This is why it is so important that technologists get input from faculty, learning designers, and students as to the ways in which the UX of different AOCD interfaces affords and constrains natural discussion flow.

As another example, the program lead of an online academic program would typically have more ability to impact academic culture as it pertains to discussion norms across courses than would an individual instructor hired to teach a single course section. Given the importance of instructor AOCD involvement, program expectations for teaching a course with discussions should emphasize that instructors actively facilitate course discussions. For instructors concerned that their involvement might overly influence the direction of the discussion, recall that Bethany in the Consultations course was regarded as being quite involved without posting in the discussion space itself. Instead, she provided individualized feedback to students demonstrating her participation while helping guide the discussions productively.

Student traits are often mentioned as an area instructors have little to no influence over; yet, while one may not be able to influence student traits, one can often design for them. When it comes to discussions, this study echoes the findings of Rourke and Kanuka (2007) in that students often view the purpose of the discussions quite differently. This can lead to a situation where one student regards himself as "provocative," while others view him as problematically "negative" or "difficult" if they, in contrast, think of the discussion as a social space. That students will view the purpose of discussions differently is something to anticipate and the course design should be clear as to expectations for how students should be communicating in the AOCD space. Is the purpose of the AOCD to challenge each other's ideas using an argumentative model? Is the purpose to share experiences, reading about and learning from each other? Is the purpose something else entirely? Making these communication norms explicit, with examples, is important as is instructor feedback regarding discussion communication expectations.

As a final example, when considering academic culture and course design as it relates to discussions, it is important to reflect on the pedagogical purpose of the discussions. It is likely AOCDs are at times implemented when there is a more appropriate tool. The nature of the AOCD UX combined with course design elements, such as the requirement that one replies only to a post that doesn't already have two replies (see Figure 1), can put pressure on students to arbitrarily focus on particular posts over others. If the goal is for students to have a place to share their experiences with others in the class, AOCDs without required replies, blog posts, or even individual assignments that allow group viewing would all achieve that outcome without unnaturally constraining reading and posting behaviors. Similarly, if the primary goal is individual idea articulation, an individual reflection assignment would be more appropriate than an AOCD.

Other Applications for this Model

While the model discussed here has been presented in the context of AOCDs, with a few modifications it can be applied to considering learners' experiences with other technology mediated educational activities. Of the five key factors of academic culture, course design, AOCD UX, student traits, and time-bound dynamics, the only one that would need to be changed would be the AOCD UX. Instead, that component would be the UX of whatever was the mediating technology.

Conclusion

This study provides valuable insights into students' experiences with AOCDs in an online graduate program. The findings highlight key challenges and limitations of AOCDs, including the prescriptive nature of the requirements, limited instructor involvement, and problematic UX design. At the same time, it demonstrates that both students and faculty continue to value online course discussions for idea articulation and peer learning. The study was conducted in the context of AOCDs as a persistent activity in online higher education and a gap in the extensive AOCD literature base regarding in-depth qualitative studies. The research inquiry was an investigation into students' AOCD experiences from their own perspectives considered within a broader LXD lens. The study site was a fully online asynchronous graduate program and data included 26+ hours of interviews, including TAOs, with eight student participants, four instructor interviews, two course design reviews, and a review of participants' AOCD posts. All the data were analyzed through a reflexive thematic approach to identify salient themes. This study found that learners tended to experience their discussions as a lower quality deliverable where participation was required. There were individual variations among participants, however, with some clearly more positive than others. Their experiences were shaped by the specific course requirements and limitations of the AOCD interface. Learners were also highly aware of the participation of their instructors and felt that more often than not, their instructors were absent from the discussion, which also impacted the quality of the AOCDs. All that said, the majority of

participants would not suggest removing the AOCD as an activity and described valuing the opportunities they provided for social connections, idea articulation, and collaborative group processes.

This paper also proposed a new model for considering learners' experiences with AOCDs through an LXD lens based on a synthesis of the findings and both the AOCD and LXD literature. The model is made up of the five components of academic culture, course design, AOCD UX, student traits, and time-bound dynamics. With slight modification, this proposed new model can be extended to apply to student experiences with other technology mediated educational activities. While distinct, the components of academic culture, course design, AOCD UX, student traits, and time-bound dynamics also inevitably intersect in interesting ways to shape students' experiences. Future research should implement and evaluate this new model in the context of both AOCDs and other educational technology mediated environments.

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Situating MOOC Learners Within the Field of Learning Experience Design Through Immersion in Authentic Contexts

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Online Learning | Learning Experience Design | MOOC | Extended Reality | Professional Education | Immersive Learning

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We present a design practice paper to explore the power and potential of extended reality (XR) to enable immersive and dynamic learning opportunities within a series of MOOCs focused on the Learning Experience Design (LXD) profession. This project integrates XR-enhanced learning experiences using interactive 360º videos. These media take MOOC learners through a fictionalized design process mapped to key topics of the series. Through a simulated apprenticeship, MOOC learners develop situational awareness and contextual understanding of LXD practice. We use the Developing Instructional Design Professionals for Education through Apprenticeship model to understand the ways these immersive experiences instantiated the four stages of the model.

Introduction

Learning Experience Design (LXD) is a growing field that integrates learner-centered design perspectives, theories of learning, socio-culturally sensitive approaches, and a range of user experience design processes and methods (Jahnke et al., 2022; Schmidt & Huang, 2022). As the field is increasing in prominence, so is a demand for educational programs that cultivate LXD professional competencies and skills. In many respects, such programs aim to instantiate the "signature pedagogy" of the LXD profession. Shulman (2005) describes signature pedagogies as the "forms of instruction that leap to mind when we first think about the preparation of members of a particular profession" (p. 52). In the LXD context, this could involve developing disciplinary knowledge, analytical and critical ways of using that knowledge for design, an understanding of how expertise functions in the LXD field, and a nuanced conception of how stakeholders influence LXD activity. Within programs offered through traditional college and university settings,

developing these LXD “habits of mind” should increasingly involve pedagogical approaches where learners engage in apprenticeship and experiential activities, observing and working alongside professionals in the field (Tracey & Boling, 2014).

We are starting to see new programs bringing the practice of LXD to new audiences of global learners at the scale of large online audiences. This requires that instructors consider how learners can engage with the signature pedagogy of LXD and how learners can develop and practice professional skills within authentic design contexts (McLain, 2022). The challenge becomes one of providing online learners with similar experiential activities that promote meaningful opportunities to cultivate LXD competencies and reflect on various LXD design practices. One promising avenue for exploration—and the focus of this paper—is the inclusion of immersive learning activities situated within LXD online learning experiences offered *at scale* as a vehicle for fostering professional engagement in an educational setting (cf. Ip et al., 2016).

Professional Skills for Learning Experience Design

LXD, as with most professional contexts, requires learning about a range of ideas, practices, roles, and skills in the profession. LXD professionals need to understand different theoretical perspectives on learning and media and how they can use those theories within their designs (Jahnke et al., 2022). They also need to know the process, activities, and tools for designing learning experiences, how to navigate the design process, all while collaborating with partners, communicating their ideas, and managing projects in an effective manner (Ritzhaupt et al., 2021).

When we consider these types of professional competencies that are part of learning experience design and the skills that we want students to gain, we can look to how others have used a cognitive apprenticeship approach (Stefaniak, 2015) to help us move towards a vision of a more active, experiential education approach. This is also what we see when we institutions encourage students to take industry internships that hopefully connect with their degree programs. The aim here is to put students in situations where they can see and interact with the activities, roles, discourse, etc. that comprise the professional culture that students are aiming to join. Brown (2006) describes this as the distinction between “learning about” and “learning to be.” Where “learning about” something mainly involves communicating ideas from an expert to a learner (i.e., many traditional classrooms), “learning to be” involves learning how to become part of a professional culture. Drawing on ideas from situated cognition and situated learning (e.g., Lave & Wenger, 1991) where learning involves enculturation into a new practice, Brown (2006) describes “learning to be” as “enculturation into the practices of a field” through apprenticeship where students can experience the “ways of knowing” in that professional culture, and where students can learn to engage in productive inquiry to know what constitutes solutions to the important problems in that profession. This learning perspective is seen in the concept of *signature pedagogies*, where the goal is to draw on pedagogies that prepare learners to become practitioners in a professional field, all while imparting a set of beliefs about the attitudes, values, and dispositions of the profession (Shulman, 2005). This also leverages the idea of *cognitive apprenticeship*, where we see the notion of apprenticeship models being applied as “learning-through-guided-experience” on cognitive skills and processes (Collins et al., 1989).

The Development of Instructional Designers Apprenticeship (DIDA) Model

If “learning to be” involves becoming acculturated into a profession, learning experience designers can “learn to be” through the cultivation of professional competencies. Such competencies represent the knowledge, skills, and attitudes needed to effectively perform on the job. As educators of new members of the profession, it is necessary to create educational activities that allow learners to acquire such competencies and apply them within similar activities and contexts that they will encounter in the profession. One such model we can use to guide a pedagogical approach for LXD professionals is the *Development of Instructional Designers Apprenticeship (DIDA)* model (Mancilla & Frey, 2020), which extends Ertmer and Cennamo’s (1995) work on cognitive apprenticeship and has been tailored to higher education contexts. The model was developed in response to a need for a professional development pathway for novice

instructional designers in higher education (Tracey & Boling, 2014). Throughout each stage of the model, novice learning professionals are encouraged to articulate their knowledge, reasoning, and problem-solving processes (Collins et al., 1999) with mentors at their internship or job site.

The model consists of four stages that encompass pedagogical features that are essential to the development of a learning design professional. It is presented as a "continuum of immersive tasks designed to foster competence among recently employed, novice IDs with little to no practical experience in design knowledge, practices, processes, and thinking" (Mancilla & Frey, 2020, p 1). The model can be used to craft internship or onboarding experiences for new LXDs who are starting at a new job site. Depending on level of experience, the LXD could begin at any stage with full completion of the model lasting from months to years.

- **Stage 1: Observation and Modeling.** In this stage, novice LXDs are provided with multiple opportunities to observe experienced learning professionals engaged in authentic design tasks. By observing at the periphery, novice designers are exposed to the "implicit cognitive strategies and rules of thumb [that] heavily influence the design process" (Kirschner et al., 2002, p 87). In addition to observation, novice LXDs are given opportunities to hear expert practitioners explicitly describe how they are approaching a design problem or task.
- **Stage 2: Tasks with Coaching.** In this stage, novice LXDs engage in structured, discrete design activities and receive direct coaching from expert learning professionals throughout this process (Stefaniak, 2017). Coaching from the expert mentor can include assisting with goal setting and organizational skills, providing feedback on the novice's design choices and offering alternatives if appropriate, and setting up timely debriefings and question and answer sessions.
- **Stage 3: Contextualized Practice.** In this stage, the novice LXD engages in increasingly independent and applied design work, moving beyond individual elements and taking on entire projects. From the expert mentor, they may receive sufficiently challenging and meaningful design problems and specific feedback on their progress.
- **Stage 4: Reflection and Exploration**. In this stage, the novice LXD applies a critical lens to their design work through a process of reflection and self-assessment. The LXD begins to move from reflection *in* action (Schön, 1983) about design decisions they have made to reflection *on* action, bringing together theory and practice (Mancilla & Frey, 2020). Exploration in this phase refers to the novice LXD being able to locate resources, experts, and opportunities needed to advance in the profession beyond their immediate work environment.

The DIDA model gives us a conceptual framework that we can use to develop an overarching educational approach for novice LXDs. But within this framework, we would like to consider what kinds of representations and tools we might use to foster the types of experiential activities that would support "learning to be" an LXD. Furthermore, we would like to consider ways of doing this at scale as we think about online educational contexts that have the potential to reach a larger number of learners in a range of venues. When the educational context is in-person and residential, we might engage in internship placements where students can work with professional LXD teams. However, this approach is limited by the number of internship venues and by the in-person nature of the experience. As we look to develop online educational opportunities for LXD education (e.g., within MOOCs), we would like to design alternatives that can still give a broader range of students more experiential, apprenticeship experiences within those online contexts. For this, we look at the possibility of incorporating immersive learning approaches in the form of extended reality (XR; this term will encompass virtual reality and immersive 360-degree video) tools and representations.

Using Immersive Media Within the Development of Instructional Designers Apprenticeship (DIDA) Model

In recent years, there has been more discourse around the potential of XR and other immersive media to positively impact learning (e.g., Bailenson, 2018). The promise of tools like virtual reality is to immerse learners in educational contexts that might be difficult or impossible to engage with otherwise. This opens a range of possibilities for using immersive media to support training, professional development, and other types of learning activities that beforehand might only be available in person. By being able to immerse learners in different contexts, we can envision ways to

develop the types of experiential activities that help support “learning to be,” especially in the LXD context where we could use immersive media to help novice LXDs attend design meetings, meet and work with collaborators and stakeholders, and practice communication skills. This also gives us the opportunity to explore ways of enhancing online learning opportunities with immersive media to see if we can give students access to similar kinds of activities that would normally be out of their reach because of the online context.

As we look at exploring the use of immersive learning approaches within a DIDA framework to support LXD education, our paper is guided by the following research question:

> *How do course designers and instructors draw on theoretical perspectives and design frameworks to develop immersive learning activities that allow MOOC learners to engage in observation and reflection within authentic, professional learning experience design contexts?*

Situating MOOC Learners in the Field of Learning Experience Design

This work is situated within a four-course MOOC series on Learning Experience Design. The motivation for this MOOC series was to develop an online version of a graduate certificate program at the University of Michigan that is a collaboration between the Marsal Family School of Education (MFSOE) and the Center for Academic Innovation (CAI), which is the on-campus center that develops online educational programs for much of the university. The residential graduate certificate program is a 12-credit program open to all university graduate students. The program combines academic courses on learning theory, curriculum design, multimodal literacies, evaluation, and research design at the MFSOE along with a student residency at CAI. This residency is the hallmark of the certificate program, as students are afforded the unique opportunity of working alongside professional LXDs, media designers, and other partners and stakeholders on authentic design opportunities as they engage in several projects, such as MOOC development.

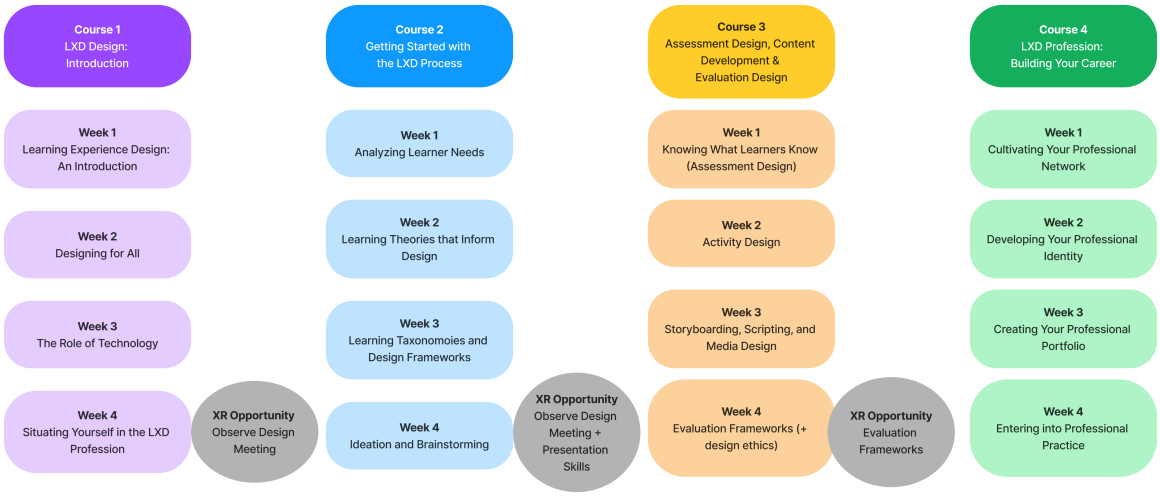
The motivation for developing the LXD MOOC series was to respond to requests from many students outside of the university and professionals who were interested in the curriculum and residency from the certificate, but who, because they could not matriculate at the university, were unable to enroll in the residential certificate program. A challenge, however, in developing the LXD MOOC series, was to develop content that offered a parallel to the residency aspect of the residential certificate program. While much of the course material, lectures, readings, etc. in the certificate program could be included in the MOOC series, the exposure to professional opportunities that arises in the certificate residency is more challenging to replicate. This is where the idea of experimenting with immersive media began to emerge. While this would not necessarily be a complete replacement for a full student residency, it could provide a way of engaging online students with some professional interactions and experiential opportunities that goes beyond the typical MOOC.

Application of DIDA Model to Immersive Learning in LXD MOOC Series

The DIDA model provides a frame for the design and development of the three immersive learning experiences that are integrated into the first three courses of the LXD MOOC series (Figure 1). (Note that the fourth course is focused on the learning in terms of career building, developing a professional portfolio and network and is less suited for an immersive experience.)

Figure 1

Course Design Visualization With XR-Enhanced Learning Experiences Shown in Gray Circles, Week 4 of Courses 1, 2, and 3



The model assumes that novices or learners are situated within an authentic design context, such as real-life internship or work environment as part of a structured professional development or onboarding process (Mancilla & Frey, 2020). The model also assumes direct and sustained engagement between the novice and expert LXD. While it is not possible to provide MOOC learners with such a rich, generative experience, we chose to simulate a complex design environment, where they would have the opportunity to progress through the four stages of the DIDA model through immersive learning opportunities that use interactive 360° videos. In this way, we sought to provide an opportunity for MOOC learners to be situated (even briefly) within an authentic design context, offering the possibility to become engaged in a community of practice (Lave & Wenger, 1991) within a large online environment.

Figure 1 shows the XR-enhanced experiences embedded in the LXD MOOC. The immersive activities present a fictionalized design process for an online course called “Transforming Education.” While Transforming Education is an actual MOOC series, the details of its design process are simplified in the XR experience for the purposes of creating an experiential learning opportunity that the LXD MOOC series learners will be to comprehend.

Immersive Learning Experiences in the LXD MOOC Series

The XR-enhanced experiences in the LXD MOOC series make use of 360° video, (i.e., surround or spherical video), where a 360° panorama is recorded using video and audio. Users can pan around this space using their gaze or controllers. The XR-enhanced experiences were created using an e-authoring tool that allows designers to include interactive elements, such as text, audio, recording options, and multiple-choice quiz questions. The XR-enhanced experiences are embedded in the MOOCs through a learning technology interoperability (LTI) protocol. Learners access the experiences through a link or QR code in the course. Through a web-browser, mobile device, or virtual reality headset, learners can engage in a sequence of situated learning activities. Each course in the MOOC series contains a recommended XR-enhanced activity. Before each activity, MOOC learners are given a set of pre-activity materials to review, such as project status reports, design artifacts, and project communication.

Scenario 1: Observing an Expert LXD in Action

Course 1 Overview

The first course in the series, “Learning Experience Design: An Introduction,” introduces MOOC learners to the big ideas of learning experience design, including an overview of the design process and process activities, along with introductions to different learning theories and design frameworks seen in curricular design, and when designing for all learners via equitable and accessible design approaches. Then, MOOC learners examine the role of technology in

designs for learning, including those that LXDs use in their practice and those that are used by learners throughout a learning process. The XR-enhanced activity is situated within Week 4 of the course, which focuses on becoming situated in the field of LXD. The driving question that guides learners in this section of the course is: “How can novice LXDs begin to develop skills and attitudes that are integral to the profession?” which includes the topics just mentioned here in terms of theory, design process, and frameworks.

Week 4 Overview

Here, MOOC learners start articulating a definition of LXD by situating it within a broader field and related ideas, such as learner-centered and user-centered design (Quintana et al., 2003). MOOC learners identify key competencies, skills, and attitudes that are necessary to cultivate to become a thriving professional (Stefaniak, 2015). Through watching a recorded conversation with two experts in the field, MOOC learners recognize challenges that novice LXDs may face and start to identify strategies they can use to develop LXD competencies (Chang & Kuwata, 2020). An applied project follows the immersive learning experience, where learners are asked to construct a professional development plan that is linked to key LXD competencies. This plan will serve as a guide for their self-directed learning throughout the rest of the courses in the series.

Immersive Learning Pre-Activity

MOOC learners are given a set of reading materials to set the stage for the XR-enhanced activities that will follow in courses 1, 2, and 3. These materials provide context about the Transforming Education online course that will be used as the basis for a sequence of XR-enhanced activities. Design team stakeholders include a faculty member, senior learning experience designer, project manager, and media designer. Also included is a project brief that conveys the overarching goals and ambitions for the Transforming Education course, meeting agendas from the first couple of project meetings, and email correspondence that shows communication between an “early career learning experience designer” (i.e., the MOOC learner) and a more experienced designer. The MOOC learner is instructed to prepare a short self-introduction for the next design meeting in the final email of the sequence.

Immersive Learning Experience

The immersive learning experience is designed to align with two important topics in the course: designing for all learners and the role of technology in supporting designs for learning. The 360° interactive experience is organized in two corresponding parts: (1) the MOOC learner is seated in a conference room, with various design artifacts representing the progress of the design team to date distributed around the walls of the room. While they wait for the meeting to start, they can zoom in on each artifact (e.g., project notes on a whiteboard). When the meeting starts, they see a textual prompt: “Click on the microphone to introduce yourself and your role on the project. Then say, ‘I’m glad to be here.’” The learner clicks on a spinning microphone and verbally responds. The XR application recognizes the final phrase spoken by the MOOC learner and the experience resumes. MOOC learners observe an expert LXD facilitate a productive discussion with the faculty client about how the course design can support engagement for a global audience of learners; (2) MOOC learners observe a second turn of conversation, where the faculty member asks for advice on learning technologies that would support the desired interactions described in part one. The scenario ends when the expert LXD turns to the MOOC learner and says, “I’d like to ask our new colleague to do some research and make a recommendation at our next meeting” (see Figure 2).

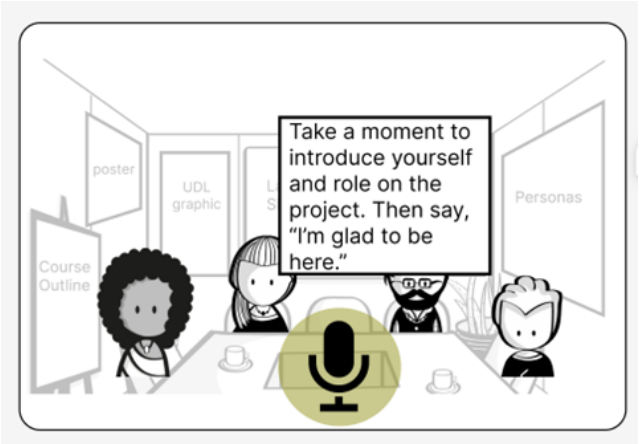
Immersive Learning Post-Activity

This post-activity corresponds with various aspects of the DIDA model, including: (1) Observation and Modelling, (2) Tasks with Coaching (in activity that follows the immersive-learning opportunity), and (3) Reflection and Exploration. In the MOOC platform, learners are asked to reflect on the immersive experience by using a digital workbook tool connected to the online learning platform. They are asked to reflect on what they observed by answering the following questions: (1) What were the key contributions of the LXD in the scenario? (2) How did they demonstrate mastery of core LXD competencies? (3) What ideas do you have for how you will develop skills and competencies you observed? In a discussion forum on the MOOC platform, learners are also asked to do some light research and identify one or two

learning technologies that meet the requirements described during the scenario. MOOC learners create an entry that describes the functionality of the tool(s) they have identified and rationale for their choice.

Figure 2

Sketch Showing Conference Room Where Design Meeting Takes Place. Design Artifacts are Positioned Around the Room. The MOOC Learner is Seated Across From Project Stakeholders and Must Give an Introduction When Called On



Scenario 2: Giving Feedback to a Colleague on a Presentation

Course 2 Overview

The second course in the Learning Experience Design MOOC series, called "Getting Started with the Learning Experience Design Process", focuses on early phases of the design process where LXDs analyze learner needs, use learning theories to inform design, and articulate learning outcomes using learning taxonomies. This incorporates a learner-centered design approach (Quintana et al., 2003) to ensure that the overarching learning experience design process is well-defined from the outset. The XR-enhanced activity is situated within Week 4 of the course, which focuses on ideation and brainstorming. The driving question that guides learners in this section of the course is: "How can LXDs use conceptual tools to facilitate ideation and brainstorming?"

Week 4 Overview

In this week of the course, MOOC learners focus on the topic of visualizing course structure, using a variety of methods and conceptual tools, including sketching, prototyping, and blueprinting (Dodd, 2021). They recognize that by using rapid prototyping techniques to visualize the major elements of a proposed course design, LXDs can capture, represent, and share design decisions without committing to a timeline or sequence (cf. Quintana & Tan, 2021). MOOC learners examine the strengths and limitations of these approaches and discuss the importance of finding a good "fit for purpose" (Conole & Wills, 2013). MOOC learners are exposed to a variety of examples and case studies that show early sketches paired with final course designs. Included within these case studies are explanations from practicing LXDs of how they selected and used each representation type and the advantages and disadvantages that they afforded. The immersive learning activity precedes an applied project where learners are asked to outline a learning experience from start to finish, including needs analysis, learner personas, learning outcomes, and identification of a learning theory that underpins it.

Immersive Learning Pre-Activity

MOOC learners are asked to read the materials before participating in the immersive learning experience. MOOC learners are reminded that XR-activities in the course are optional, and that alternative means of engagement will be provided. To prepare for the immersive learning component of the course, MOOC learners are provided with a set of pre-read materials: a textual summary of the overarching goals of the fictionalized course and status of the course design, course learning outcomes, weekly learning outcomes, and several sketches, prototypes, and diagrams that evidence

current design decisions. For MOOC learners who have reviewed the previous XR-enhanced materials, the course design context will be familiar. For those who have not, the pre-read materials should be sufficient to set the context for the immersive activity that follows.

Immersive Learning Experience

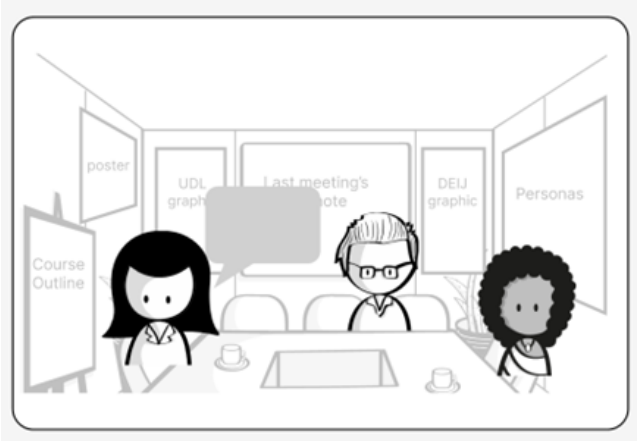
The primary focus of this experiential learning opportunity is on conceptual tools for ideation and brainstorming, and visualizing course structure. A secondary focus is on presenting new ideas to project stakeholders, a critical skill for LXDs. The 360° interactive experience is organized in two parts: (1) MOOC learners observe an LXD practice a “pitch” to stakeholders in front of colleagues. MOOC learners are given the opportunity to respond to multiple choice questions related to peer feedback they would most strongly support to improve the presentation (see Figure 3); (2) MOOC learners observe LXD deliver a revised, improved “pitch” in front of stakeholders (i.e., project team). The LXD uses a visual representation (diagram of course structure) to aid in sharing ideas, and the faculty member responds positively to the presentation. MOOC learners are given the opportunity to respond to multiple choice questions with elaborative feedback about the efficacy of the presentation, including the use of visual representations of course structure.

Immersive Learning Post-Activity

This post-activity corresponds with two aspects of the DIDA model, including: (1) Observation and Modelling, and (2) Reflection and Exploration. In the MOOC platform, learners are asked to reflect on their recent immersive experience using a digital workbook tool connected to the online learning platform. Learners are asked to respond to the following prompts: (1) Discuss what you learned from observing the practice and polished presentations. (2) Comment on the “fit for purpose” of the conceptual tools chosen for this presentation task. (3) Use resources available to you (websites, colleagues) to explore a range of ways to visualize course design.

Figure 3

Sketch Showing LXD Practicing Presentation in Front of Colleagues Showing a Preliminary Idea Using Course Visualization Approaches. Colleagues Provide Feedback.



Scenario 3: Making a Recommendation to a Project Stakeholder

Course 3 Overview

The third course in the Learning Experience Design MOOC series, called Assessment Design, Content Development, and Evaluation Design, focuses on design processes that LXDs use to ensure that course elements are developed to align with targeted learning outcomes. The XR-enhanced activity is situated within Week 4 of the course, which focuses on evaluation. The driving question for this section of the course is: “How do we know that our course design meets its intended goals and objectives?”

Week 4 Overview

In this week of the course, MOOC learners explore the topic of evaluation and recognize its importance within the overall design process, including ensuring goal alignment and improving the overall learning experience. They recognize that evaluation approaches and practices can be used to determine whether the designed instruction allows learners to transfer skills and knowledge learned to long-term changes in behavior and skills required for the target context (Calhoun et al., 2021). The course explains the role of data collection and analysis in the evaluation process. Three types of evaluation are discussed: formative, summative, and confirmative. Several evaluation frameworks are presented including the Quality Learning and Teaching (QLT) Rubric, the OSCQR Rubric, and Quality Matters Rubric. The immersive learning activity follows a multiple-choice quiz that assesses MOOC learners' comprehension of the week's learning goals.

Immersive Learning Pre-Activity

MOOC learners are asked to read the materials before participating in the immersive learning experience. To prepare for the immersive learning component of the course, MOOC learners are provided with a set of pre-read materials: a textual summary of the current status of the fictionalized course design, course learning outcomes, weekly learning outcomes, and a finalized course outline. The previous week's design meeting notes summarize 1-2 evaluation frameworks that are being considered. As with the other pre-activity materials, a biography of the faculty member who is leading the course design effort is included.

Immersive Learning Experience

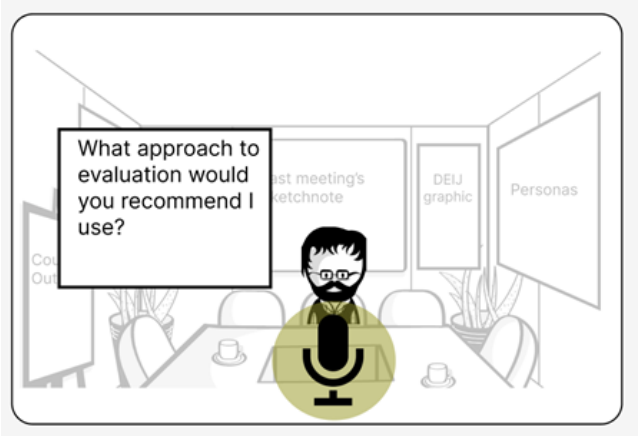
The MOOC learner is positioned across the table from the faculty client and listens carefully as he shares with them evaluation goals for the course he is developing. The faculty client then looks directly at the MOOC learner and says, "What approach to evaluation or framework would you recommend I use?" (Figure 4). The 360° video pauses and the MOOC learner is then shown a modified prompt: "What evaluation framework would you recommend and why?". A spinning microphone icon appears in a sightline with the following audio instructions: "Click the microphone icon to record your response. You will have the option to playback your response and re-record your response if you choose." Once the MOOC learner clicks the microphone icon, their response is recorded. They press the microphone to stop recording. The learner is given four options: listen to their response, record again, restart experience, and exit experience. Listening to their response again gives the MOOC learner the opportunity to prepare for the reflection questions that will follow outside of the activity. No further interactions with the faculty member take place.

Immersive Learning Post-Activity

This post-activity corresponds with two aspects of the DIDA model, including: (1) Contextualized Practice and (2) Reflection and Exploration. In the MOOC platform, MOOC learners are asked to reflect on their recent immersive experience using a digital workbook tool connected to the online learning platform. They are asked the following questions: (1) What did you learn from this experience? (2) What went well? (3) What would you do differently? (4) What aspects of evaluation would you like to learn more about to be more effective in an LXD role?

Figure 4

Sketch Showing Faculty Client Sitting Across from MOOC Learner. After Explaining Goals for Evaluation, the Faculty Member Asks, "What Approach to Evaluation Would You Recommend I use?" MOOC Learners Can Record a Response by Clicking on the Microphone.



Discussion

The three immersive experiences map roughly to the four-stage DIDA model, with some aspects of the model more clearly evident in the XR-enhanced experiences than others.

Stage 1: Observation and Modelling. This stage of the DIDA model was clearly evident across two of the XR-enhanced activities. In scenarios 1 and 2, there are extended opportunities for MOOC learners to observe an experienced LXD in action. In scenario 1, MOOC learners observe an expert LXD lead a discussion about designing for all learners and technology integration. In scenario 2, MOOC learners observe an expert LXD give a presentation of a new idea to a group of stakeholders. As with the Communities of Practice model advanced by Lave and Wenger (1991) where novices start at the periphery as observers before moving to the center of expert activity, MOOC learners have multiple opportunities to observe a complex design situation and the nuanced behaviors of stakeholders within it (Chang & Kuwata, 2020). Through careful scripting, the MOOC learner can observe the way the expert LXD asks questions, summarizes information, and drives progress. In this sense the LXD is able to model expert behavior within an immersive environment.

Stage 2: Tasks with Coaching. This stage of the DIDA model was not evident in the XR-enhanced experiences, namely because of the limitations of technology. Most LXD design tasks are difficult to simulate or enact in an XR environment, so the range of tasks possible are already limited. In terms of coaching, MOOC learners could practice providing a response within two of the scenarios, but the technology did not allow for real-time, external feedback. However, these limitations were addressed somewhat in the post-activity design, when MOOC learners are asked to identify a learning technology that could address the requirements surfaced during scenario 1's design meeting. MOOC learners are required to locate a real-world learning tool to address the client's needs in the scenario. While they are not likely to receive feedback on their choice at the level of coaching, they still have the opportunity to receive input from their peers.

Stage 3: Contextualized Practice. This stage of the DIDA model was strongly evident in scenario 3, where the MOOC learner is asked to provide a direct response to a faculty client after listening to their goals for the course. In this scenario, the MOOC learner is meeting 1:1 with the faculty client, showing that they are moving from novice-like tasks toward independent and applied tasks. They are presented with a detailed account of the faculty member's goals for course evaluation and are then asked to make a recommendation for a suitable evaluation framework based on their knowledge and experience. MOOC learners are required to engage in authentic problem-solving in a complex design situation.

Stage 4: Reflection and Exploration. This stage of the DIDA model was evident through the post-activities of scenarios 1, 2, and 3, and in the XR-enhanced portions of scenarios 2 and 3. Following each immersive learning activity, MOOC learners were given a chance to reflect on their experience in a digital workbook tool. Most questions were structured to provide opportunities for reflection on what they observed or on how they performed. Some questions were designed to prompt further exploration, following the DIDA model. In scenarios 2 and 3, MOOC learners were given changes to

reflect within the XR-environments themselves. In scenario 3, MOOC learners are encouraged to listen to their recorded response, reflect on its usefulness, and then decide whether to record again. From a technology perspective it is quite possible to provide feedback opportunities, with the ability to pause, add textual prompts, multiple choice questions, and playback options.

While this is an exploratory step at using immersive media to expand the range of educational experiences available to learners, we feel that it is helping us think about and develop ways that we can start to integrate experiential educational opportunities within online learning to impact, in our specific case, LXD education, but professional education more broadly. If we adopt a situated learning perspective and aim for enculturating learners within a new discipline, then we see that immersive media can have promise for providing these situated experiences in virtual settings to give learners some measure of experience that can support them as they learn to be LXDs, all within a MOOC setting that also supports learning about LXD.

Our initial work here is helping us start to see where immersive media becomes a valuable tool and also areas where it needs to be complemented by other tools in order to fully support learners. The DIDA framework is helping us see where immersive media can be a strong support to help learners observe and model new tasks and situations, and to help learners reflect on the activity they are immersed in to guide their further exploration into their professional activity. We see that immersive media can also support contextualized practice, where we can use the media to place learners in a professional context to help them engage with the people, resources, and activities that they are learning. But other times, immersive media alone may not be enough, as in providing tasks with coaching where the media might provide a setting for learners to work in, but the media would need additional support to embed coaching within that context. For example, integrating XR with artificial intelligence can provide some manner of coaching, much in the way that intelligent tutoring systems can scaffold learners with feedback when they are using them to engage in disciplinary activity (e.g., algebra). Furthermore, while we are experimenting with 360° video, we can also explore whether more immersive media that leans more towards virtual and augmented reality can provide realistic with more degrees of freedom for learner activity, all to see whether such media is indeed useful to facilitate “learning to be.”

Our approach outlined here is still exploratory work, and as such, has some conceptual limitations. This is a small study as we reflect on our own designs, and the next strand of work could involve a systematic evaluation into the utility of the immersive media to gauge our design, and to see how to refine these immersive media designs in a design-based research approach (Cobb et al., 2003). So there is still future work to continue to fully evaluate the impact of immersive media in these contexts. However, our design work at this point is helping us to outline specific cases and new directions for using immersive media to take us in a cognitive apprenticeship/situated learning direction at a larger scale. If successful, we hope to expand the scope of experiential education beyond the limited range of in-person internships to broader experiences that can benefit more learners.

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Chris Quintana engages in research that connects education and learning sciences, human-computer interaction, and computer science. He has focused much of his work on software-based scaffolding for middle school science students, including the development of scaffolded software tools, scaffolding frameworks for software, and learner-centered design processes. His recent work includes heading the Zydeco Project, which was funded by the National Science Foundation (NSF) to explore how mobile devices (e.g, smartphones and tablets) and web-based technologies can be integrated to connect science classrooms and museums to expand science learning opportunities. Using Zydeco, Quintana explored the possibilities and challenges of developing learning activities that integrate formal and informal learning environments. Other recent work includes exploring how new media, such as games, extended reality, wearable technology, and online educational approaches can be designed to support learning in a variety of contexts. Dr. Quintana's previous work involved working as a principal investigator in the Center for Highly Interactive Classrooms, Curricula, and Computing in Education (hi-ce), where he worked on several learning technology projects. Quintana led NSF-funded projects focused on developing and assessing software that supports students with different inquiry-based practices, such as the creation of software- based “digital idea-keepers” to support students in analyzing and synthesizing information found in digital libraries to answer science questions. He was on the research team for a project focusing on how media- rich digital texts that follow a “universal design for learning” approach may impact science learning. Other previous projects that Quintana has worked on include the ASSESS project to develop a “scaffolding design framework” to guide developers and researchers of learning technologies, and the Symphony2 project to develop a software framework that could be used to build scaffolded work environments. Aside from developing and researching different types of learner-centered software, Quintana is also interested in design processes and the notion of “design thinking” for education. His design activity informs his courses on the design and assessment of learning technologies, and other work exploring the development of new technology-enhanced learning spaces. Quintana received his BS from the University of Texas at El Paso in Biological Sciences, and his MS and PhD from the University of Michigan in Computer Science and Engineering.

Theory-Driven and Practice Oriented Perspectives on Instructional Design and Learning Experience Design

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Instructional Design | Learning Experience Design | Design Expertise | Design Practice

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In this position paper, I argue that Learning Experience Design (LXD) is not different from Instructional Design (ID) but rather another natural evolution of ID. I make this argument through: (1) exploring the history and theory of Instructional Design and Technology (IDT) discipline, and (2) sharing a reflection on my own career as a learning designer, where I describe my journey toward becoming an experienced and expert learning designer through examples of my design work.

Learning Experience Design: Key Definitions and Meaning

Before I illustrate my position on how I view Learning Experience Design (LXD) as not different from Instructional Design (ID), but rather another natural evolution of the discipline, in this section I provide a brief overview of how LXD is discussed in the LXD literature. The section provides key arguments concerning LXD and its distinct features.

Learning experience design does not appear to have a clear definition, as it is positioned both as a new field and a new phenomenon (Jahnke et al., 2022; Schmidt et al., 2020). At the same time, Jahnke et al. (2022) stress that LXD is not distinct or separate from instructional design (ID), but rather "LXD sits alongside ID and UX [user experience] as a complementary approach to design for learning" (Jahnke et al., 2022, p. 52). An important part of design, LXD is characterized by its design intentionality as it engages the learner in the process of human-centered activities (Jahnke et al., 2022; Jahnke et al., 2020). The distinct feature of LXD is its focus on the learner and their sociocultural context. It is human-centric, and the design process is largely informed by user experience design (UXD) methods (Schmidt & Huang, 2021). In contrast, existing theories and approaches in ID have historically not accounted for actual learners' experiences when they navigate through their learning, specifically in digital learning environments.

LXD draws heavily from other design disciplines, including user experience (UX), user centered design (UCD), and human-computer interaction (HCI). It employs methods that are not widely used in instructional design, as, historically, the instructional design discipline focused predominantly on processes, such as models (Gray, 2020). Such novel methods include creating personas and scenarios, prototyping digital environments for learning, rapid prototyping, paper prototyping, wireframing, card sorting, cognitive walkthroughs, heuristic evaluation, think-aloud user study, and eye tracking (Schmidt et al., 2020). Further, LXD uniquely considers the following three major dimensions when designing worthwhile learning experiences: the social/sociocultural dimension, the technological dimension, and the pedagogical dimension (Jahnke et al., 2020).

In sum, LXD employs novel methods and combines traditions from UXD and HCI to highlight the role of the learner and their experiences when designing web-based or digital learning experiences.

Instructional Design & Learning Experience Design: Are They Different?

In this section, I provide an overview of the major milestones in the instructional design discipline and describe the origin of epistemologically dominant claims about the novelty of LXD.

Change in Instructional Design and Technology is Constant

The discipline of instructional design and technology (IDT) is constantly evolving and experiencing changes in its paradigms and pedagogical approaches. Such changes have also brought new terms. Looking back on key milestones of the development of IDT, we can easily see how the discipline reflected contemporary trends society. As Willis (2011) stressed, “Minds are not isolated thinking machines that operate independently of their context, other minds, and social relationships” (p. 13). IDT is not an exception.

The IDT discipline we are most familiar with today emerged in the form of visual media in the early 1900s in school museums (Molenda, 2022). This was the gateway to the use of creative instructional media and the encouragement of teachers to bring observable, sometimes tangible, objects to assist learning in a new way. Items such as film, photographs, and other visual aids were used to guide learning in exhibits (Molenda, 2022; Reiser, 2012).

Throughout history, there have been many prescriptive instructional design models created by leading scholars in the discipline to assist instructors with developing the best learning approaches for students. Among the many models were the Dick and Carey model, the Pebble-in-the-Pond model, and the ADDIE model (Branch & Merrill, 2012). Although some argue that ADDIE is not a model, it is often taught as a model in IDT programs. Such instructional models, which call for effective and efficient instruction, were developed in light of the need to educate a large and diverse group of individuals in the post-World War II era. For instance, the ADDIE model remains one of today’s most well-known tools across instructional systems technology (IST) and human performance technology (HPT) contexts, as it represents the core elements necessary for both instruction and evaluation (Branch & Merrill, 2012). Along with the instructional design models, over the history of IDT, there have been different instructional design theories, including Robert Gagne's Nine Events of Instruction (Driscoll, 2005) and David Merrill’s First Principles of Instruction (Merrill, 2002).

With advances in communication media, the IDT discipline started witnessing the evolution of means used to deliver instruction, from audio-visual technology to distance education technology. Specifically, the IDT discipline began to focus on distance education in the 21st century as internet technology became more commonplace (Molenda, 2022). This new focus was a response to the need to make education better, more accessible, and more affordable.

Given the developments of educational technology, approaches to designing instruction could not stay the same over time; design approaches need to be responsive to existing realities and learning contexts. For instance, as Molenda (2008) stressed, digital technology enabled instructional designers to create learning environments with the use of verbal and visual media and pedagogies that allow for the integration of problem-solving with collaborative learning. Due to the philosophical shift to constructivism, the discipline changed its orientation toward the design of

environments that facilitate learning and away from prespecified instructional routines (Januszewski & Molenda, 2008). Each period of advances in technology and instructional media results in new educational paradigms as new generations of professionals bring their backgrounds and values into the discipline (Molenda, 2008). With these changes, new terms appear in the discipline and learning experience design is one of them.

In today's realities, which include the ever-changing technological landscape and unprecedented challenges, such as the global COVID-19 pandemic, the IDT discipline cannot remain stagnant. It must not always follow the beaten path (Bonk, 2020; Hodges et al., 2020; Lachheb et al., in press). Instead, what is required is a flexible designer mindset (Boling et al., 2022), which implies a repertoire of design approaches and practices to make the design process and outcome more intentional and purposeful. The designer mindset entails the ability to use flexible thinking through framing and judgment-building processes. It also encompasses the use of design tools (Stolterman et al., 2008), the consideration of ethics in the design process (Moore & Tillberg-Webb, 2023), and the harnessing of design failure in the design process to explore new design possibilities (Lachheb, 2020). This flexible thinking, resourcefulness, and problem-solving (Tracey et al., 2022; Yanchar et al., 2010) allow designers to navigate through complex design situations.

As part of this design process, it is undoubtedly important to think through possible experiences that learners might have along the way. This might sound similar to identifying learning target audience and learning context as prescribed in the Dick and Carey model (Dick et al., 2014). However, as reported by learning experience designers themselves, this process goes deeper into the analysis of learner persona and identity as part of designing with diversity, equity, and inclusion in mind (Lachheb & Quintana, 2021). The IDT discipline remains open to innovative design approaches, both theoretical and practical, to create learning experiences that cater to diverse learners. I assert that the term "learning experience design" emerged in response to the need to design for diverse audiences, specifically when it comes to digital learning experiences. Unlike other approaches to instructional design, LXD places greater emphasis on designing with equity, diversity, and inclusion in mind to better tailor to learners' unique experiences and identities. The purpose of designing such learning is to help learners better identify with their learning experiences and engage with learning on a deeper level. Thus, it can be argued that LXD is a result of the natural evolution of the IDT discipline and came into existence to fulfill the demand for scholars and practitioners to research and design meaningful learning today.

Learning Experience Design: What Does it Mean to Me as a Learning Designer?

I appreciate the perspective that above several LXD-oriented scholars offer, arguing that LXD can be viewed as more comprehensive and novel in comparison with ID. However, I resonate with the idea that LXD is an evolution of ID, especially when it comes to designing learning experiences in technology-enhanced (e.g., virtual reality and augmented reality) and digital environments. Nevertheless, I find certain arguments about LXD not to be unique to it as their origins can be traced back to instructional design.

First, the major claim of LXD is that it centers the learner during every step of the design process and at every stage of the design decision-making process. ID appears to make a similar, if not identical, claim, as evident in several instructional design theories (e.g., Reigeluth & Carr-Chellman, 2009). It appears in major design principles and theories that are meant to guide the design of learning experience (e.g., Keller's (1987) motivational theory). It also appears in the theoretical foundation of instructional design, such as Edgar Dale's (1946) influential textbook in which he expanded the idea of audiovisual instruction and proposed the idea of the Cone of Experience: learning experiences that range from direct/psychomotor experiences to vicarious/cognitive and affective with the use of visual media could be "arrayed in a continuum from concrete to abstract, and each type has a role to play" (Molenda, 2022). Parrish (2009) stated that designing instruction calls for a holistic approach to design learning experiences. Learning experiences include emotional, social, cultural, political, and aesthetic qualities/dimensions.

Second, one cannot refute the argument that ID historically focuses on processes, such as instructional design models for example (Gray, 2020; Boling & Gray, 2014), grounded in the principles of cognitive psychology that prescribe guidelines, best practices, and rules to follow. However, the formulaic nature of such models has been discussed and

critiqued by different scholars in the discipline (Boling & Gray, 2014; Lachheb & Boling, 2018; Smith & Boling, 2009; Yanchar et al., 2010) who emphasized that strictly following prescribed steps can result in ignoring the learner and the uniqueness of their learning context. Thus, different authors in the ID discipline suggest taking a wide perspective on learning design that calls for going beyond prescribed steps and best practices (Smith & Boling, 2009; Yanchar et al., 2010). Therefore, the argument that only LXD takes a holistic approach to design and considers the learner in their sociocultural contexts at every stage of the design process appears to have insufficient evidence.

Third, LXD, as claimed by Jahnke et al. (2022), considers three important dimensions when designing for effective learning experiences in digital environments: the social/sociocultural, the technological, and the pedagogical. Arguably, needs analysis that is traditionally used in ID does not target or consider the same dimensions. However, I argue that the purpose of needs analysis and assessment (Sleezer & Russ-Eft, 2009; Stefaniak et al., 2015; Stefaniak & Sentz, 2020) is to also consider the above dimensions, whether for face-to-face or online learning. Depending on how well a needs analysis and assessment is conducted, it may yield the information related to the listed dimensions about the learner.

LXD literature claims that LXD encompasses perspectives and approaches that are novel and more comprehensive than ones that have traditionally been used in ID and subtly implies that LXD is a better and more well-thought-out approach to designing learning experiences. My argument is that LXD approaches, methods, and claims are easy to follow and employ once a designer gains a high level of expertise that allows them to view their design work holistically and gives them the ability to reach out to neighboring design disciplines and use their methods (e.g., personas from HCI). I claim that LXD, at its core, does not differ from ID but rather represents a certain level of expertise and knowledge that a learning designer has accumulated.

This growth is not necessarily inevitable, but it can be experienced by every designer. It is possible to have years of experience that do not enrich a higher level of expertise because of staying comfortable in using one's current methods, practices, and approaches and refusing to evolve. As I have personally experienced, growth in expertise is the result of intentionally reflecting on one's work and gaining knowledge by staying abreast of new developments in the discipline. As Cross (2004) stressed, design expertise is not solely a matter of having design skills, abilities, or talent but is also the outcome of dedicated application and advancement of design knowledge in a specific design discipline.

Based on Dreyfus's skill-based model, there are six distinct levels of design expertise: (1) novice, (2) advanced beginner, (3) competent, (4) expert, (5) master, and (6) visionary (Dorst & Reymen, 2004; Lawson & Dorst, 2013). What distinguishes a novice designer from an expert (or a master or visionary) is the approach they use when working on a design problem. According to Cross (2004), a novice designer tends to approach a design problem by sequentially identifying and exploring design solutions in depth. In contrast, master designers employ a top-down approach, looking at the big picture first. Expert designers use strategies that novice designers might not yet possess. Additionally, expert designers possess richer design precedent knowledge, which allows them to explore multiple solutions. As part of their design knowledge, expert designers possess a more extensive repertoire of skills and experiences, or "gambits," (Lawson, 2004) through which they can approach a design problem on a deeper level. Therefore, it is safe to assert that the term "learning experience design" and the title "learning experience designer" are heavily tied to a high level of learning design expertise. Learning designers with more expertise are able to approach learning design situations from multiple perspectives.

Because a learner's experience is so multifaceted, LXD requires a holistic view that considers three different domains (cognitive, psychomotor, and affective). To create positive and effective learning experiences, it is crucial to employ methods not only from instructional design but also from other design disciplines. Such methods include personas, rapid prototypes, mock-ups, and user/learner testing to identify areas for design iterations.

In the next part of the paper, I present concrete examples of how growing expertise allows a designer to create more authentic and meaningful learning experiences. As a learning designer myself, I use this section to introduce my design work and philosophy. The purpose of this section is to illustrate how a person's approach to designing can mature over

time and result in more meaningful and authentic learning experiences, regardless of whether one has the official title of Learning Experience Designer.

Positionality Statement: My Design Philosophy

Prior to showcasing certain design examples, I discuss the core values that guide my design work. As a learning designer, I subscribe to the idea that instructional design belongs to the family of design disciplines (Gibbons, 2013; Parrish, 2009). As such, learning design should address unique problems, serve a purpose, and be service oriented. Regarding design outcome, there is no such thing as a perfect design; there will always be room for improvement. A design will continue evolving over time, which makes the design ultimate. Therefore, design can be described as the ultimate particular (Nelson & Stolterman, 2014). Attempts to strictly apply existing instructional design models to a given design situation can result in ignoring the uniqueness of that design situation and designing stereotypical ways of learning (Gibbons et al., 2014).

My overall design philosophy foregrounds four main elements: meaningfulness, purpose, consistency, and appeal. Meaningfulness should manifest itself in the design of learning activities and assessments that are relatable to students on professional and/or personal levels. Relatedly, instructional designers should design learning experiences for a specific purpose, and learners should see the purpose of their learning. The third element of my design philosophy is consistency, which manifests itself in instructional design through alignment, such as the alignment of technology, instructional materials, and assessments with learning outcomes. Learners should feel that their activities are connected with each other and that nothing seems random or arbitrary in their learning process; the design creates an organic whole. The fourth element is appeal, which means that components of the learning experience, such as learning materials and content, should be well presented to learners.

Design Narrative: Learning Experience Design as a High Level of Expertise

By 2023, I had accumulated 12 years as a professional in the IDT discipline in diverse contexts, mainly in higher education settings. I have had the opportunity to design a wide range of learning experiences, including face-to-face courses, blended courses, and fully online courses, as well as onboarding and professional development face-to-face and online training. In 2022, I obtained my Ph.D. in Instructional Systems Technology from Indiana University Bloomington, where I was trained to be a scholar, an educator, and a designer, through coursework, professional experiences, mentorship, and minoring outside of education majors—minoring in Human Computer-Interaction and Design (HCI/d) at the IU School of Informatics.

The Design of the Design Narrative

This professional experience in the IDT discipline of instructional design and technologies allowed me to have knowledge of both in situ design practice and a scholarly understanding of design practice—a scholar-practitioner design knowledge that is theory-driven and practice-oriented. I believe this kind of knowledge is important to share and learn from as it is valuable to inform (and why not guide) educators' practices, scholars' work, and fellow colleagues in the professional practice of learning design.

To access this knowledge and share it in this scholarly position paper, I drew upon autoethnographic approaches to qualitative inquiry (Ellis, 2004; Ellis et al., 2011), to gain inspiration on how to write this paper. I did not restrict myself to a specific methodological process to keep my authentic voice. The inspiration for autoethnographic approaches came from a few examples of autoethnographic research in IDT literature (Boling, 2016; McDonald et al., 2022). Additionally, I provide three different short design cases that capture my growth as a learning designer. Doing so allowed me to describe and analyze my personal experience in my respective professional settings to support my aforementioned claims in support of my position.

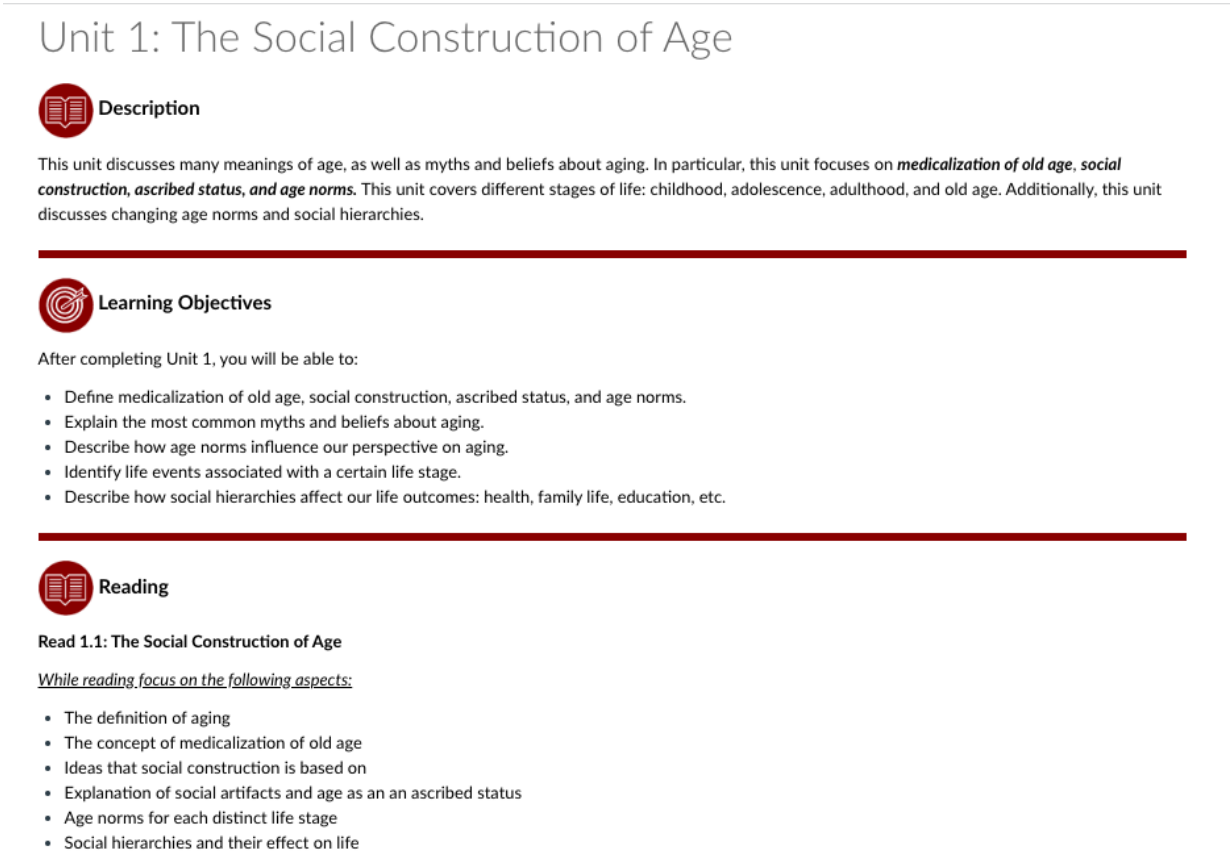
Example 1: Designing an Online Academic Course

At the beginning of my journey as a learning designer, I mostly designed academic courses. This offered a well-defined design space since the structure of the course was easy to identify as the course spanned a semester. The learning objectives of the courses were also clearly formulated, as they were tied to specific professional competencies. My key purposes were to ensure alignment with learning objectives and assessments, update learning content with affordable open educational resources, and make assignments more hands-on and practice oriented. Therefore, the design process simply entailed thoroughly thinking through each step and sequentially moving from one design step to the next, such as formulating learning objectives first and then checking for alignment.

At that point in my career, I believed that having such a structure in the design process guaranteed that learners would enjoy the course. There is no doubt that identifying key milestones in the design process and outlining next design steps and moves is crucial, but with more years of experience and as my expertise grew, I realized that it involves a more intense thinking process. As a manifestation of my design approach and process at that time, the courses that I designed were presented in a structured and linear way (see Figure 1).

Figure 1

Example of a Page Structure of an Online Course



Using Dreyfus' skill-based model (Dorst & Reymen, 2004; Lawson & Dorst, 2013), I would consider myself at that stage in my career as a novice, slowly becoming a competent designer. Like a novice, at that time I treated the goals and objectives of a design project as if they were given to me by the experts (a lead learning designer and a supervisor) and strictly followed the prescribed steps. I would carefully follow a suggested instructional design model to complete a

project. Yet, like a competent designer, I started paying closer attention to the contextual nuances of each design project. I began to focus on the goals of the course and learners rather than only following the prescribed steps. However, I still needed guidance from expert designers in situations in which I had no previous knowledge or experience, such as a designing completely new course or employing a new format.

Eventually, I realized that ensuring the alignment of learning objectives with assessments is not enough to ensure a positive learning experience. Over time I gained more knowledge about design as a discipline and dove deeper into mapping learner experiences and learner analysis. The next time I worked on the above-mentioned course, I used a different design method with four new techniques (Abramenka-Lachheb, 2022). First, I created a learner persona, which helped me as a designer better analyze key characteristics of learners (e.g., demographic, career aspirations, identity) who would typically take this course and those who would usually not take this course. Second, I employed learning experiences mapping (Buchenau & Suri, 2000; Kalbach, 2020), which included brainstorming and deliberation sessions with a faculty member regarding the experience that learners/students would have. I asked: What could be confusing? What could be too easy to complete? What would resonate with them better on both professional and personal levels? Third, I designed authentic learning projects that would ask students to apply competencies that they were supposed to acquire to a real-life project. Fourth, I created a rapid prototype of the course site, which allowed for testing and identifying areas for design iterations and improvement.

It was a more time- and thought-intensive design process, but, as was reported by learners/students, it ultimately resulted in more meaningful learning for them. I believe that I progressed from the novice designer level to the competent designer level as I engaged in this new design process. A competent designer identifies the most important issues in each design situation and devises an appropriate plan to solve that problem. Based on the analysis of student feedback, the problem in this example was that the course lacked opportunities for students to apply knowledge and skills that would mirror what professionals did in the real world. This realization led us to incorporate a real-life authentic learning project, providing students with the opportunity they desired.

My other two examples are about designing online trainings. The first online training I designed onboarded new staff members at an Assistive Technology and Accessibility Center at a large midwestern university. I designed the other training for postdoctoral fellows and faculty members who desired to learn more about using mathematical methods for conducting research. In both cases, I was not familiar with the subject matter, and both were new design situations for me.

Example 2: Designing an Online Training for New Staff Members

The training was originally designed for new alternate media editors whose job was to create accessible learning materials for students with special needs. My role as a learning designer was to create a self-paced online training that would walk learners through the major steps in creating accessible learning materials. The training targeted both declarative knowledge (i.e., knowledge about assistive technology) and procedural knowledge (i.e., how to prepare and create accessible learning materials), although the focus was on the latter.

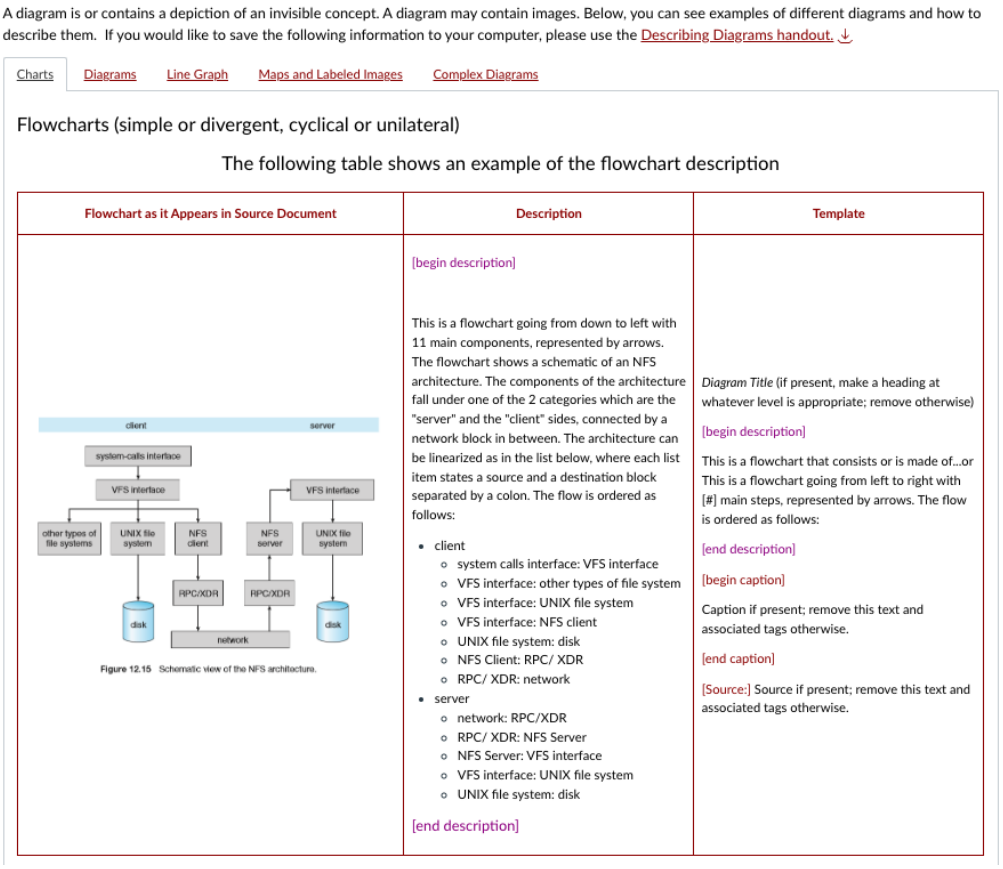
As I had never worked as an alternate media editor, my first task was to gather as much information about the role of alternate media editors. To do so, I had meetings with current alternate media editors and their supervisor to ask questions about the nature and most challenging aspects of their jobs. This information helped me prepare a detailed design outline document that served as my road map during the design process. Prior to starting to design the course, I had follow-up meetings with both the staff and their supervisor. In these meetings, to research the experience of learners (e.g., identify what type of information to include and, most importantly, how to best present it) (Kalbach, 2020), I asked scenario questions, like: *If you were on this course site, what else would you like to see? If you did not know how to describe this type of visual, how could this type of training help you? Once on this particular page, what would you click first to proceed? What makes an intuitive sense to you?* Such scenario questions allowed me to gain a stronger understanding of their work and build empathy with them.

This led me to building the “experience prototype” (Buchenau & Suri, 2000, p. 424) of the course site, which I showcased to the existing media editors. What made it an “experience prototype” was its emphasis on the experiential aspects of

the course site/system. For instance, I made sure to clearly show the structure of the course, navigation, materials to be included, and how they would be represented—all the elements that appeared to be crucial according to what the existing media editors and their supervisors had shared. This allowed me to validate my design decision to include short video demonstrations and step-by-step instructions, coupled with handouts that new staff could print out and keep at their desks. As the training mostly focused on procedural types of knowledge, I heavily relied on visual aspects of the course, such as clear examples of the materials that new alternate media editors would make accessible (see Figure 2).

Figure 2

Example of a Page Showing the Use of Visuals with Instructions



A diagram is or contains a depiction of an invisible concept. A diagram may contain images. Below, you can see examples of different diagrams and how to describe them. If you would like to save the following information to your computer, please use the Describing Diagrams handout.

Charts | Diagrams | Line Graph | Maps and Labeled Images | Complex Diagrams

Flowcharts (simple or divergent, cyclical or unilateral)

The following table shows an example of the flowchart description

Flowchart as it Appears in Source Document	Description	Template

Figure 12.15 Schematic view of the NFS architecture.	[begin description]
	
	This is a flowchart going from down to left with 11 main components, represented by arrows. The flowchart shows a schematic of an NFS architecture. The components of the architecture fall under one of the 2 categories which are the "server" and the "client" sides, connected by a network block in between. The architecture can be linearized as in the list below, where each list item states a source and a destination block separated by a colon. The flow is ordered as follows:
	• client
	  ◦ system calls interface: VFS interface
	  ◦ VFS interface: other types of file system
	  ◦ VFS interface: UNIX file system
	  ◦ VFS interface: NFS client
	  ◦ UNIX file system: disk
	  ◦ NFS Client: RPC/ XDR
	  ◦ RPC/ XDR: network
	• server
	  ◦ network: RPC/XDR
	  ◦ RPC/ XDR: NFS Server
	  ◦ NFS Server: VFS interface
	  ◦ VFS interface: UNIX file system
	  ◦ UNIX file system: disk
	
	[end description]
		Diagram Title (if present, make a heading at whatever level is appropriate; remove otherwise)
		[begin description]
		This is a flowchart that consists or is made of...or This is a flowchart going from left to right with [#] main steps, represented by arrows. The flow is ordered as follows:
		[end description]
		[begin caption]
		Caption if present; remove this text and associated tags otherwise.
		[end caption]
		[Source:] Source if present; remove this text and associated tags otherwise.

The experience prototype also helped me identify how to make this learning experience more relatable. For instance, existing media editors helped me create the narrations, and they specifically mentioned confusing and challenging aspects of the work. Their personal stories emotionally engaged new media editors by reassuring them that a specific task was challenging for everyone, not just them, and simply would require more practice.

My career-long habit of reflecting on my practice as a designer and thinking through methods that could serve me well in a specific design situation led me to follow this method. By advancing my knowledge about design methods and gaining more experience designing different types of learning, I arrived at the conclusion that I should go beyond prescribed instructional design procedures and theories in my design work.

Example 3: Designing an Online Training for Postdoctoral Fellows and Faculty Members

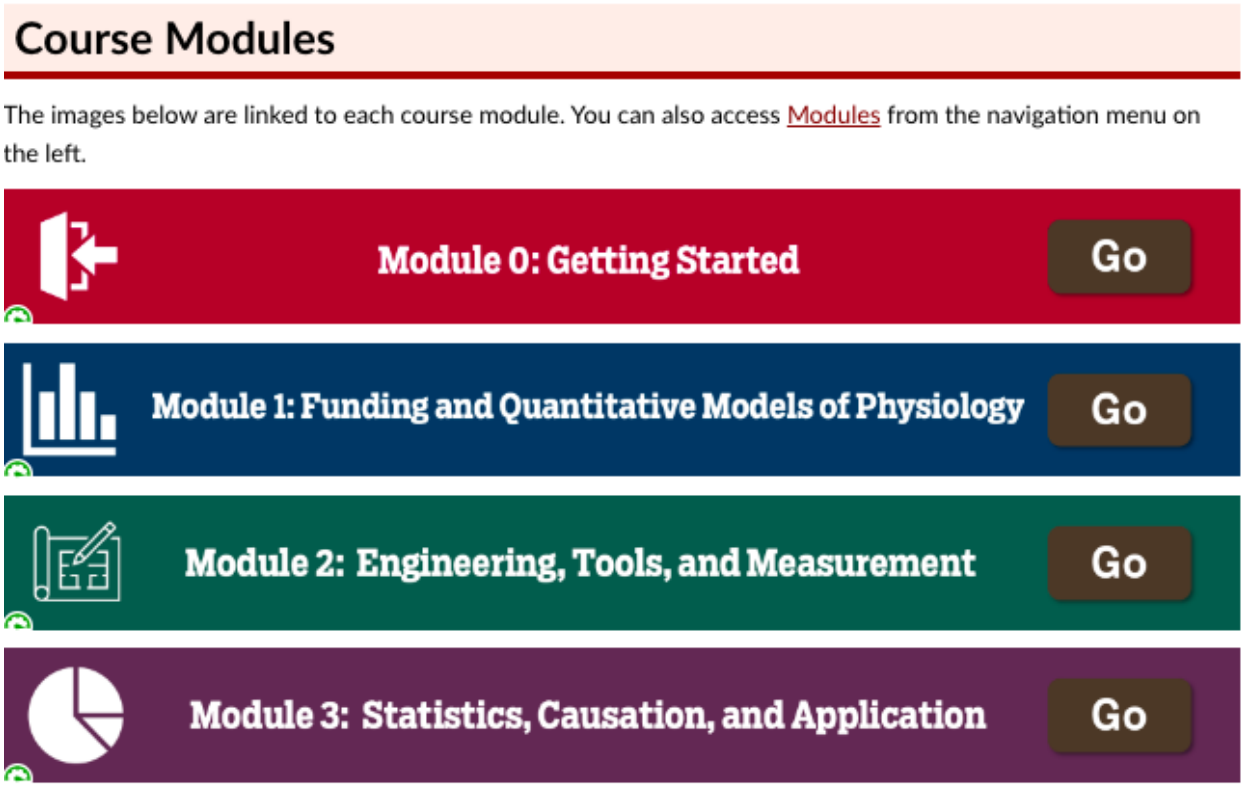
My third example is an online training that I designed for postdoctoral fellows and faculty members who aimed to apply mathematical principles in conducting research in the area of nutrition and obesity. As opposed to the second training, I worked on the design of this training in tandem with other faculty members. Their role was to curate reading resources and coordinate guest lectures with experts in the subject matter. My role as a learning designer was to “orchestrate” experience (Risdon & Quattlebaum, 2018), which meant that I was responsible for making this course engaging, interactive, and responsive.

First, I looked at examples of training courses that were offered before. This expanded my repertoire of design exemplars (Bardzell, 2011) and allowed me to use them as a starting point. While going through these exemplars, I carefully examined the design elements that fostered or failed to foster engagement. I also paid close attention to the look and feel of the training course sites. This allowed me to imagine what this training course could look like. Next, I asked the faculty members specific questions about the type of learners enrolled in the training to ensure accessibility of learning materials and resources to diverse groups of learners. Since learners answered questions regarding their physical location, special accommodations, occupation, and career aspirations, upon registration, I learned that we had learners who took this training outside the United States. This information was crucial to ensure intentionality and purposefulness in my design.

Consequently, I created a clear and consistent layout throughout the course site to help learners go through the training seamlessly. I focused on visual elements that were necessary to see different sections of the training and ensure ease of navigation. While aesthetics is one of the most important aspects of fostering emotions (Pine et al., 1999) when designing for learning experiences, I used visuals only for functional purposes. Rather than including a variety of decorative images, I only included those that were helpful in navigating the training (see Figure 3). That was the engagement piece that I found lacking in the training examples.

Figure 3

Example of the Use of Visuals for Navigation



To help ensure that learners were engaged with the material, I included clear descriptions of each session and provided easy-to-use navigation elements that allowed learners to go to the topic of their interest. My role was to create a learning environment that was aesthetically pleasing, functional, and informational.

As I continued to expand my experience working on different types of learning design projects, I saw myself grow from the competent designer level to the expert designer level. The expert level is characterized by the designer's ability to respond to a specific situation intuitively and immediately take the appropriate action. While working on the project described above, most design decisions, like placing a focus on visual elements and including additional navigation elements, came almost entirely from my precedent knowledge (Boling, 2021) – a repertoire of design knowledge, professional and personal experiences stored in my mind in the form of cognitive schema. It is also worthwhile to note that while as designers we have a variety of methods at our disposal, there is always room for design judgments (Boling et al., 2017; Nelson & Stolterman, 2014) that are unique to every designer and instrumental during the design process.

The expert level is a comfortable level, and many professionals do not go beyond this point of expertise (Dorst & Reymen, 2004; Lawson & Dorst, 2013). In my current professional practice, I design training and workshops, primarily for online higher education staff development and training. Because of my academic training and passion for the IDT discipline, I continue to engage in (award-winning) research and teaching, as well as independent consulting. This makes me operate from a master level of design expertise, as Lawson & Dorst (2013) explain:

> *The master sees the standard ways of working that experienced professionals use not as natural but as contingent. A master displays a deeper involvement into the professional field as a whole, dwelling on successes and failures. This attitude requires an acute sense of context and openness to subtle cues. (p. 99)*

Conclusion

The Instructional Design and Technology (IDT) discipline has undergone changes in its pedagogical and design approaches since its inception. These changes have reflected changes in the way we view learning and ways to make it more efficient and effective. As time passes, new professionals enter the discipline, bringing their own core beliefs, values, and perspectives. This naturally results in new theories, terms, philosophies, paradigms, and practices. Additionally, technology is ever-evolving, so the IDT discipline naturally cannot stay the same. Using the same approaches would cause IDT to become obsolete and irrelevant. Therefore, a mere focus on efficacy and efficiency, or cognitive or psychomotor domains, is no longer the only way to ensure quality of learning.

In IDT, the word "experience" allows us to think beyond mere acquisition of knowledge and skills. This deeper understanding of learning experience comes with a certain level of expertise, which is a result of dedicated efforts and practice in a design discipline. The provided examples in this paper illustrate that Learning Experience Design (LXD) does not necessarily deviate from the canon of Instructional Design (ID) in an attempt to create quality learning experiences but rather raises ID to a higher level. As design situations become increasingly complex, they call for more complex solutions, which require a diverse design skillset. The IDT discipline will likely witness the emergence of new theories, approaches, and practices as technology continues to advance and/or challenging situations occur (e.g., pandemics, wars, and acts of nature). As such, IDT scholars and practitioners should work hand in hand to analyze complex, ill-structured design situations and/or problems in which prescriptive design models cannot provide necessary guidance (Tracey et al., 2022; Yanchar et al., 2010). This may open more avenues for mutual exchange between research and practice to inform each other; as research serves practice, practice may unveil new areas of research.

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Exploring the Relationship Between Usability and Cognitive Load in Data Science Education

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Scaffolding | Computational Thinking | Learning Experience Design | Cognitive Load Theory | Data Science Education

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This study explores how an aspect of learning experience design (usability) correlated with the learning process as individuals engaged in block coding. Although there were no differences when scaffolded with blocks or no blocks coding condition, the study found weak to moderate correlations with usability and factors of cognitive load (intrinsic, germane, extraneous). Whereas learning experience design literature is often approached from an evaluation perspective, the empirical data suggests learning experience design may be correlated with in situ elements of learning.

Introduction

The United States federal strategic plan notes that STEM education is a critical component of the country's immediate and future goals (Bottia et al., 2021; Fernandez et al., 2022). Not only does STEM support global competitiveness, but STEM education is also important for equity among all learners. One response has focused on a more holistic view of STEM, which integrates skills such as computational thinking and data science as learners resolve contextualized cases. For example, a student might employ data science to measure expected rainfall within a region. Another case might ask learners to explore clusters of mammals to investigate the importance of biodiversity. In doing so, data science requires learners to engage aspects of statistics, programming, and machine learning as part of their STEM learning experience.

As this integrated view of STEM has grown, there has been an increased emphasis on learning environments that make data science education more accessible to a wider array of learners. It follows that interactions within these learning environments and learning experience design (LXD) are therefore a key component of the design of STEM learning tools designed for these skillets. However, few studies have explicated the extent to which LXD aligns with key aspects of the learning process, such as cognitive load. Given this gap, the article first begins by exploring the growth of data science education. Second, we describe the importance of interactions within data science education and the importance of

LXD. Specifically, the literature review explores how the field of learning design has evolved from exploring usability as an aspect of evaluation towards a more comprehensive and holistic view of LXD, along with proposed definitions as the field seeks to understand the LXD phenomenon. We then present a study that looks at LXD and its relationship with cognitive load factors (intrinsic, germane, and extraneous) and conceptual knowledge (test scores). Finally, we conclude with a discussion and implications for data science learning, interactions with complex learning tools, and LXD.

Literature Review

Data science is an interdisciplinary field that combines aspects of statistics, machine learning, and computer science in order to analyze data. While data science as a field arguably dates back at least 20 years (e.g., with the journal *Data Mining and Knowledge Discovery*) and research on computer science education and statistics education goes back decades more, the confluence of skills and knowledge that come together in the modern definition of data science has received little attention. This lack of understanding of how data science is learned is perhaps due to the interdisciplinary nature of data science, the current science of learning research emphasis on K-12, and the recent emergence of the label "data science."

Learning data science appears to be particularly challenging in large part due to the deep prerequisites in statistics, programming, and machine learning. As such, 89% of U.S. degree programs in data science are graduate programs (Swanstrom, 2020). Data scientists are not using degree programs for the bulk of their training as indicated by a recent survey (Kaggle, 2021). Rather the majority of data scientists are learning on the job by participating in data science competitions, taking online courses, and via informal learning resources (Kaggle, 2021). The current state of data science education and learning presents both opportunities and challenges for the science of learning data science.

Prior work in computer science education suggests several instructional supports that may be applicable, but they have never been applied to learning data science. One way to understand the need for learner support is through the lens of cognitive load theory, which suggests that individual's have limited cognitive capacity as they process information via their working memory (Sweller, 2020). The theory further posits that the load consists of three factors - intrinsic cognitive load (ICL), germane cognitive load (GCL), and extraneous cognitive load (ECL). Intrinsic cognitive load is defined as the natural complexity of the information and is often considered fixed based and largely dependent on the inherent element interactivity (Klepsch et al., 2017). Low element interactivity allows individuals to learn a concept with minimal reference to other elements, which results in low working memory. Alternatively, high element interactivity results in a large strain on working memory because it requires elements to be learned in conjunction as they impact one another. Whereas intrinsic cognitive load is often dependent on the characteristics of the material, germane cognitive load is focused on schema acquisition as it directs working memory resources that are triggered by the design of learning resources. Lastly, extraneous cognitive load is described at the strain of working memory that distracts from the learning process (e.g., flashing words, distracting words) (Skulmowski & Xu, 2022). Therefore, a "decrease in extraneous cognitive load results in an increase in germane cognitive load as working memory resources are switched from elements associated with extraneous to elements associated with intrinsic cognitive load" (Sweller, 2010, p. 126).

There have been considerable efforts to support cognitive load as learners engage in computational thinking and data science education. For example, worked examples are a well-known pedagogical approach that benefits problem-solving learning and cognitive load in fields like mathematics, programming, and physics (Atkinson et al., 2000; Pashler et al., 2007). Minimally, a worked example is a problem solution that shows each worked step (Clark et al., 2011). Learners studying worked examples must induce, or self-explain, the missing reasons for each step (Chi et al., 1989, 1994; Nokes et al., 2011). In other words, learners must self-explain why each step is desirable (the latent goal structure of the problem) and why each step is permissible (the epistemic justification of the step). Various approaches for transitioning students to independent problem-solving have been investigated within education, including interleaving worked examples with problem-solving (Sweller & Cooper, 1985) and converting worked examples to problem-solving at the step level (Atkinson et al., 2003).

Another pedagogical approach, graphical programming languages (Cunniff et al., 1986), has seen recent wide adoption for teaching introductory programming in the form of blocks languages (Bau et al., 2017; Resnick et al., 2009). Blocks languages compose code elements via irregularly shaped graphical widgets. Their design typically makes syntactic mistakes impossible because the widgets cannot fit together in non-syntactic ways. Because blocks are visually browsable on an interface palette, students need only recognize them rather than the more difficult task of recalling code. Research suggests blocks languages appear to have multiple positive effects on learning, including both cognitive and motivational effects, in introductory undergraduate courses. For example, Armoni et al. (2015) found that an introductory course using a blocks language resulted in increased motivation and future enrollment in advanced computer science classes. Comparable effects have also been found for at-risk students using blocks languages, such that the blocks-based approach led to equivalent or greater retention and motivation outcomes for at-risk students than non-at-risk students (Moskal et al., 2004). While Armoni et al. (2015) found no difference in grades between students who previously took a blocks-based course and those who did not, another study found that a blended blocks/Java instructional method increased test scores by approximately a letter grade (Dann et al., 2012). These studies suggest that blocks may be an effective way to foster computational thinking and data science skills within STEM education.

Usability, UX, and Learning Experience Design

Given that data science is reliant on learning technologies to perform tasks, it follows that interaction is a key element of learning experience design. This multifaceted phenomenon includes aspects including usability and other interactions individuals engage in as they interact with the learning environment. In disciplines outside of education, a component of user-experience literature includes usability, which describes the efficiency by which users are able to use the features of the system. Although approaches may vary, studies have begun to empirically validate how interaction is an important aspect of learning technologies. In early stage research, Lohr et al. (2003) found that usability testing identified areas of refinement and specific features that were needed. Similarly, Lim et al. (2012) detailed how learners utilized an interactive textbook and credited usability testing for suggesting ways the interface could support self-directed learning and cognitive load management. Findings suggest key interface design and interaction considerations in terms of learnability, efficiency, effectiveness, and satisfaction. Rather than a distinct evaluation phase at the end of the design cycle, Lim and colleagues (2012) especially highlighted the highly iterative nature of usability testing and referenced its importance throughout the development process. In line with these findings, Schmidt and Glaser (2021) detailed how usability testing provided data as to the effectiveness, efficiency and appeal of a learning technology. Beyond the traditional views of evaluation, they underscored the need for usability testing to be inclusive of diverse demographics given their unique needs. Whereas design has often been approached from a learning theory perspective, the literature highlights how evaluation of user interaction data is a key component of the design process for diverse learning groups.

The literature on LXD within learning technologies has traditionally focused on data collection techniques (e.g., eye tracking) used by learning designers. However, the data denoting the importance of LX has been detailed as subconstructs within other theoretical frameworks. For example, the unified theory of acceptance and use of technology (UTAUT) describes a construct of effort expectancy (Marchewka et al., 2007), which takes into account how key elements of usability impact technology adoption. Other literature illustrates how extraneous cognitive load in the form of poor navigation and usability can strain working memory, which ultimately deters the learning process (Novak et al., 2018). A more comprehensive view of LXD is needed because it not only focuses on traditional cognitive or affective learning outcomes, but it considers how to design for the overall learning experience and the technology interactions that drive the goal-directed behavior.

As interest in LXD has emerged, theorists (e.g., Clark, 2022) have recently provided various definitions to provide clarity around the phenomenon of LXD. For example, Chang and Kuwata (2020) describe it as a "practice of designing learning as a human-centered experience leading to a desired goal," which merges design practice with the learner role. Yet others provide a broader view, especially considering the broader socio-technical context in which LXD takes place (Gray, 2020; Jahnke et al., 2020). More recently, data has also emerged to provide clarity on the elements inherent within LXD. Tawfik et al. (2022) employed a grounded theory to empirically describe LXD in terms of two complementary facets: *interaction with the learning space* (engagement with the modality of content, dynamic interaction, the perceived

value of technology features to support learning, scaffolding) and *interaction with the learning environment* (customization, expectation of content placement, functionality of component parts, interface terms aligned with existing mental models, navigation). In doing so, their framework extends beyond theory as the data details unique interactions that are collectively part of the learning experience. When compared with the case study approaches, Schmidt and Huang (2022) surveyed the literature and described LXD as "human-centered, goal-oriented, theoretically-grounded, and interdisciplinary" (p. 149). Collectively, the aforementioned articles suggest emerging theory and empirical support as the field looks to apply LXD in the design of learning technologies.

Research Questions

Novak et al. (2018) argue that "Despite a growing body of research in the area of digital learning and information processing, the literature on how people process and interact with information on electronic devices and computers is still very scarce" (p. 151). To better understand its impact, more empirical data is needed to understand how interactions play a role as learners engage with technology. A number of qualitative studies have provided insights into the UX or user perceptions (Carey & Stefaniak, 2018), but they may be limited to describing the extent of the relationship between these aspects of design. While quantitative studies have been published, these are often in the form of descriptive statistics or from a technology acceptance perspective. Based on this gap, we proffer the following research questions:

1. To what degree are *learning outcomes* different when supported with a blocks or no blocks approach to data science?
    a. To what degree is *conceptual knowledge* different when supported with a blocks or no blocks approach to data science?
    b. To what degree are the three factors of *cognitive load* (i.e., intrinsic, germane, extraneous) different when supported with a blocks or no blocks approach to data science?
2. To what degree is *learning experience design* correlated with factors of cognitive load (intrinsic, germane, extraneous)?
3. To what degree is *learning experience design* correlated with aspects of *conceptual knowledge* of computational thinking?

Methodology

The study was part of a larger set of design-based research that explores specific learning supports that support data science education.

Participants

All participants were recruited from the psychology subject pool of a large urban university in the southeastern United States (*n*=59). Participants were compensated with course credit or extra credit, depending on the psychology courses in which they were enrolled.

Materials

Learning Environment

Research on worked examples and blocks programming in prerequisite areas of data science suggest that these instructional supports could be integrated into a single design for learning data science. In our recent work, we have reified these supports inside JupyterLab computational notebooks, which are the most popular platform for professional data scientists (Kaggle, 2021). JupyterLab computational notebooks combine narrative, executable code, and rich media like interactive plots, allowing analyses to be shared and reproduced by other data scientists. As such, they are naturally occurring worked examples. We have added blocks-based programming to JupyterLab using its extension framework, such that naive users can connect blocks to solve a data science problem, click a button to

convert those blocks to Python code, and execute that code in JupyterLab as usual (Olney & Fleming, 2021). We have created over 100 hours of data science training materials using this approach and have run an 8-week data science internship open to all majors (Payne et al., 2021) for the past 3 years.

Two training videos were used in different experimental conditions: a video on how to use the computational notebook interface (JupyterLab) using code only and a video on how to use the Jupyter interface using blocks. The videos were carefully constructed to cover the same content except for the blocks/code component. Four Jupyter notebooks were used with variations based on experimental condition: a didactic worked example notebook that demonstrated solution steps using video (WE), a problem-solving notebook requiring near transfer to the worked example without demonstrated steps (NEAR1), a second near transfer problem-solving notebook (NEAR2), a far transfer problem-solving notebook (FAR), and an even further transfer problem-solving notebook (FAR+). An example of this level of problem solving transfer for filtering rows in a data frame based on a value in a column would be, WE: x < 7, NEAR: x < 10, FAR: x > 5, FAR+: x = "Smoking" (i.e., changing the value alone is near transfer, reversing the inequality is far transfer, and changing the operator and data type is further transfer).

Instruments

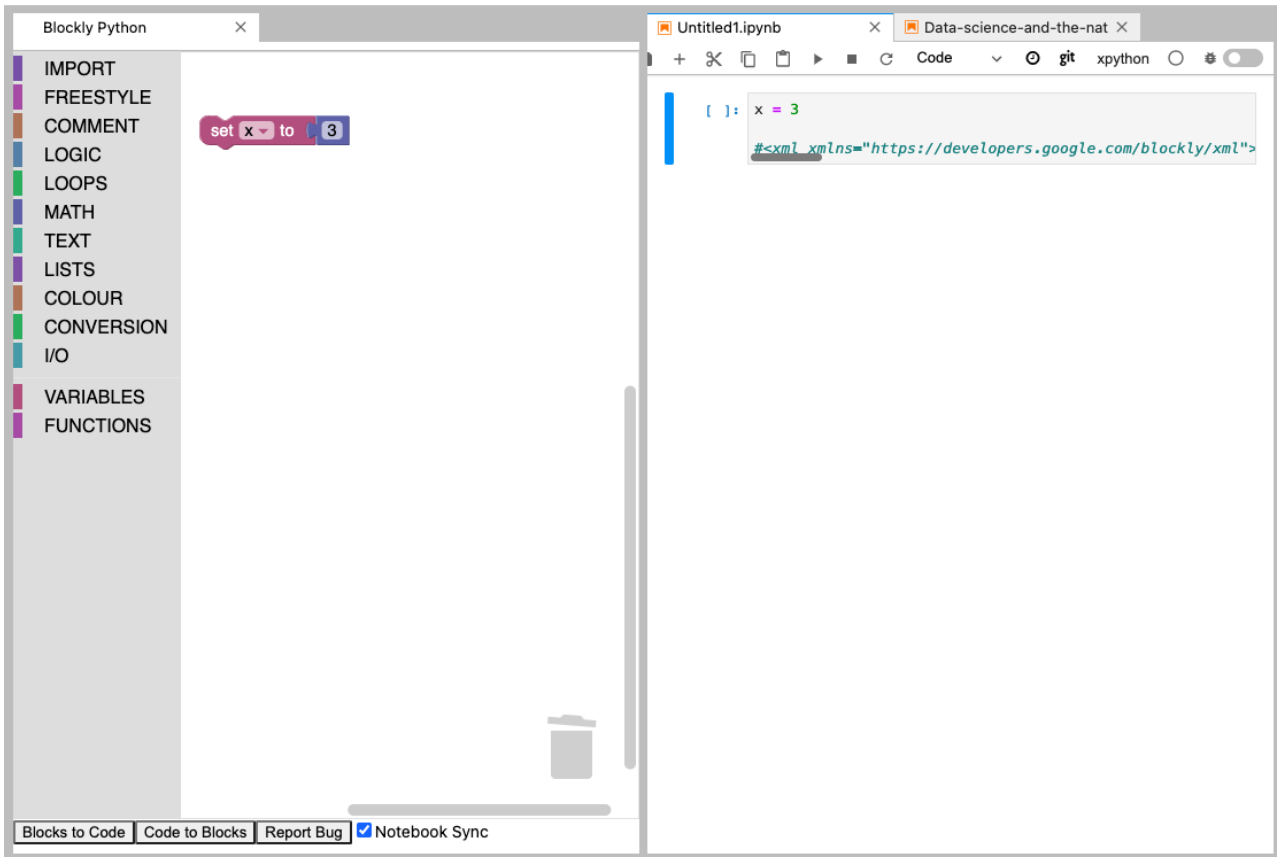
A posttest with eight word problems, multiple choice questions isomorphic to exercises in the notebooks was used to assess learning. Two UX surveys were used. The first was a five-item modified version of the system usability scale (SUS; Bangor et al., 2008; Lewis, 2018). An example of the modified item, "It was easy to learn from the system," is based on the original SUS item "I thought the system was easy to use." The second survey consisted of eight statements measuring the three elements of cognitive load, including extraneous cognitive load (ECL), germane cognitive load (GCL), and intrinsic cognitive load (ICL; Klepsch et al., 2017) and used a Likert-type scale. An example of an ECL survey item was "During this task, it was exhausting to find the important information." One of the GCL survey items used was "The task contained elements that helped me better understand the material." Alternatively, an example of an ICL was "For this task, many things needed to be kept in mind simultaneously." Finally, a demographics survey contained questions about gender, ethnicity, educational attainment, years of expertise in programming, statistics, and data science, and high stakes test scores (SAT, ACT, etc.). All materials were hosted on Qualtrics, except the Jupyter notebooks, which were hosted on a JupyterHub. Since the experiment was online, participants used their own computers and the Chrome browser (mobile devices and other browsers were blocked).

Procedure

Participants were recruited through their affiliated subject pool website and completed the entire experiment online using Qualtrics. After completing the informed conset form, participants were asked to read instructions about the experiment, including silencing their phones, not taking breaks, and completing the study in one session (approximately two hours). Next, participants were randomly assigned to one of the following conditions: (a) the Jupyter interface supported programming with blocks or (b) only supported programming with code (no blocks) (see Figure 1).

Figure 1

Sample Jupyter Notebook with Blockly Plug-In



Note. Blockly plug-in appears on the left side, while the corresponding code appears on the right side.

Participants then watched instructional videos according to their condition and completed five notebooks in the order WE, NEAR1, NEAR2, FAR, and FAR+. Because the notebooks were on a JupyterHub, participants added them by clicking a link in Qualtrics, which opened another tab on their browser containing the notebook. When participants finished with a notebook, they clicked a link in the notebook that revealed a password and otherwise disabled the notebook interface. Participants had to enter the password correctly into Qualtrics to continue. This process prevented participants from backtracking or accessing more than a single notebook at a time with one important exception: they were permitted and encouraged to consult the worked example while solving NEAR1. This exception was accomplished by opening an additional tab for WE in Jupyter that was disabled when NEAR1 was completed.

Participants were included in the study if they completed the study and attempted a single cell on the worked example notebook (n=59). Some participants completed the study in more than one session; these participants were retained as long as they met the above inclusion criteria, even if they were assigned to a different condition in a later session. After the notebooks, participants took the posttest, two usability surveys, and the demographic survey, after which they were debriefed. Because the posttest came at the end of the experiment, participants who completed it tended to do so in the session in which they completed the experiment to preserve the instrument's integrity.

Results

Research Question 1

The first research question sought to understand the degree to which learning outcomes differ when learning is supported with blocks or without blocks. To answer this question, a one-way MANOVA was conducted to determine whether there is a difference between block-based programming on test scores, ICL, GCL, and ECL. Using Wilk's

statistic, there was not a significant difference in test scores and cognitive load (ICL, GCL, ECL) based on block-based programming or no blocks programming, $F(5, 53) = 1.17$, $p = .34$, $\lambda = .901$, partial $\eta^2 = .99$.

Table 1 shows the average test scores for students and the results from the cognitive load survey given the instructional materials without the aid of block-based coding versus with blocks coding. In terms of RQ1.a, MANOVA findings reported above suggested no significant difference relative to test scores. In terms of RQ1.b, which was concerned with the three factors of cognitive load (ICL, GCL, and ECL), the MANOVA did not identify any significant difference between a block-based or no blocks programming approach on perceived ICL (F (1,57) = .89, p =.35, partial η^2= .02), GCL (F (1,57)= .20, p = .66, partial η^2= .004), and ECL (F (1,57)= 3.97, p = 0.51, partial η^2= 0.07).

Table 1

Means and Standard Deviations by Condition for Conceptual Knowledge (Test Score) and Cognitive Load Factors Across Treatment Conditions

	No Blocks (*n*=37)	Blocks (*n*=22)
Test Score	*M* = 51.35 (*SD* = 25.52)	*M* = 40.91 (*SD* = 8.67)
Intrinsic Cognitive Load	*M* = 73.14 (*SD* = 17.96)	*M* = 78.23 (*SD* =23.01)
Germane Cognitive Load	*M* = 63.51 (*SD* = 14.58)	*M* = 65.59 (*SD* =20.88)
Extraneous Cognitive Load	*M* = 55.38 *(SD = 23.12)*	*M* = 68.73 (*SD* =27.65)

Research Question 2

The second research question asked to what degree an aspect of *learning experience design* correlated with factors of *cognitive load*. That is, how *is* usability correlated with factors of *cognitive load* (intrinsic cognitive load, germane cognitive load, and extraneous cognitive load)? To answer this question, a correlation test was performed with responses to system usability scale (SUS) questions and cognitive load factors. All participants' SUS scores were averaged (M = 51.69, SD = 9.38), with the average SUS score falling below the threshold of 68 (Brooke, 1996), suggesting that ease-of-use was "OK" (Bangor et al., 2009). There was a significant weak correlation (Cohen, 1988) between the SUS learner responses and intrinsic cognitive load (M = 75.03, SD = 19.95, $r(57) = .37$, $p = .004$). There was a significant moderate correlation (Cohen, 1988) between the SUS learner responses and germane cognitive load (M = 64.29, SD = 17.05, $r(57) = .66$, $p < .00$). There was a significant weak correlation (Cohen, 1988) between the SUS learner responses and extraneous cognitive load (M = 60.36, SD = 25.51, $r(57) = .33$, $p = 0.01$).

Research Question 3

Whereas RQ2.a focused on cognitive load, the second part of RQ3 asked to what degree is *learning experience design* correlated with aspects of *conceptual knowledge* of computational thinking? To answer this second part of RQ3, a correlation test was performed with SUS and posttest scores. The correlation test for this research question showed no significant correlation between student SUS responses and test scores, (M = 51.69, SD = 9.38, $r(57) = .15$, $p = .26$).

Discussion

Computational thinking is an important component of learning within the STEM domain. Whereas other subdomains of STEM are largely conceptual, computational thinking necessitates the use of technology as students code and complete other programming tasks. This places a greater emphasis on the role of LXD and the interactions that are foundational to the tools that facilitate the learning process. Hence, it is important to explore the role of LXD as different scaffolding techniques are embedded within learning environments that support data science. To date, theorists have begun to theorize and formalize constructs of LXD (Chang & Kuwata, 2020; Gray, 2020); however, few quantitative studies exist that explore the relationship between LXD and learning outcomes. This study sought to address this gap

by exploring the LXD in learning as it relates to cognitive load (intrinsic, germane, extrinsic) and conceptual knowledge within data science education.

The first research questions (RQ1.a, RQ1.b) sought to determine the degree to which there was a difference in learning outcomes (conceptual knowledge, ICL, GCL, ECL) when the data science learning environment employed blocks or no blocks. The research found no statistically significant differences between the conditions. This is somewhat surprising because one might hypothesize these additional supports engender various learning outcomes, especially given the literature associated with the importance of scaffolding during coding. There may be multiple interpretations for this finding. As it relates to learning outcomes in the form of test scores, it is possible that learners may have done well at the procedural aspect of coding *in situ*, but struggled on the testing activity which required learners to recognize and recall aspects of data science during testing. This data science coding process also has a significant degree of element interactivity in which learners need to understand the concept, perform functions, interpret the output, and iterate. It is possible that additional support is needed beyond the status quo or a block-based approach. Whereas blocks help to simplify the more technical aspects of coding, it may be that additional features are needed for the blocks that help with interpretation or next steps that are essential to data science.

Another finding relates to the LXD results that were the focus of the second research question, which specifically explored the relationship between LXD and the factors of cognitive load. Analysis found correlations with each factor of cognitive load, which is noteworthy because research often describes LXD as part of the evaluation portion that (e.g., ADDIE) occurs at the end of the development cycle (DeVaughn & Stefaniak, 2020; Lohr et al., 2003). As opposed to just user testing, this research suggests there may be a relationship between elements of LXD and *in situ* learning processes.

The finding of ECL correlated to LXD aligns with prior literature in which individuals speculate that ECL may be exacerbated by poor design of the learning environment (Mutlu-Bayraktar et al., 2019). Beyond just presentation of content and multimedia, the results extend the discussion suggesting that extraneous cognitive load may stem from both the design of learning materials *and* interactions that are embedded within the learning environment. In terms of intrinsic and germane cognitive load, one might conclude that designed LXD interactions (navigation, progression of content) can support learner's iterative knowledge construction for intrinsic load, which in turn supports schema formation associated with germane load. Whereas LXD was seen as a design aspect during the development process, the findings suggest LXD is related to cognitive load and thus an inherent part of the learning process.

Limitations and Future Studies

The current study utilized data from a larger research project to understand the degree to which learning outcomes differ with graphical supports (blocks vs. no blocks) and to explore the correlations among LXD and aspects of cognitive outcomes. Given that few research studies exist that explore the relationship between LXD and learning outcomes, our findings could be a step toward bridging that research gap. While the study did uncover correlations between the SUS and factors of cognitive load, the participants were limited to undergraduate psychology students. Considering this limitation, testing for duplication of results in other populations, such as adult learners in other fields of study or high school students, could provide further empirical validation of the results. Future research could replicate the findings with a large sample size and conditions.

In this study, participants were asked to complete the learning program and conceptual knowledge test in one session. Although many user experience studies leverage this type of methodology, one might argue it could impact the overall interaction. Instead, if the participants were provided access to interact with the learning materials/environment over multiple sessions/dates, this could influence how they view their own cognitive load upon completing the tasks provided. Therefore, a valuable future study would be to test and survey participants at various stages of familiarity with the learning materials to compare their perceptions of their own cognitive load levels at these different stages.

Lastly, the participant pool for the current study was offered a small incentive to participate in the study. However, it is not known if or how mandating the study (e.g., as part of a class assignment) would impact the results found. To answer that question, we recommend future research that replicates the study in a way that integrates the learning environment within the assigned classroom requirements. The current study also looked at self-reported cognitive load factors (i.e., ICL, GCL, ECL) and test scores, which helped us to understand correlations between an aspect of LXD and knowledge gains. However, the test items were conceptual in nature, whereas data science is more procedural in nature. Therefore, for this data set, it may have been beneficial to assess the accuracy of the participants' actual coding, rather than their post-hoc test scores. This may have helped us to better understand students' coding processes, which may more accurately represent their learning outcomes.

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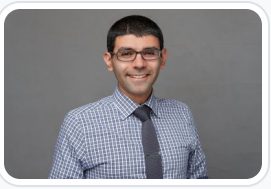

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Designing Rational and Emotional Learning Experiences via the Learning Experience Canvas (LXC)

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Augmented Reality | Rational Design | Emotional Design | Instructional Theory Framework

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When designing learning experiences, instructional designers should engage learners with designs that balance rational and emotional experiences. The Learning Experience Canvas (LXC) is a process model that designers can use individually, with a team, and/or with stakeholders to gather and document learning experience design ideas. The designer can then turn those rational and emotional ideas into one or more "fuzzy visions," which is a designer's preliminary vision of the instructional content, methods, media, and sequencing that learners might experience. The LXC aims to deliver a learning experience high in effectiveness, efficiency, and appeal.

Introduction

This article proposes an improvement to the Instructional Theory Framework (ITF)[1] (Honebein & Reigeluth 2020, 2021, 2023; Reigeluth & Carr-Chellman, 2009) that guides instructional designers in how to accommodate rational and emotional experiences when designing a learning experience. As instructional design is a linking science, this article incorporates "multiple traditions" (Jahnke et al., 2022) from a wide variety of domains, such as instructional design, marketing, imagineering, happiness, complexity, user-centered design, human performance technology, and business analysis, to name a few.

Eight Criteria that Characterize Good Learning Experience

The early work that contributed to the shift in the field toward learning experience design (LXD) occurred in the 1990's constructivist revolution. Bednar et al. (1992) and Duffy and Jonassen (1992) proposed that "understanding is indexed by experience" (p. 88), which involves both physical contexts and cognitive/physical tasks. Back then, learning

experiences were known as "constructivist learning environments" (Honebein et al., 1993, p. 89), which embodied instructional ideas such as authentic activities, multiple perspectives, complexity, and context, as well as the "Seven Goals"[2] for constructivist learning environments (Cunningham et al., 1993; Honebein, 1996; Knuth & Cunningham, 1993). Carr (1997) and Carr-Chellman et al., (1998) added the idea of user research (referred to today as user experience design). Now 30 years later, Jahnke et al. (2022), Grey (2020), and others have recognized these elements as key constructs for LXD.

Peter C. Honebein and Darryl L. Sink began using the term "learning experience" commercially in 2005 (Darryl L. Sink and Associates, Inc. and Learning Tree International, 2008). Our client, Learning Tree International, asked us to reimagine a series of mostly lecture-oriented business management courses. Employing constructivist philosophy mixed with user experience (UX) principles, the result was an International Society for Performance Improvement (ISPI) award-winning learning experience called RealityPlus™. This learning experience focused on "attendees experience in the classroom," projects that combine "one part fantasy, two parts technical possibility, and a large dose of reality," and "creating effective, efficient, and appealing learning experiences" (p. 1). The Learning Tree project and Honebein's later work with Richard Goldsworthy and the Academic Edge, Inc. (Honebein & Goldsworthy, 2009, 2012) hatched many of the ideas found in this paper.

How does a designer know that they have created a learning experience? In our work with Learning Tree, we asked customers, and there was only one question to ask: Will you recommend this (product, service, learning experience) to another person? (Reichheld, 2003). We agreed with that idea, and, over time, we included a few other Likert-scale items inspired by theory, observation, and experience to differentiate a commodity course from a learning experience (Figure 1).

Figure 1

The Learning Experience Scale Aims to Differentiate a Commodity Course From a Learning Experience

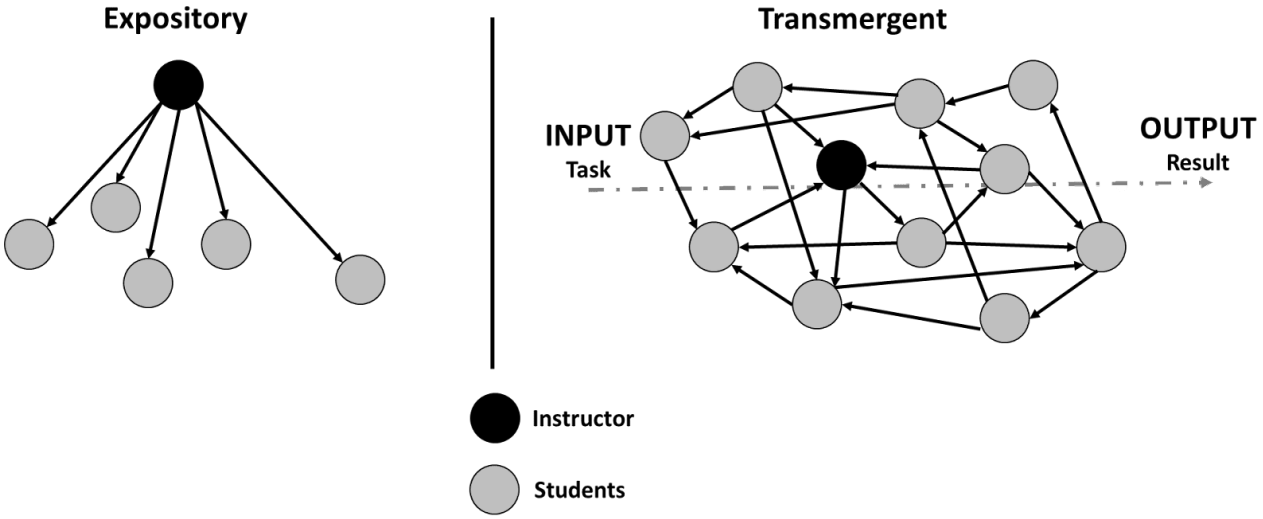
Lower Rating = Commodity	Criteria	Higher Rating = Experience
0 1 2	Time seemed to fly by during the learning experience	4 5 6
0 1 2	I would not have noticed if I had food on my face during the learning experience	4 5 6
0 1 2	My level of concentration was high during the learning experience	4 5 6
0 1 2	I was very focused during the learning experience	4 5 6
0 1 2	The learning experience made me very happy	4 5 6
0 1 2	I was transformed by the learning experience	4 5 6
0 1 2	I created a novel technique or way of solving a problem that was positively recognized as such by the instructor	4 5 6
0 1 2	I will recommend this learning experience to a colleague	4 5 6

This list is grounded in three experiential theoretical constructs: flow (Csikszentmihalyi, 1990, 1997), transmergence (Honebein, 2009), and loyalty (Reichheld, 2003). Items 1 through 5 are characteristics that indicate a learner has likely experienced a flow state. A flow state is a mental state that occurs in an activity where time flies by, self-consciousness decreases, concentration and focus increases, and happiness abounds. Vann and Tawfik (2020) suggest that incorporating flow principles in a learning experience helps avoid learner boredom and frustration.

Items 6 and 7 represent ideas related to complexity theory (Jahnke et al., 2022), interpreted as a concept called transmergence (Honebein, 2009). Figure 2 illustrates the difference between an expository learning experience and a transmergent learning experience. In an expository learning experience, the instructor sets the agenda and tasks for learning, where learners work independently. A transmergent experience, on the other hand, describes a dynamic learning experience that leverages the principles of a neural network, a system of inputs and outputs that models the brain. Through this neural network, the learning experience has the potential to transform a learner in a positive way. Transform, in this context, represents a learner's self-directed change that achieves an aspiration, such as a new skill (Pine & Gilmore, 1999). Emergence, in this context, is the generation of new knowledge and ideas created by the learner. Where flow is in the moment, transmergence is after the moment, representing a worthwhile change or outcome in the learner.

Figure 2

A Comparison of Expository and Transmergent Learning Experiences



Note. An expository experience is very instructor-centered and independent, with each student completing a task specified by the instructor. A transmergent experience is the opposite. A student (or students operating as a group) can leverage the resources of other students or the instructor to deliver a result, typically an inspirational goal.

Item 8 represents loyalty, which is a customer satisfaction construct that designers can repurpose for a learning experience. It is operationalized as the Net Promoter Score (Reichheld, 2003): "I will recommend this learning experience to a colleague."

The scale presented here has been informally vetted through use in practice contexts but has not been formally validated. The scale's primary purpose at this time is only for formative evaluation.

Leveraging Rational and Emotional Experiences

Learning experience designers should seek balance in their designs in terms of how they utilize rational and emotional experiences. Norman (1988, 2004) introduced many designers to foundational ideas about rational and emotional design in the books The Design of Everyday Things and Emotional Design. Honebein and Cammarano (2009) (Figure 3), suggested that rational and emotional experiences must work together to deliver delight to customers, which, in an instructional theory context, is represented by a balance of effectiveness, efficiency, and appeal (Honebein & Honebein, 2015; Honebein & Reigeluth, 2020, 2021, 2023; Reigeluth & Carr-Chellman, 2009). If one of the two factors (rational or emotional) is hindered, it may result in an experience that is dysfunctional (high appeal, low effectiveness, low efficiency), dissatisfied (low appeal, low efficiency, low effectiveness), or directed (low appeal, high efficiency, high effectiveness).

Here are some examples of the four experience types. A learner is delighted when a learning experience evokes feelings of joy and pleasure. These emotions are often associated with a flow state. Our design experience with adult learners suggests that instructional methods such as authentic tasks (Reigeluth & Keller, 2009) activate learner motivation and delight.

Designers can identify a dysfunctional experience when a learning experience delivers a feel-good, charismatic presentation that does not deliver learners any kind of useful or actionable skills. In other words, learners master nothing but they really like the learning experience. Typically, these kinds of learning experiences reveal themselves as affective sales presentations that employ instructional methods such as expository teaching (Reigeluth & Keller, 2009).

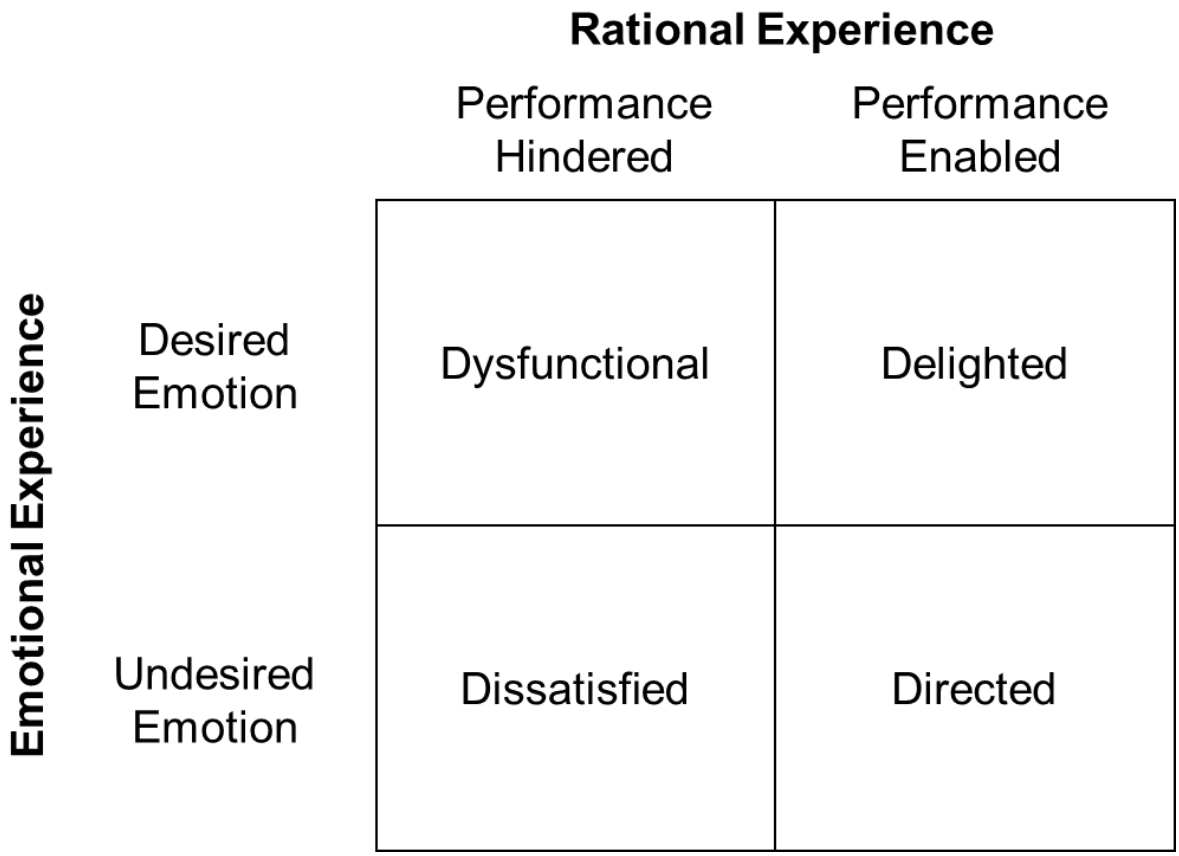
A learner experiences dissatisfaction when a learning experience lacks effectiveness, efficiency, and appeal qualities. The typical causes for this situation include poor instructional design skills, the absence of formative evaluation, and inappropriate instructional methods.

A directed experience enables performance, which includes effectiveness and efficiency, but sacrifices appeal. Learners are able to master the instructional objective independently, but there is not a lot of fun or enjoyment for the learner along the way. The instructional method of drill-and-practice (Reigeluth & Keller, 2009) illustrates a directed-type of learning experience.

Designers should avoid designs that increase the likelihood of introducing the three types of negative outcomes because these types of outcomes increase negative learner emotions about the learning experience.

Figure 3

The Memorable Experience Model

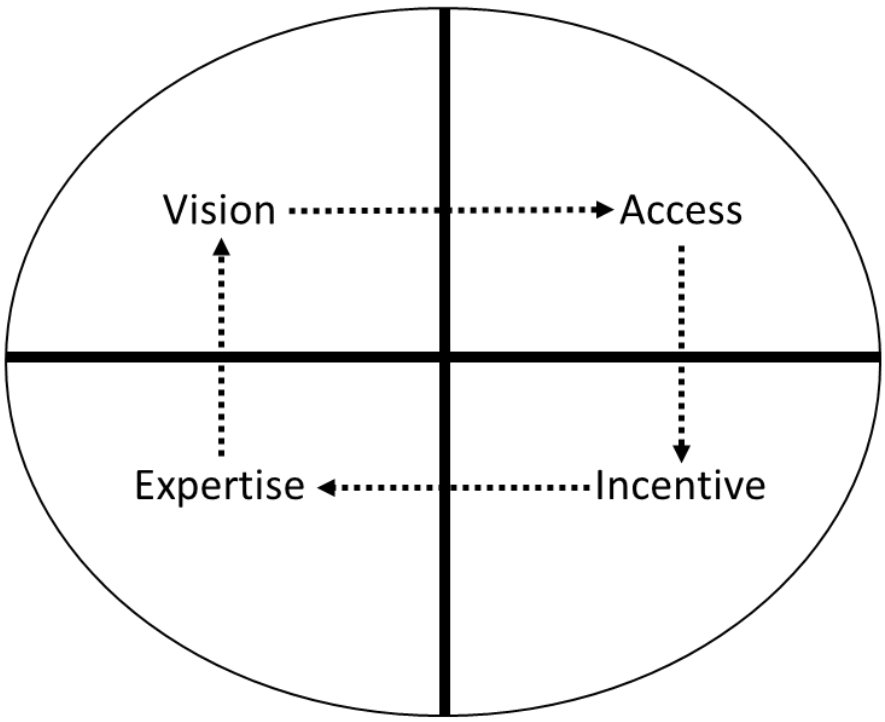


People are wired for both rational and emotional experiences (McLean, 1990; Ornstein, 1992). The new brain, featuring the cerebral cortex, controls rational thinking and reasoning skills, such as math, reading, and problem solving. The old brain, consisting of the amygdala, hypothalamus, and hippocampus, manages emotion and instinct. This controls flight or fight and pain or pleasure responses. Plutchick's (1980) classification of human emotion describes three states: positive (joy), negative (anger, fear, sadness), and neutral (curiosity, surprise, acceptance). To guide learning experience designers to deliver a delighted experience, Honebein and Cammarano (2005) and Pine and Gilmore (1999) developed models for customer experience (CX) design. Instructional designers can apply these models to LXD.

Honebein and Cammarano's (2005) contribution to CX design was the Coproduction Experience Model (Figure 4), which outlined a balanced mixture of four rational experience elements: vision, access, incentive, and expertise. Utility drives rational experiences (Nielsen, 2012; Pagonis, 2021; Rachels, 2009), which reflects the functional usefulness of an experience. This thinking incorporates such concepts as ethics, self-interest, and preference-maximization, "which all point to an experience in which people can achieve what they calculate to be best" (Honebein & Cammarano, 2005, p. 123).

Figure 4

Honebein and Cammarano's Coproduction Experience Model



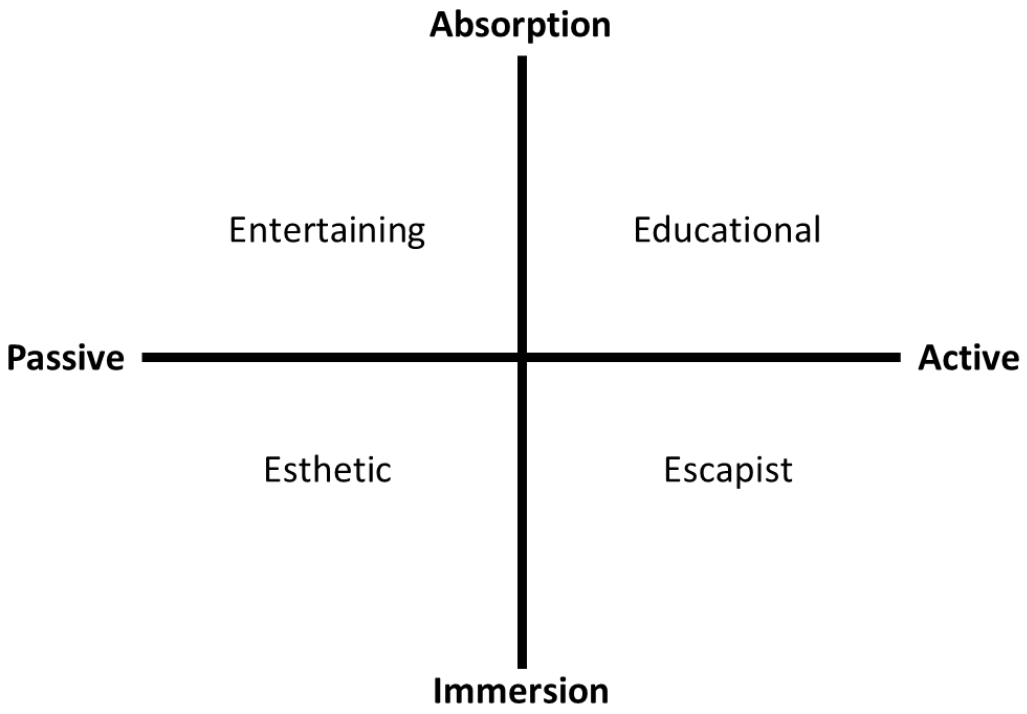
Note. The four experience elements are systemic, as they all interact and condition the entire experience.

Vision includes such constructs as goals, expectations, plans, and feedback, which, from an instructional design perspective, represent instructional objectives (Mager, 1984). Access includes policies, procedures, people, tools, interfaces, information, and nuances (the latter being sensory cues such as aroma, lighting, tastes, and music (Gobé, 2001). Incentive includes rewards, punishments, negative reinforcement, and removal of punishing conditions. Expertise includes, from an instructional perspective, basic tools, embedded tools, premium tools, problem tools, and support tools. The four experience elements are systemic, as they all interact and condition the entire experience.

Pine and Gilmore's (1999) contribution was the Experience Realms model, which focuses on emotional experiences. As shown in Figure 5, on the outside of the model are two sets of continuous engagement variables. The horizontal axis represents passive-to-active participation. The passive-participation extreme is when participants don't influence the performance at all; they are, for example, observers of a lecture. The active-participation extreme is when participants personally and strongly affect the performance; they are, for example, doers participating in an instructional game. The vertical axis represents absorption and immersion. Pure absorption is when an experience is manipulated with one's mind (for example, the content of a lecture). Pure immersion is when one engages completely in the experience (for example, a fully immersive virtual gaming zone (Atria Admissions Team, 2022).

Figure 5

Pine and Gilmore's Four Realms of Emotional Experiences



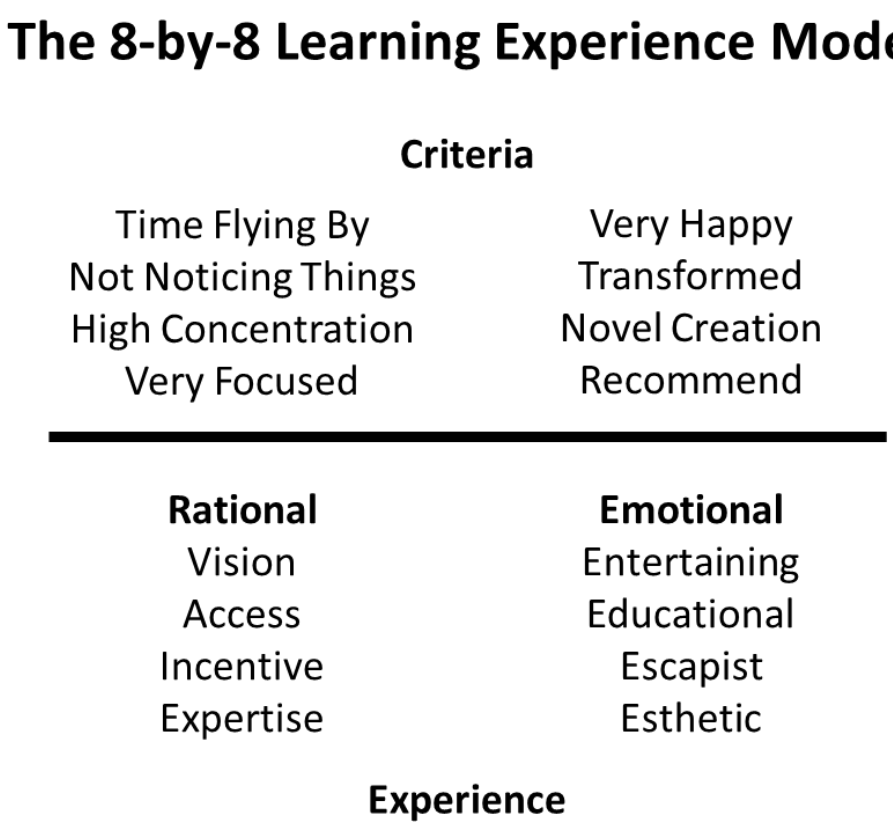
Note. The Experience Realms model is also systemic, interacting and conditioning the entire experience.

These variables activate a mixture of four emotional experience realms: entertaining, educational, escapist, and esthetic. Thus, being passively absorbed represents a state whereby one is passively entertained. Actively absorbed represents an active educational state in which an active learner pursues knowledge rather than having it poured into them – see the Nürnberg Funnel (Carrol, 1990). Actively immersed represents an escapist state, which is best described as being like in an amusement park or a flight simulator. Passively immersed represents an esthetic state, such as observing the grandeur of Yosemite National Park or visiting an art gallery. Similar to the Coproduction Experience Model's four elements, the Experience Realms model's four realms are systemic as well, interacting and conditioning the entire experience.

Thus, we propose that a good learning experience embraces and balances both rational and emotional experiences. Rational experiences blend vision, access, incentive, and expertise qualities. Emotional experiences blend entertainment, education, escapist, and esthetic qualities. When brought together, these eight experience types enable designers to create learning experiences in which learners experience flow, transmergence, and loyalty. When combined with the eight criteria, we call the entire structure the 8-by-8 Learning Experience Model (Figure 6).

Figure 6

The 8-by-8 Learning Experience Model Represents Learning Experience Outcome Criteria and Rational/Emotional Experience Elements



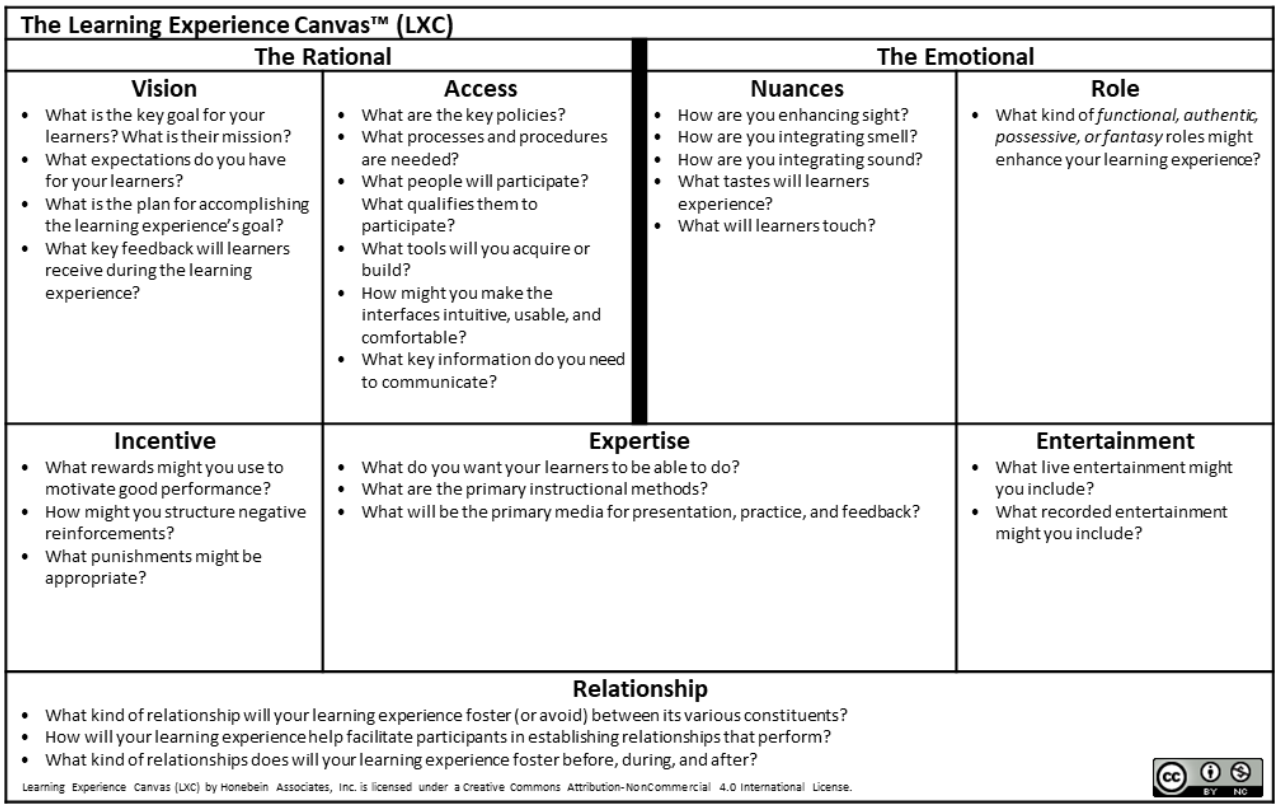
The Learning Experience Canvas

Conceived by Peter Honebein and first taught at a Training Magazine event in 2013, The Learning Experience Canvas™ (LXC) (see Figure 7) is a template that enables designers and their stakeholders to generate a vision for a given learning experience. Osterwalder and Pigneur's (2010) Business Model Canvas, a template for developing and documenting business models, inspired the LXC.

The LXC focuses on constructivist oriented (Honebein et al., 1993) rational and emotional design factors that assume situational variables are already known to the designer (explained shortly near Figure 8).

Figure 7

An Example of The Learning Experience Canvas™ (LXC; Honebein, 2013)



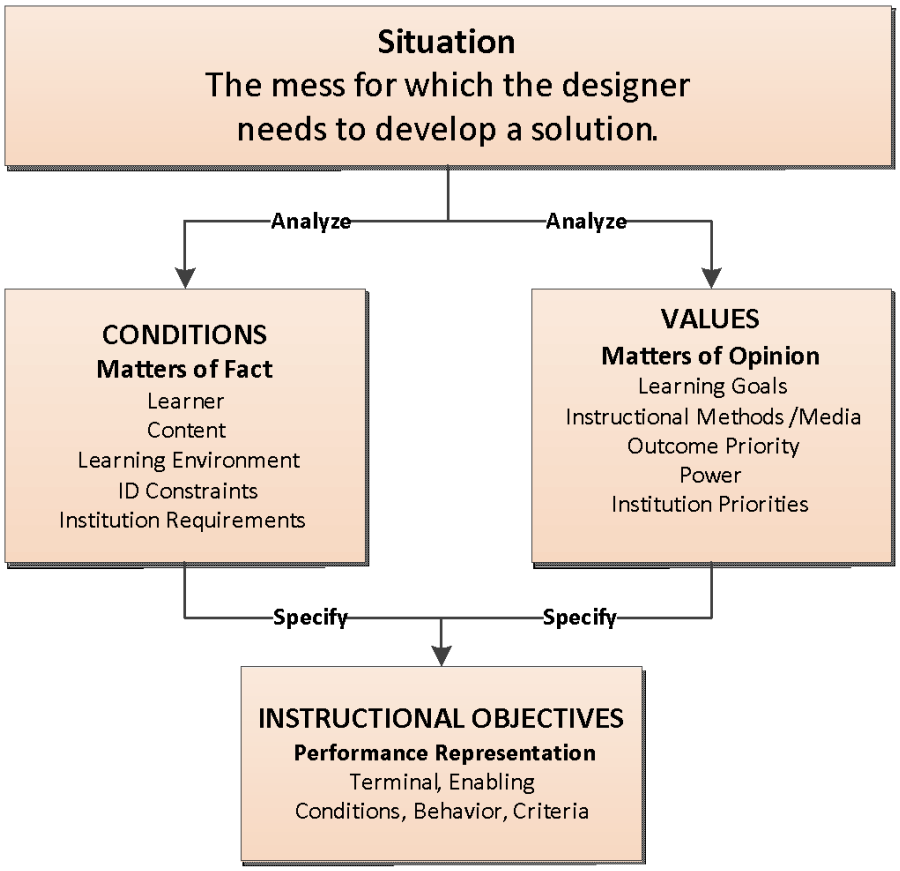
Note. The LXC focuses designers to think about how to incorporate rational and emotional experience into their learning experience. It assumes that designers have already determined situational variables.

As shown in Figure 7, two sides divide the LXC. The left side helps a designer visualize, think about, and design learning experience elements that are associated with rationality. The right side helps a designer visualize, think about, and design the learning experience elements associated with emotion. The building blocks within and spanning each side are containers for design ideas.

Before a designer begins working with the LXC, the designer and the participants the designer has recruited should have a good understanding of the situation (Gronseth, 2022; Honebein & Reigeluth, 2020, 2021, 2023; Reigeluth & Carr-Chellman, 2009) (Figure 8). Situation refers to the conditions and values that a designer elicits from stakeholders that "are useful for deciding when and when not to use a particular instructional method [or medium]" (Reigeluth & Carr-Chellman, 2009, p. 21). Kinds of situational variables include content, learner, goals, and priorities. The LXC process itself is a way to further identify and refine situational variables that a designer uses to develop a "fuzzy vision"[3] (Reigeluth & An, 2021, p. 14). The LXC design process has seven steps, which we illustrate in the following sections using a real-life business need involving electric vehicles.

Figure 8

The Upper "IF" Section of the ITF



Note. The Upper "IF" section of the ITF represents the collection and synthesis of situational variables, which include conditions (matters of fact) and values (matters of opinion). Conditions and values then influence the nature of instructional objectives. Conditions tend to represent more rational variables, where Values tend to represent more emotional variables.

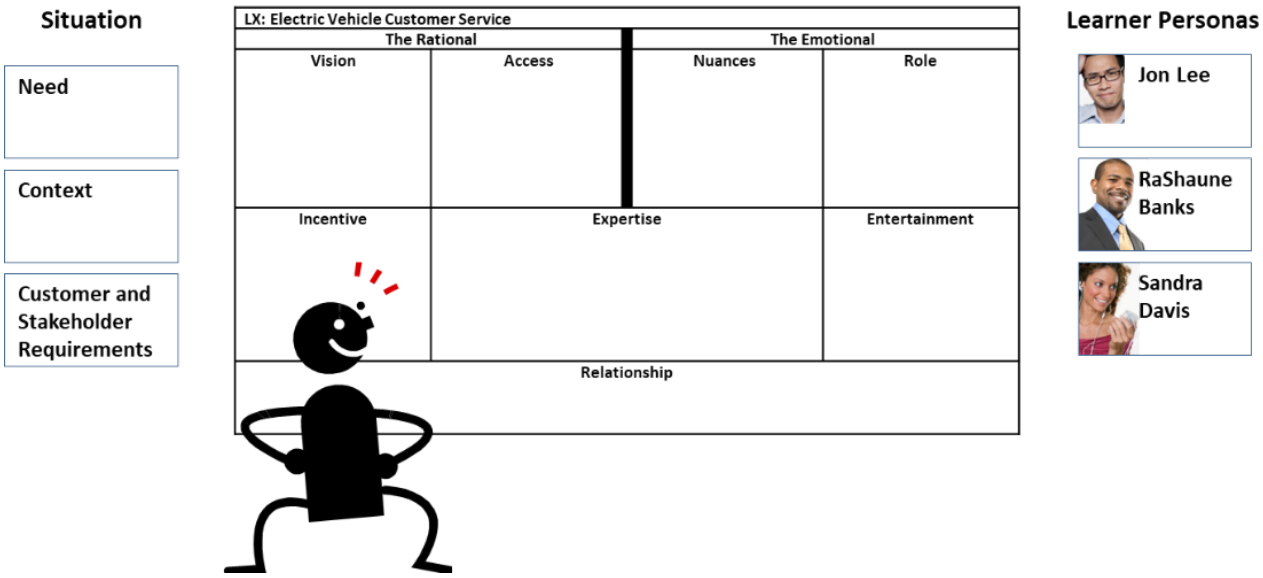
The Seven Steps of the LXC Design Process

Step 1. Orient Participants

Participants enter a large room and are greeted by a facilitator (designer). Projected on a whiteboard is a blank LXC (Figure 9). To the left of the LXC is a set of flipcharts or posters summarizing the situation, specifically the need, the context, and the customer/stakeholder requirements. To the right of the LXC is another set of flipcharts or posters that introduce the audience personas – the fictional people who represent the characteristics of the target audience.

Figure 9

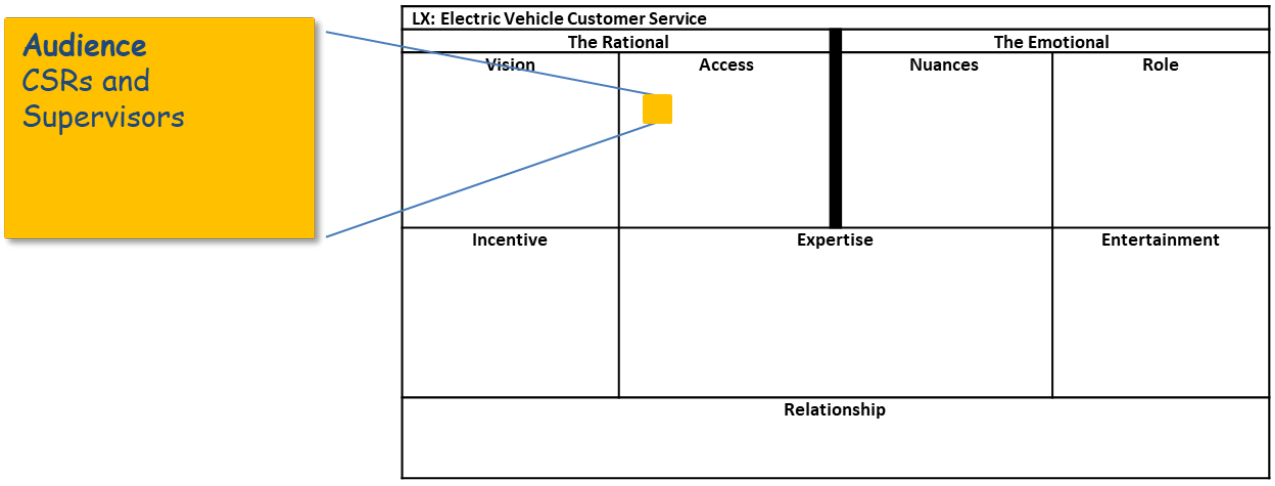
The Starting Elements for an LXC Design Session Include Situational Variables and a Blank LXC



The facilitator of the design session begins with an introduction and describes the goal for the session: In this example, the goal is: Develop a learning experience for electric vehicle customer service. The facilitator then reviews the situation and introduces the group to the learner personas.[4] The personas are a trio of people who work in a utility company's customer service call center. Jon Lee is a supervisor, RaShaune Banks is a veteran with 10 years' experience, and Sandra Davis is a new hire. To reinforce the connection of the personas and their requirements to the LXC, the facilitator creates a sticky note that reads, "CSRs and Supervisors" and puts it in the Access box (as it represents "people") (Figure 10). During the review, the facilitator answers questions about the situation and target audience personas and makes appropriate modifications to ensure the group understands the situation and are aligned with what it represents.

Figure 10

We Call Adding Data to the LXC "Painting the Canvas"



Note. The data added in this example is "rational" audience data, representing customer service representatives and supervisors.

With the participants aligned with the situation, the facilitator points to the Vision box on the LXC. The facilitator explains that the group will start by generating ideas that address four questions. These questions are the same as shown in the Figure 7 job aid that the designer distributed to participants.

1. What is the key goal for your learners? What is their mission?

2. What expectations do you have for your learners?

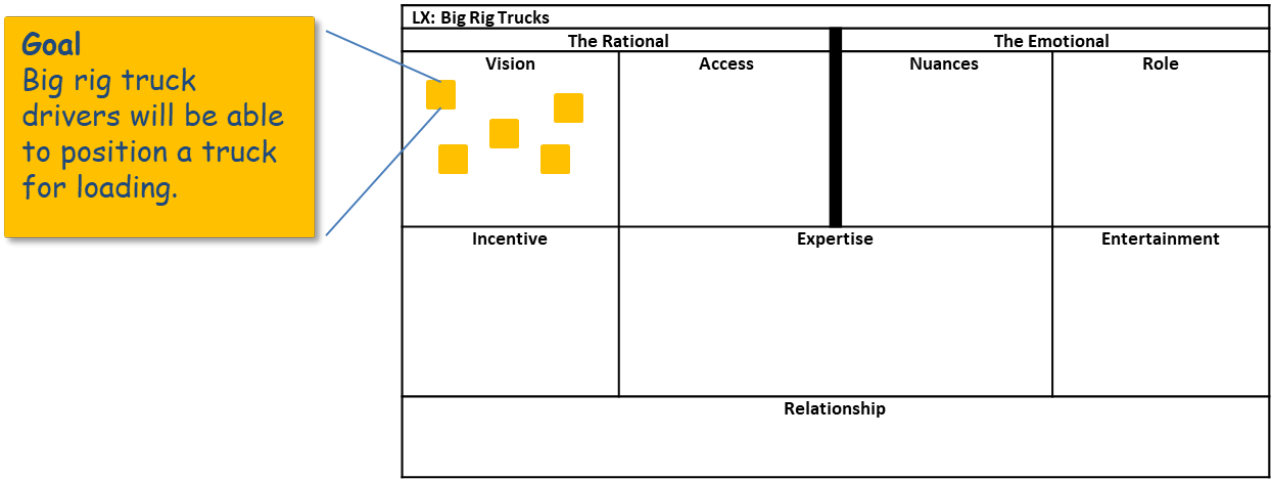
3. What is the plan for accomplishing the learning experience's goal?

4. What key feedback will learners receive during the learning experience?

The facilitator directs participants to write their ideas on sticky notes, explaining that it is best if one writes only one idea per sticky note. The facilitator also asks participants to label their sticky note with the appropriate topic: goal, expectation, plan, or feedback. To demonstrate what the facilitator is expecting, the facilitator shows a learning experience from another project (Figure 11).

Figure 11

An Example of Data in the Vision Box



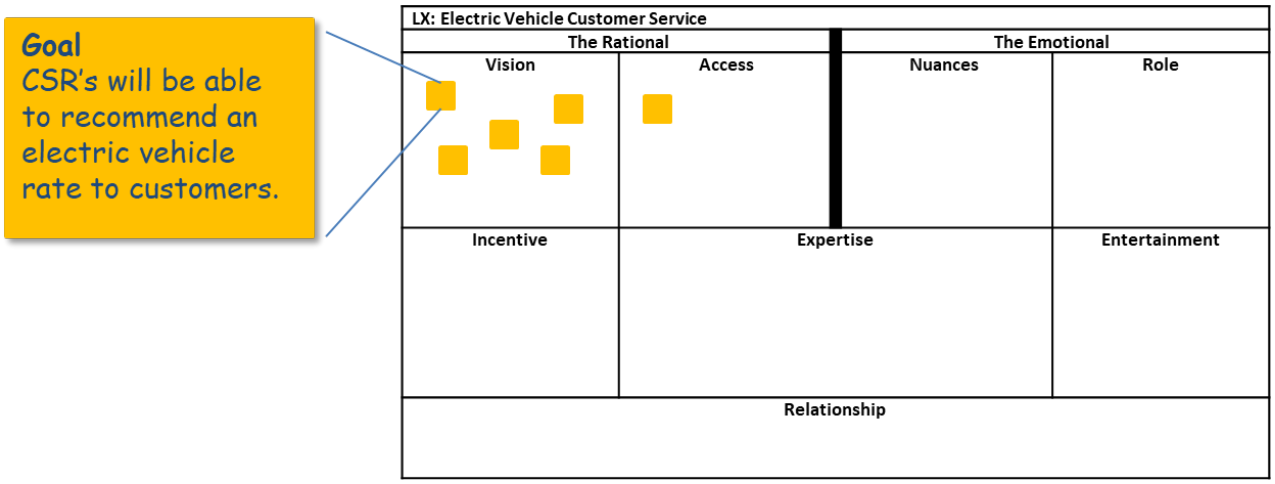
Note. The facilitator models the desired data for the Vision box by showing participants an example of another learning experience, where the audience was truck drivers.

Step 2. Generate Ideas

The facilitator directs participants to get started. Participants write their ideas (answers to the four Vision questions) on sticky notes, and then stick them in the Vision box. The facilitator also has the option of generating ideas as well. It shouldn't take more than five minutes to generate a good set of ideas. The LXC should now look like Figure 12.

Figure 12

An Example Shows Participants Generating Ideas for the Vision Box



Note. Ideas for each of the LXC boxes are guided by the LXC's questions (shown in Figure 7).

Step 3. Synthesize and Elaborate Ideas

While the facilitator could move on to generating ideas for another box, the facilitator does not. Instead, the facilitator invites participants up to the LXC to discuss what ideas have been painted into the box. First, the participants visually organize the ideas by affinity mapping[5]: goal, expectations, plans, feedback. Then the facilitator asks the participants to "yes, and…" the ideas, starting with the goals.

What is "yes, and…"? It is a brainstorming method associated with appreciative inquiry's positive principle idea (Mishra and Bhatnagar, 2012). For example, "Yes, I like that CSRs are listed as the target audience in the goal." Then the group builds off of that appreciation to elaborate the idea: "And, I think we should add CSR supervisors as well, since they are one of the personas that were identified."

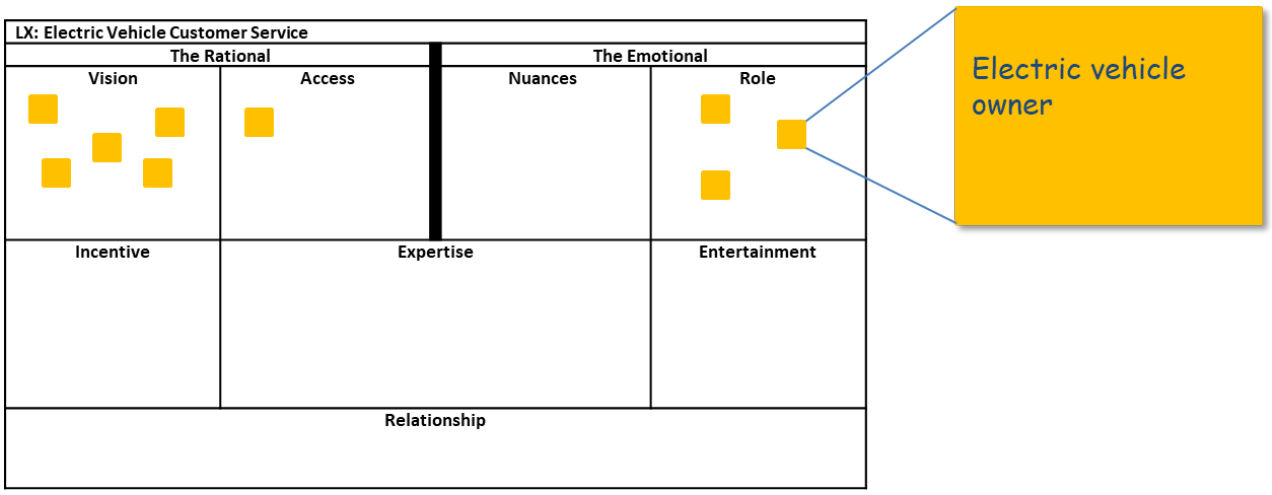
The "yes, and…" direction is very important. In design situations, participants tend to be negative, along the lines of, "yes, but…" (also called skeet shooting), which is demotivating. The "yes, and…" alternative represents beach balling, where the group tries to keep ideas flowing and up in the air.

Step 4. Wash, Rinse, Repeat

After the facilitator and participants get through synthesizing and elaborating ideas in the Vision box, the facilitator moves the group to another box. Typically, that would be the Role box. The choice is up to the designer. The starting question in the Role box is, "What functional, authentic, possessive, or fantasy roles might people in your learning experience play?" The facilitator then directs the participants to generate ideas for the Role box. The result looks something like this (Figure 13).

Figure 13

This Example Illustrates Adding Ideas to the Emotional "Role" Box



Note. Roles (or role play) (Kirk & Jay, 2018; Reigeluth & Keller, 2009) provide useful memorable signposts for learners. For example, in 1969, Honebein played the role of Neil Armstrong in his kindergarten's reenactment of the first lunar landing. Another student played the role of flight surgeon. She made sure Neil Armstrong was healthy before boarding Apollo 11, and then again when he returned to earth. After 55 years, Honebein still remembers this experience (and the flight surgeon, whose name was Karen).

Step 5. Freeform

At some point the LXC will have enough ideas for the facilitator to either 1) continue with the wash, rinse, repeat process, or 2) freeform. Freeform is a type of improvisation where the facilitator takes ideas generated by the participants in one or more boxes and uses those ideas to generate ideas for other boxes in the LXC.

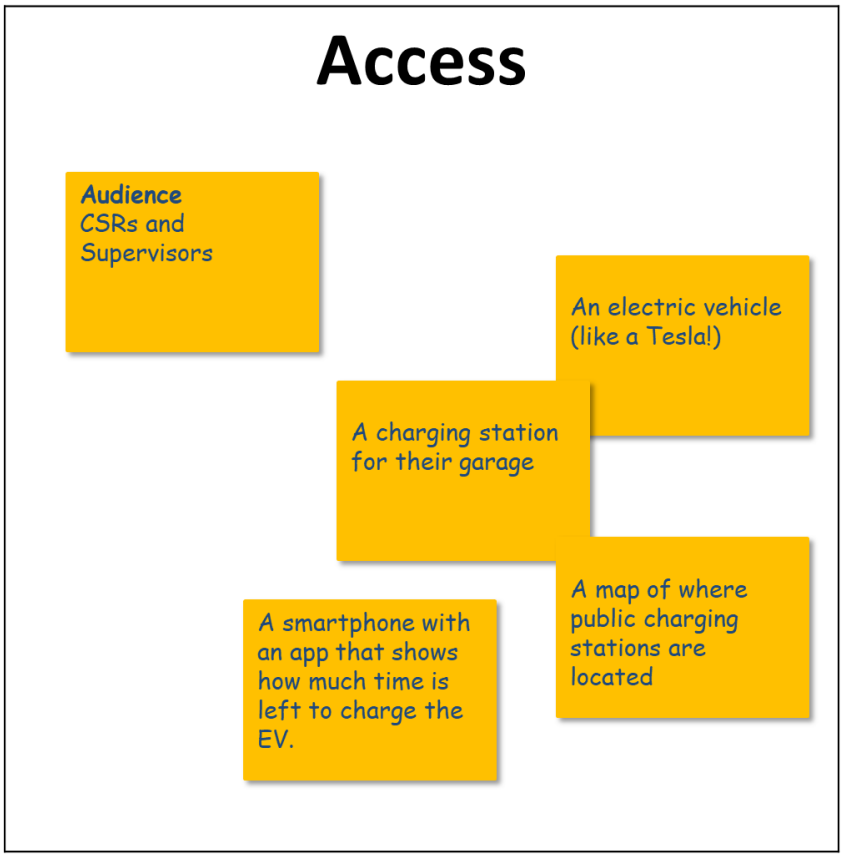
Using the content thus far generated, the facilitator improvises on the idea that the learner should experience the role of an Electric Vehicle Owner. First, the facilitator asks participants why the learner should play that role. A participant responds:

> *Perhaps because customers will have more trust in a CSR's recommendations if they know the CSR has actually experienced owning an electric vehicle, even if it is just for 30 minutes. Remember the requirement we gathered from the discussion board analysis: "Increase the trustworthiness of the CSR's recommendation."*

The response pleases the facilitator, since the participant used requirements from the situation analysis to defend the design. The facilitator then asks the participants, "If learners are going to play the role of an electric vehicle owner, what will learners need to play that role?" The participants start suggesting ideas (which the facilitator asks them to write on a sticky note), and then posts the notes in the appropriate box, as shown in Figure 14.

Figure 14

An Example of Data in the Access Box



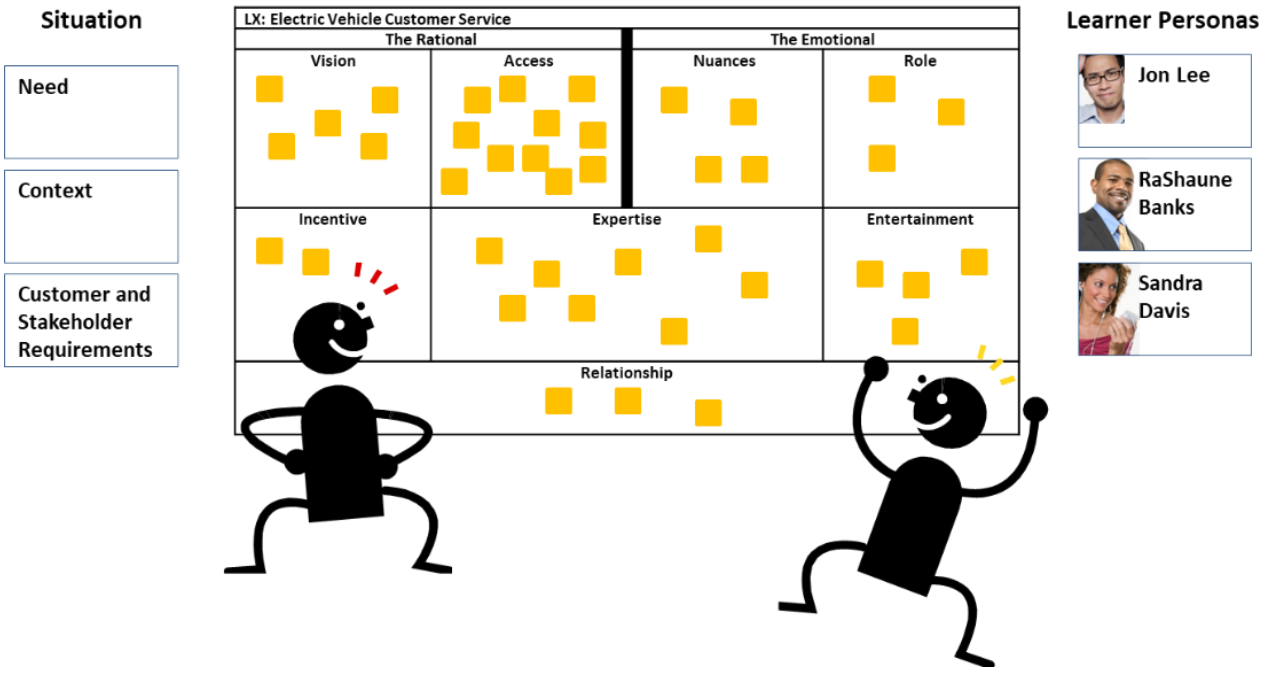
Note. Access box may contain policies, procedures, people, tools, interfaces, information, and nuance. In this example, participants have added ideas associated with people and tools, which are rational-experience elements.

Step 6. Take a Museum Walk

The facilitator continues to use the wash, rinse, repeat and freeform methods until 1) there is a reasonable set of ideas in all the LXC's boxes, 2) participants have no more ideas, or 3) time runs out. Given the participants' high motivation, the LXC has a reasonable set of ideas in all the boxes, as shown in Figure 15. The facilitator gives participants a short break.

Figure 15

A Representation of What a Completed "Painted" LXC Might Look Like



When the participants return from their break, the facilitator invites them to take a museum walk. The facilitator explains that a museum walk is a reflection activity in which participants explore the entire LXC with a critical eye. Participants read the ideas. Based upon what they read, they may add, re-organize, or even re-write an idea. Participants can discuss, debate, and/or explore "what-if's." The facilitator guides this to a point where participants begin generating the narrative of the learning experience from the point of view of the learner. What will learners experience first? When in the sequence will learners actually drive an electric vehicle and charge it? What kind of role-plays will learners experience? Ultimately, the group will reach a point where it agrees that the LXC is good enough, and that the prototype narratives have promise, at which point painting the LXC session ends.

Step 7. Wrap It Up

The facilitator thanks the participants and summarizes the next steps in the design process. The facilitator takes digital photographs of the LXC and posts them in a shared drive accessible to participants. The facilitator creates an electronic version of the LXC from the pictures and distributes it to participants – making sure participants understand that it is a living document. If there are additional ideas, the facilitator or participants add them to the LXC. Then, the facilitator can further develop the learner narrative (which represents in words and/or pictures what the learner's journey might look like) for the learning experience.

Cleaning Up the LXC

If the LXC session goes well, the LXC will have numerous ideas in the various boxes. This is good for the designer. However, the LXC cannot remain a sticky notes mess. The designer must resolve redundancies, prioritize ideas, prune each box, and synthesize so only the most important ideas remain. This is not to say the designer gets rid of all the pruned ideas – a good analyst should always keep the foundational data. But it is difficult for a designer to explain to clients, colleagues, and managers, especially those in decision-making roles, a LXC with hundreds of sticky notes. The designer must whittle it down to communicate the main features of the learning experience.

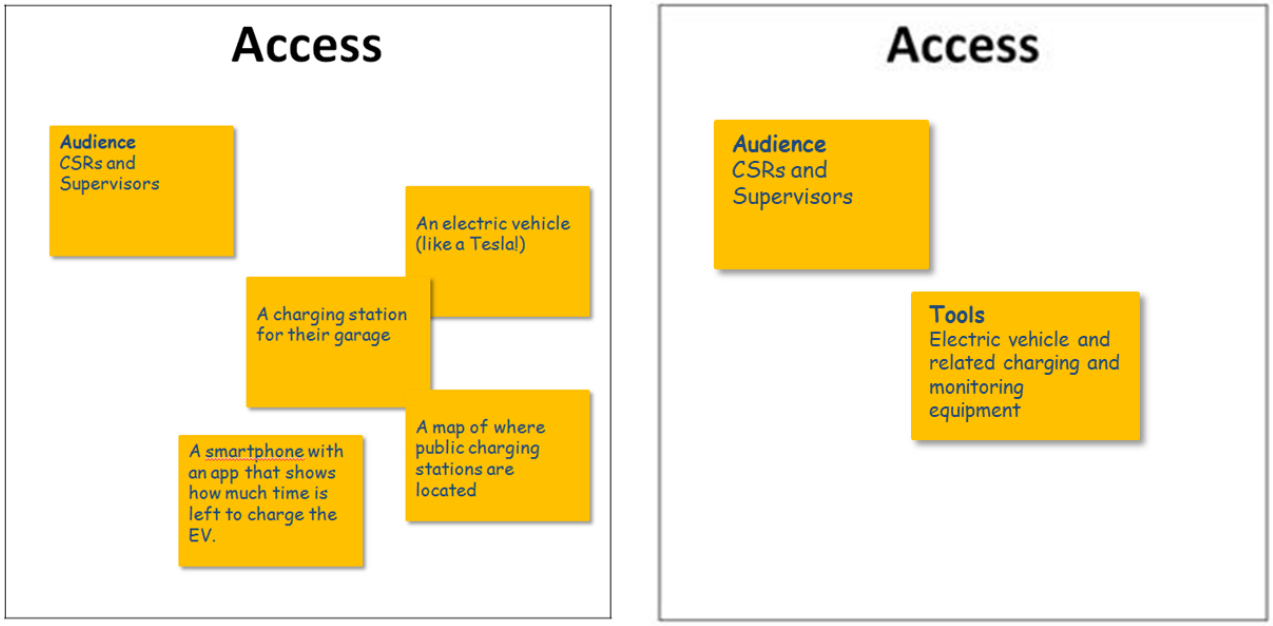
The narrative is one type of artifact. Another is a digital representation of the LXC. To create this, designers use software tools such as Visio™, PowerPoint™, Miro (https://miro.com/), and others to create a template representing the

LXC. As the designer reviews the raw data from photographs or from the actual LXC itself, the designer captures the essence of the ideas on the digital canvas.

Here is an example of how to do this. Remember the idea about the learner's role as an electric vehicle owner, which spawned numerous ideas about what learners needed to do to play that role? The designer can synthesize all of those ideas into two main ideas. An example is shown in Figure 16.

Figure 16

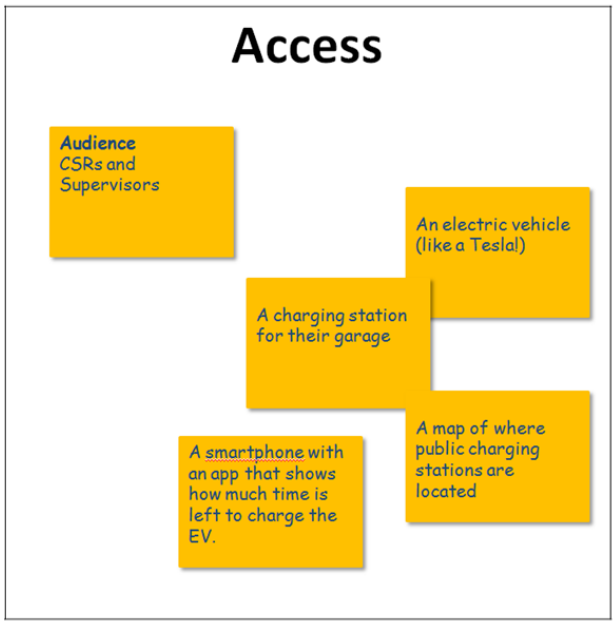
An Example of How the Designer Can Take Raw Data (Left Panel) and Synthesize it Into a More Concise Presentation of the Main Ideas (Right Panel)



Another way of synthesizing ideas is visually. Let pictures with words do the talking. Figure 17 shows an example. Pictures with words are better for illustrating and communicating the ideas for a LXC design. In fact, the whole LXC could be a collection of pictures with words.

Figure 17

This Shows an Alternative Synthesis, Where the Data in the Left Panel are Represented in Graphical Form in the Right Panel, Which the Design Can Repurpose as a Storyboard



After completing the clean-up process, the LXC could look like the one shown in Figure 18.

Figure 18

The Data From All LXC Boxes Synthesized Back Into a Clean LXC, Suitable for Sharing With Participants, Clients, Colleagues, and Managers

<table>
<tr><th colspan="4">LX: Electric Vehicle Customer Service</th></tr>
<tr><th colspan="2">The Rational</th><th colspan="2">The Emotional</th></tr>
<tr><td>Vision
Recommend an EV rate to a customer that results in the customer paying the lowest cost to fuel their EV

Help Refine How to Talk with EV Customers

Classroom, Drive and Charge an EV, Role Play

Critique of Role Plays Using a Performance Checklist</td><td>Access
Regulatory Rules
Ordering Process
CSRs and Supervisors
Classroom
CRM System
Participant Materials
EV and Related Charging Equipment
Rate Calculator</td><td>Nuances
Clean classroom, clean instructional materials, clean instructor, clean EV. Lunch at the Innovation Center.</td><td>Roles
Trusted Advisor
Electric Vehicle Owner</td></tr>
<tr><td>Incentive
Completion of training counts toward promotion to Level 2 CSR.</td><td colspan="2">Expertise
Customer Service Standard, Electric Vehicle Systems, Types of Customers, Types of Rates, Regulatory Rules for Education and Recommendations, Using the Rate Calculator, Making Recommendations, Changing the Rate

Instructor-Led
Lecture, Role Play, Job Aids, Drive and Charge an EV
PowerPoint, Participant Guide, Videos</td><td>Entertainment
Man-on-Street Interviews with EV Customers

Recordings of Calls with Actual EV Customers</td></tr>
<tr><td colspan="4">Relationship
Collaborators and Co-Designers</td></tr>
</table>

There are several interesting design details in this LXC that align with the 8-by-8 Learning Experience Model. The role of Electric Vehicle Owner (emotional: escapism) was a key catalyst for a number of other ideas. This activity enabled CSRs to empathize with customers, in that they both shared the pleasures and excitement of driving an EV. Because CSRs had to recommend to customers a "lowest cost" electric rate (there were three to choose from) to charge an EV (rational: vision), customers needed to trust the CSR from the beginning. The shared experience of driving an EV was the focal point for that trust, so it became a key part of the plan (see the Vision box) and a key part of the tools the learning experience needed to conduct the activity (see the Access and Nuances boxes).

Providing EV services to customers was new for this organization. Thus, the desired relationship recipe was to engage customers as collaborators and co-designers. This was operationalized through the expectation that "CSR's will help refine how to talk with EV customers" (see the Vision box). Thus, in the roleplay activities (emotional: escapism/educational), the design provides ample opportunity to experiment and explore ways of communicating with customers, with debriefing to capture good practices (rational: expertise).

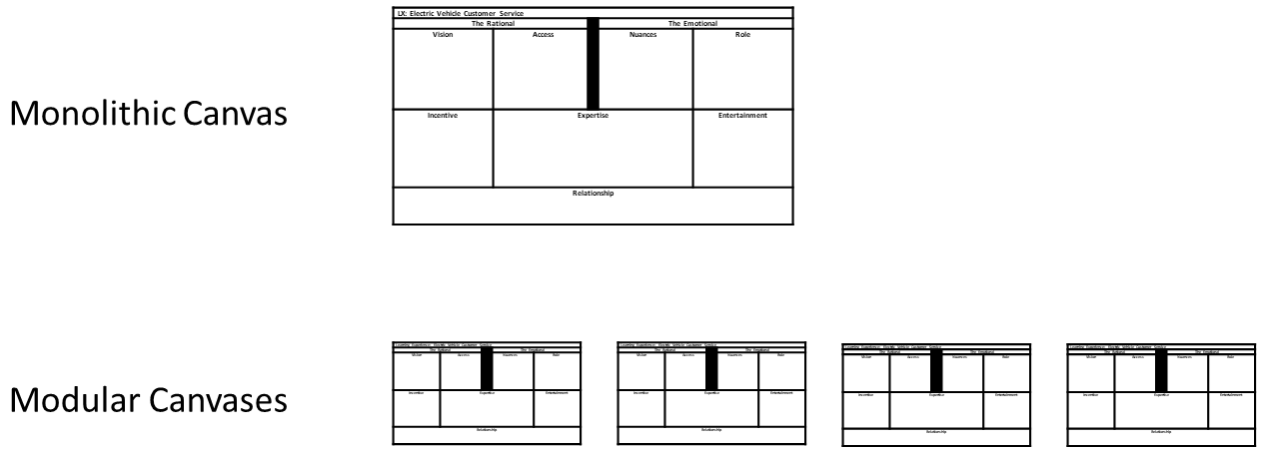
Although being assigned to the electric vehicle project was incentive enough for CSRs, the organization recently introduced new pay grades for employees linked to acquisition of new skills and competencies. Thus, the primary external reward for completing the EV training was that it counted toward earning a promotion to the next pay grade level (rational: incentive).

The challenge for designing an LXC like this one is ideating methods that entertain learners without being too gratuitous or contrived. However, participants generated some interesting ideas by freeforming off other ideas in the LXC. Based on the role of EV Owner and the customer empathy that role desired to build, the idea to have man-on-the-street interviews with EV owners (emotional: entertaining) came into being. As it turned out, CSRs had never met a real customer who owned an EV. The interviews gave them that opportunity. This also led to including recordings of calls with EV customers (and untrained CSRs) (emotional: entertaining) to better understand what it felt like to stand in the customer's shoes.

The LXC is a flexible construct. Up until now the authors have represented the LXC as a single, monolithic design of an entire learning experience. However, a designer might also use multiple LXC's, which could represent chapters, modules, units, and/or instructional objectives. Thus, as shown in Figure 19, a designer can create multiple modular LXC's, similar to a storyboard, to capture smaller parts of the design.

Figure 19

Monolithic Versus Modular Canvases

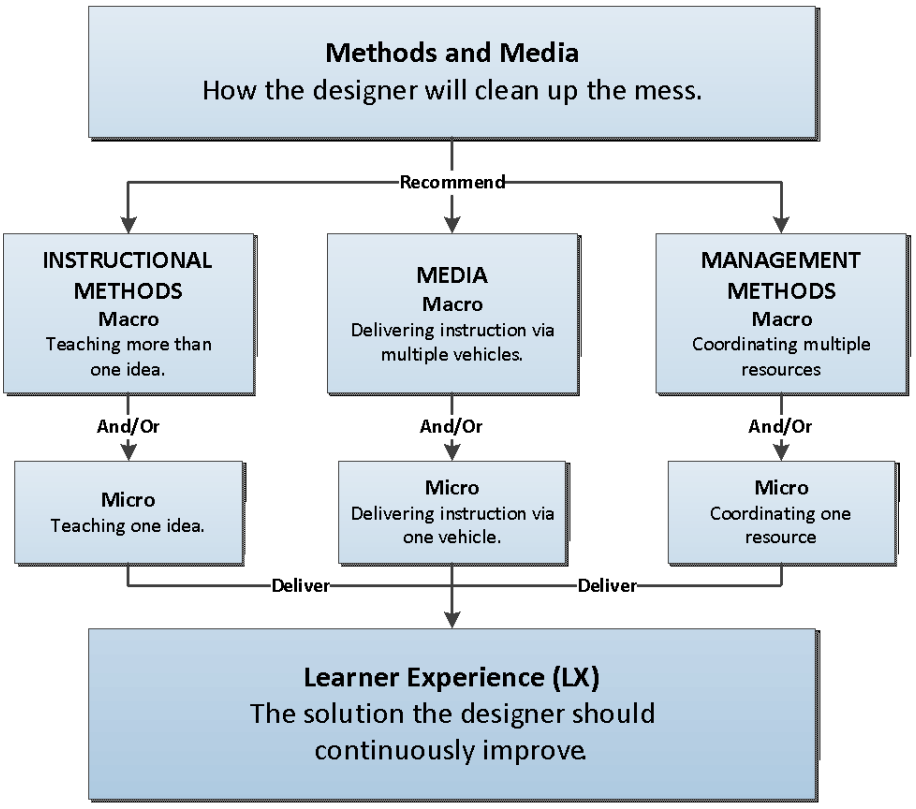


Note. The LXC can be monolithic or modular, depending on the size and scope of the designed learning experience.

Ultimately, the LXC's usefulness, in whatever form, informs downstream design tasks. This is when the Methods and Media part of the ITF comes into play (Figure 20).

Figure 20

The Lower "THEN" Section of the ITF



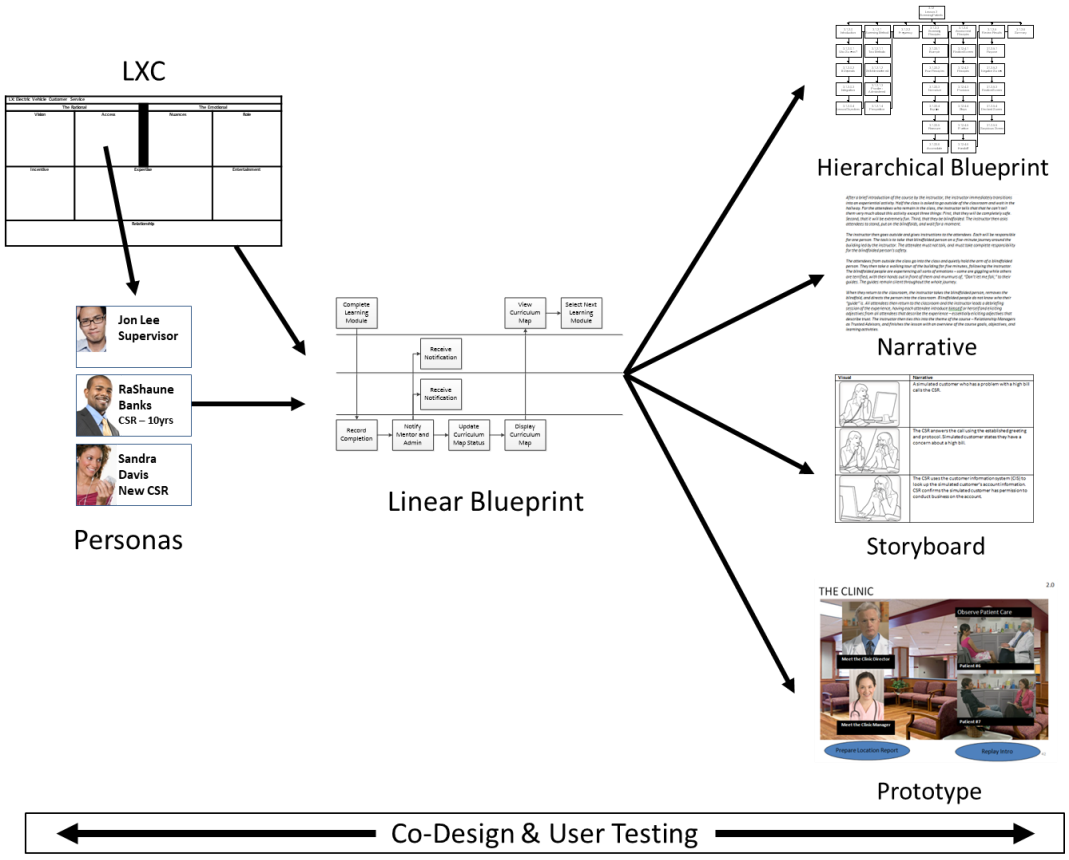
(Honebein & Reigeluth, 2021; Honebein & Reigeluth, 2020; Beese, 2020; Schmidt, Tawfik, Jahnke, & Earnshaw, 2020; IIBA, 2015; Gibbons & Rogers, 2009; Reigeluth & Carr-Chellman, 2009; Reigeluth & Keller, 2009; Briggs, 1984; Mager, 1984)

Note. Data from the LXC informs the selection of instructional methods, media, and management methods, which ultimately results in a functional learning experience.

As shown in Figure 21, the LXC's data informs detailed personas and a swim-lane-style[6] linear blueprint to establish the learning experience's content sequencing and timing. The designer may then push the linear blueprint to more detailed hierarchical blueprints, narratives, storyboards, or prototypes. The designer can then refine and test the elements via co-design activities (which involves content experts, instructors, and/or learners) and user testing (Carr, 1997; Durall et al., 2020; Honebein & Cammarano, 2005; Malinverni et al., 2016).

Figure 21

This Diagram Illustrates the Flow of LXC Data to Other Design Elements and Activities



Note. The data enable designers to improve personas and build linear and hierarchical blueprints, narratives, storyboards, and prototypes that designers can refine via co-design and user testing.

Co-design involves designers working collaboratively with stakeholders and users (funders, colleagues, learners, subject-matters experts, technical specialists, and so on) to contribute to the design of a learning experience. The key benefit of co-design is the faster adoption of possible design solutions. Through the co-design process, groups can review, revise, and improve the variety of design artifacts (Figure 21) generated by members of the group. When promising ideas emerge, the group can recruit members of the target audience, who then user-test prototypes. The data that the group collects from these user tests then guide design decisions and/or further design iterations.

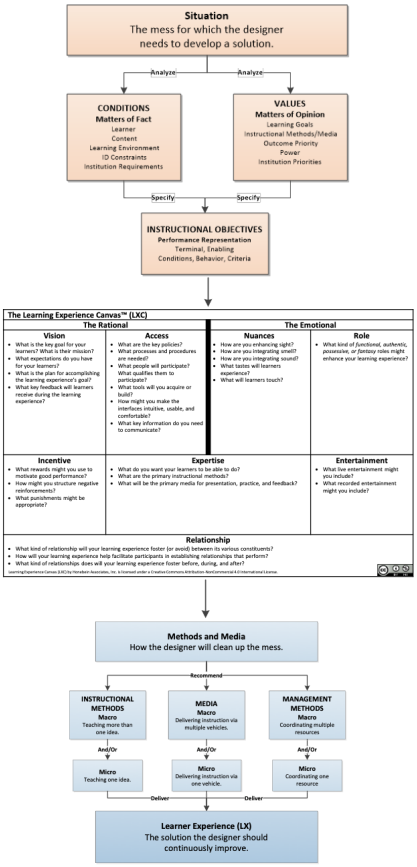
Conclusion

This article introduced the LXC, a learning experience design model that is compatible with the ITF. By "plugging-in" the LXC between the IF and THEN parts of the ITF, designers can better balance the effectiveness, efficiency, and appeal outcomes of their learning experience. When designers use the LXC early in their design work, they can elicit from stakeholders both rational and emotional qualities that lead to creative 8-by-8 instructional design solutions that deliver flow, transmergence, and loyalty.

Designers can think of the LXC as an optional plug-in design theory that is compatible with the ITF. The LXC overlaps situational analysis and the selection of instructional methods, media, and management methods (Figure 22). The desired outcome for using LXC is a tighter balance between effectiveness, efficiency, and appeal outcome variables.

Figure 22

The LXC is a Design Bridge Between Two Core ITF Constructs: Situation and Instructional Methods, Media, and Management Methods



What the LXC adds to the ITF is a bridge between analysis and design via rational and emotional constructs. The rational constructs are vision, access, incentive, and expertise (Honebein & Cammarano, 2005). The emotional constructs are the realms associated with entertaining, educational, escapist, and esthetics (Pine & Gilmore, 1999). Originally developed in customer experience (CX) contexts, both the Coproduction Experience Model and Experience Realms Model are useful when applied to designing a learning experience.

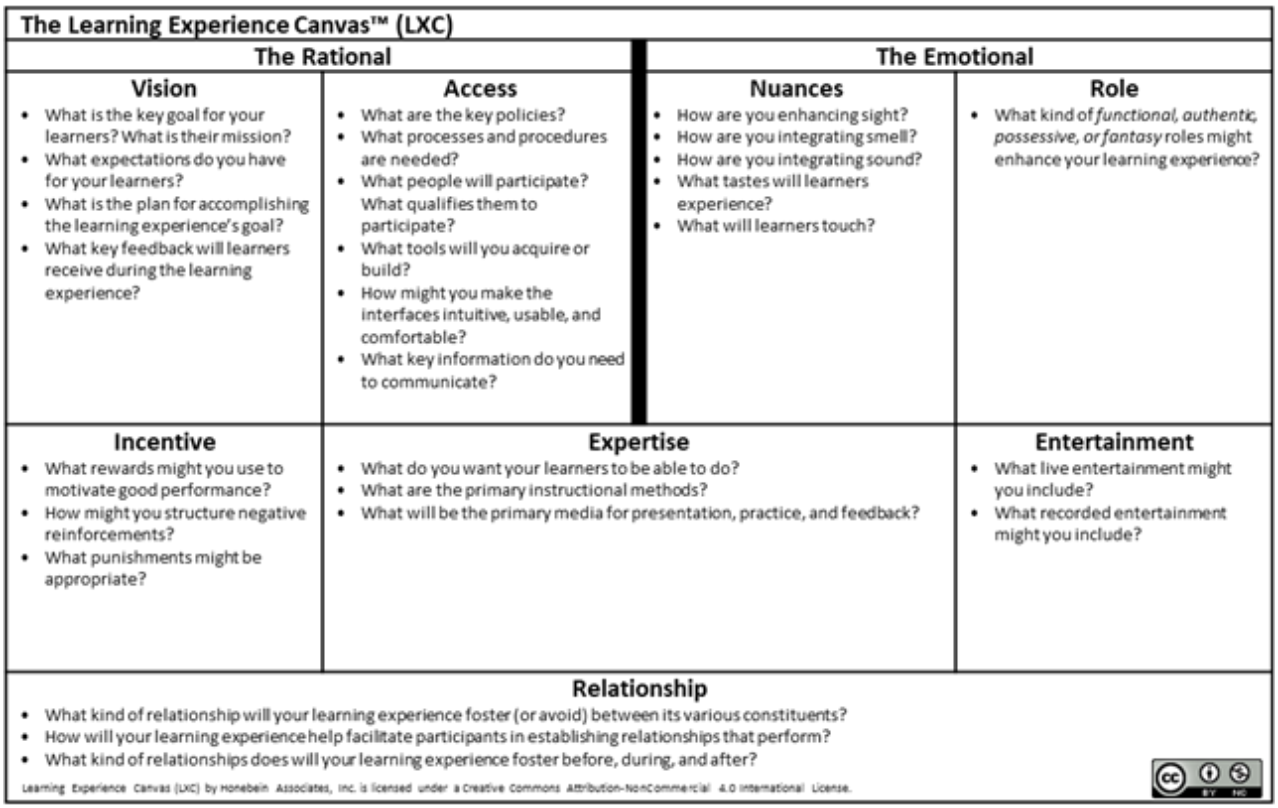
Eclecticism (Honebein & Sink, 2012) and situationism (Reigeluth & Carr-Chellman, 2009) are guiding forces in instructional design. This means that the LXC can accommodate both traditional instructional design and LXD. For example, the facilitator or participants can use the LXC's Expertise box to function as a time machine that can bring forth useful, fundamental ideas from the past related to the type of instructional objectives that best fits the situation (i.e., Briggs, 1984; Gagne, 1985; Mager, 1984). Similarly, the LXC's Access box can blend with sociotechnical-pedagogical dimensions (Jahnke et al., 2022) to combine certain tools, interfaces, and people in a way that enables foundational LXD structures.

Additional Resources

LXC Job Aid Template (PPT)

LXD Job Aid Template (PDF)

Example of a Completed Learning Experience Canvas™



The Learning Experience Canvas™ (LXC)

The Rational

Vision

- What is the key goal for your learners? What is their mission?
- What expectations do you have for your learners?
- What is the plan for accomplishing the learning experience's goal?
- What key feedback will learners receive during the learning experience?

Access

- What are the key policies?
- What processes and procedures are needed?
- What people will participate? What qualifies them to participate?
- What tools will you acquire or build?
- How might you make the interfaces intuitive, usable, and comfortable?
- What key information do you need to communicate?

The Emotional

Nuances

- How are you enhancing sight?
- How are you integrating smell?
- How are you integrating sound?
- What tastes will learners experience?
- What will learners touch?

Role

- What kind of *functional, authentic, possessive, or fantasy* roles might enhance your learning experience?

Incentive

- What rewards might you use to motivate good performance?
- How might you structure negative reinforcements?
- What punishments might be appropriate?

Expertise

- What do you want your learners to be able to do?
- What are the primary instructional methods?
- What will be the primary media for presentation, practice, and feedback?

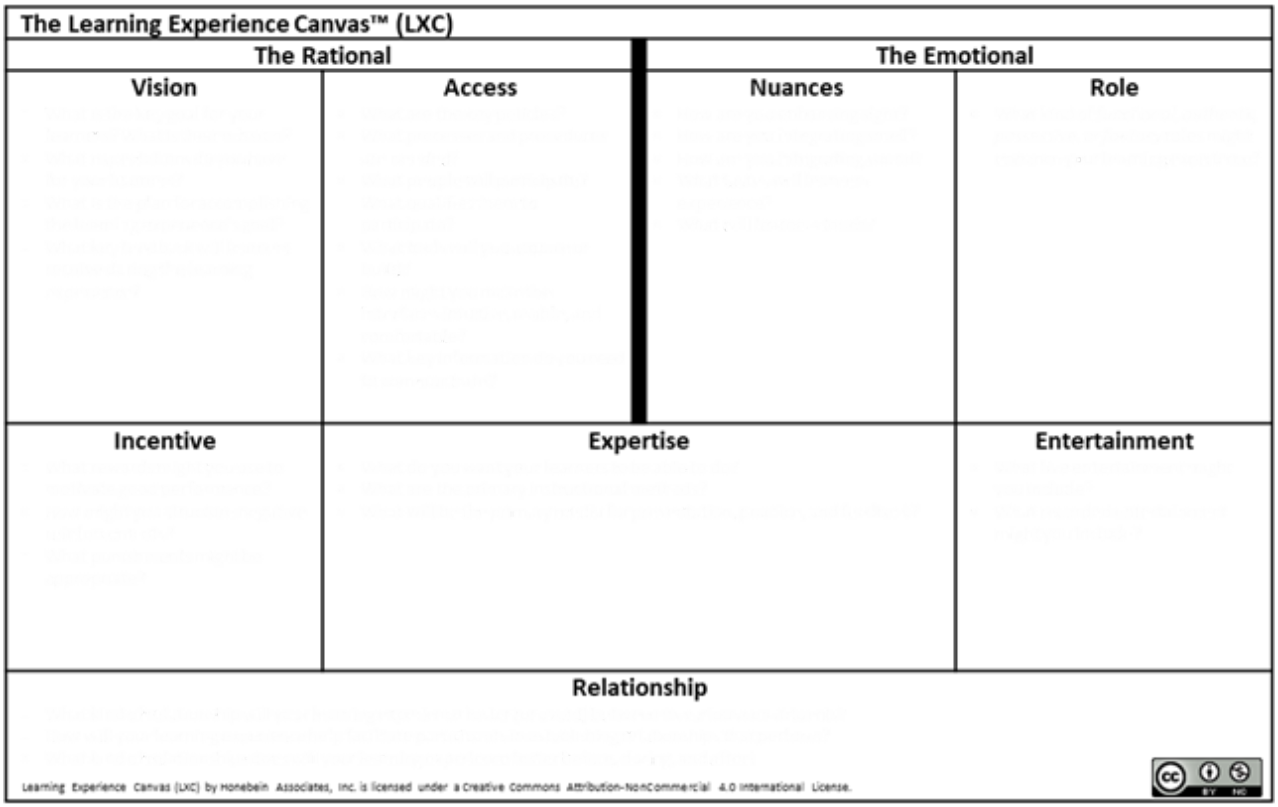
Entertainment

- What live entertainment might you include?
- What recorded entertainment might you include?

Relationship

- What kind of relationship will your learning experience foster (or avoid) between its various constituents?
- How will your learning experience help facilitate participants in establishing relationships that perform?
- What kind of relationships does will your learning experience foster before, during, and after?

Blank Learning Experience Canvas™



The Learning Experience Canvas™ (LXC)

The Rational

Vision

Access

The Emotional

Nuances

Role

Incentive

Expertise

Entertainment

Relationship

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[1] Readers who are not familiar with the Instructional Theory Framework should pause their reading of this paper and learn more about the Instructional Theory Framework. EdTechBooks provides two open-access chapters on this topic: Making Good Design Judgments via the Instructional Theory Framework

(https://edtechbooks.org/id/making_good_design) and How Do We Solve a Problem Like Media and Methods? (https://edtechbooks.org/foundations_of_learn/also_32_media_method).
[2] The seven goals are:

1. Provide experience with the knowledge construction process;
2. Provide experience in and appreciation for multiple perspectives;
3. Embed learning in realistic and relevant contexts;
4. Encourage voice and ownership in the learning process;
5. Embed learning in social experience;
6. Encourage the use of multiple modes of representation;
7. Encourage self-awareness of the knowledge construction process.

[3] "Fuzzy vision" is a phrase coined by Reigeluth and An (2021) that represents top-level instructional design featuring analysis, design, and evaluation (ADE). ADE involves, at a big picture level, content, sequencing, instructional methods, and delivery (media).

[4] Learner personas are fictional characters that designers create during situational analysis. These personas represent the expected target audience for an LX. Personas are typically shown as photographs of people with a backstory associated with the instructional situation. Personas help designers understand and empathize with their audience.

[5] Affinity mapping is the process of taking a bunch of ideas, typically written on sticky notes, and then grouping the ideas based on similarities.

[6] In process mapping, a swim lane defines the tasks that a specific stakeholder performs in a process.

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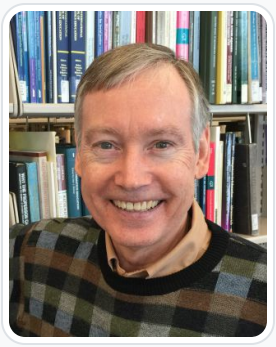
Dr. Peter C. Honebein, co-founder and managing director of the Customer Performance Group, focuses his career on researching, designing, and developing innovative employee and customer performance improvement solutions in wildly different contexts for high priority, high visibility initiatives. Peter's clients are C-level executives, seasoned managers, and visionary entrepreneurs who appreciate creative evidence-based methods, systematic process, collaborative engagement, influential thought leadership, and speed. As a thought leader in the field, Peter was editor-in-chief from 2016 to 2018 of ISPI's monthly journal, *Performance Improvement*, and has served as an adjunct professor at Indiana University, Boise State University, and University of Nevada, Reno, teaching graduate classes in instructional theory, instructional strategy, human performance technology, evaluation, marketing, and customer experience. He publishes in both peer-reviewed and non-peer reviewed journals, receiving AECT/ETR&D's Outstanding Research Reviewer Award in 2016 and 2020 and the AECT Research and Theory Division Outstanding Theoretical Journal Article Award in 2021. Peter authored the books *Strategies for Effective Customer Education and Creating Do-It-Yourself Customers*, both published by the American Marketing Association. Peter received his Ph.D. in instructional systems technology from Indiana University and currently resides in Reno, NV.



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Charles M. Reigeluth is a distinguished educational researcher and consultant who focuses on paradigm change in education. He has a B.A. in economics from Harvard University, and a Ph.D. in instructional psychology from Brigham Young University. He taught high-school science for three years, was a professor at Syracuse University for 10 years, was a professor at Indiana University for 25 years, and is currently a professor emeritus in the School of Education at Indiana University. While at Indiana University, he facilitated a paradigm change effort in a small school district in Indianapolis for 11 years. His latest books are *Instructional-Design Theories and Models, Volume IV: The Learner-Centered Paradigm of Education* (www.reigeluth.net/volume-iv), *Vision and Action: Reinventing Schools through Personalized Competency-Based Education* (www.reigeluth.net/vision-and-action), and *Merging the Instructional Design Process with Learner-Centered Theory: The Holistic 4D Model* (www.reigeluth.net/holistic-4d). They chronicle and offer guidance for a national transformation in K-12 education to the learner-centered, competency-based paradigm. He offers presentations and consulting on this topic..

Learning Experience Design as an Orienting Guide for Practice: Insights From Designing for Expertise

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Instructional Design | Learning Experience Design | Educational Simulations | Expertise | Playable Case Studies

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In this paper we consider how learning experience design (LXD) improves designers' capacities to influence learning. We do this by exploring what LXD offers the design of learning environments that help develop learners' expertise. We discuss how LXD (a) attunes designers to different learning affordances than are emphasized in traditional ID; (b) challenges the universal applicability of common ID techniques; and (c) expands designers' views of the outcomes for which they can design. These insights suggest that LXD is useful because it refocuses and reframes designers' work around flexible design approaches that are often deemphasized in traditional ID.

Introduction

In this paper we examine a central claim of learning experience design (LXD). Uniting the disparate definitions of LXD is the assertion that designers should be informed by more than only the knowledge base upon which instructional design (ID) has traditionally been built. In addition, designers should remix such established techniques with theories, models, or methods drawn from the rich heritage of other experiential design fields, particularly human-computer interaction (HCI) and user experience (UX) design (Schmidt & Huang, 2022). The claim is in doing this, designers will have improved capacity to influence learning in all its forms. Of course, this still provides considerable variation in what learning experience (LX) designers might do day-to-day. To some, LXD resembles HCI with a dominant focus on designing interactions with learning affordances (e.g., Schmidt et al., 2020). To others, it appears quite similar to conventional ID, with some additional techniques to solve particular learning challenges (e.g., Reigeluth & An, 2023). In our view, all such alternatives are acceptable, because at their core they can all offer a differing orientation towards the intersection of design and learning, meaning they can attune designers to different opportunities, challenges, patterns, or values than those highlighted by traditional ID theory and practice (cf. McDonald, 2022).

With this in mind, we also consider Jahnke et al.'s (2022) recent claim that "LXD sits alongside ID ... as a complementary approach to design for learning" (n.p.). In this view, it seems that LXD improves designers' capacities by

augmenting ID, without completely replacing it. Yet in a practical sense, what does this mean? Understanding how LXD complements ID seems essential if one is to also understand how LXD improves designers' capacities to influence learning. Thus, Jahnke et al.'s statement provides the focus of our paper. In what ways does LXD complement more conventional ID practice? We explore this issue by examining a specific case of learning design that can act as a paradigmatic example (Flyvbjerg, 2001), the common educational goal of supporting learners along their journey from novice to expert. We focus on what LXD offers designers when they design for expertise and how this contrasts with traditional ID. Doing this will provide insights into how LXD supports designers' attempts to improve learning.

Our exploration of this topic consists of four parts. First, we review typical ID approaches for developing expertise. We then contrast those with additional practices LXD contributes towards the same goal, illustrated with examples of how LXD has influenced the design of a genre of educational simulation at our university. The value of our case is that it clarifies how LXD offers an expansive set of practices for designers to structure learning environments—practices that, while not stressed as often in more traditional ID approaches, can still be used in conjunction with them. LXD (a) attunes designers to different kinds of learning affordances than are emphasized in traditional ID; (b) challenges the universal applicability of common ID techniques; and (c) expands designers' views of the outcomes for which they should be designing. In this sense, LXD—even with its practical and philosophical diversity—provides an orienting guide for practice, not as "an external storehouse of knowledge, or rule-like system for professionals to apply," but because it offers "an orienting aid that supports practitioners as they refine their personal capacities for perception, discrimination, and judgment" (McDonald, 2022, p. 29). We conclude by discussing how this view of LXD can strengthen designers' practice.

Traditional ID Approaches for Developing Expertise

Traditionally, models of developing expertise have focused on the measurable abilities of accomplished performers: their knowledge and skills, problem-solving abilities, deliberative capacities, and so on (for general reviews see Ericsson et al., 2018). What defines an expert, in these views, is they have acquired more information and skills than the non-expert, and they have developed greater competence at following the rules and processes that govern a given domain. There is an intuitive appeal to this; clearly, experts can do more than novices, do it faster, with a more refined sense of finesse, or all of these at once. Such differences suggest that experts possess something that novices do not, whether that be cognitive capacities, physical prowess, or other abilities that can be defined and quantified.

Further, since experts were not always experts, there must be a process by which they achieved their status. Consequently, ID approaches for nurturing expertise usually focus on helping people acquire whatever identified capacities are missing from their current repertoire of knowledge or ability. In Fadde and Sullivan's (2020) review of how ID supports the development of expertise, they summarized the broad consensus of how instructional designers can accomplish this, "deliberate practice that is directed by a coach, targets specific skills to improve performance, provides timely feedback and repetition to refine target skills, and is effortful rather than inherently enjoyable" (p. 53; emphasis removed). These approaches are intentionally interdependent. For example, deliberate practice is improved when a teacher, trainer, or coach scaffolds the learning process by helping learners to set achievable goals (Ericsson, 2008). And while it is important for learners to practice, integrated feedback is equally important, as it provides targeted instructions for improvement (Horn & Masunaga, 2006).

Numerous studies have provided empirical evidence for these design approaches (for a review see Ericsson, 2009). ID researchers have, therefore, systematized them into models for designers to follow, enabling learners to develop their expertise in an efficient manner. Fadde and Sullivan (2020) described some notable examples, including the ExPerT model, based on a procedure for modeling expert performance and developing training based on those models:

> *(1) identifying expert performers and representative tasks that capture the essence of expert performance in natural settings, (2) devising tasks to study under controlled conditions using process methods such as eye-tracking and think-aloud protocol to identify cognitive mechanisms of expert performance, (3) tracing the developmental history of experts to ascertain when and how they acquired mechanisms of expertise,*

> *(4) developing deliberate practice activities based on the representative tasks, and (5) reiteratively assessing training effectiveness and setting new performance goals. (p. 62)*

Another example, the ShadowBox method, relies on "input from experts . . . to create realistic scenarios," which are then used as the basis of a training framework for learners to analyze, explore options, and reflect on their own performance as they compare their ideas/actions to those of recognized experts (p. 63).

Systematic reviews of designing for expertise indicate that common to most of these approaches are ID processes and techniques that are similar to those designers apply when pursuing any other learning goal (for some counterexamples, however, see C. Miller & Hokanson, 2009; Tracey, 2016). For instance, ID processes for developing expertise typically begin by interviewing or observing people to create explicit models of expert performance that include the rules or heuristics experts follow, the conditions of success they rely upon, and so on (Ericsson, 2008). These models are based on observable activities in which experts engage (Clancey, 2006), and knowledge (facts, concepts, etc.) they either directly report they possess, or that observers derive from studying their actions (Hoffman & Lintern, 2006; Schraagen et al., 2006). And most often, designers will also define specific learning goals in advance, towards which all instructional activities and assessments are aligned (Fadde & Sullivan, 2020).

LXD Practices for Designing for Expertise

Since traditional ID approaches have provided these kinds of proven techniques for developing expertise, what more could LXD offer? One answer is found in how LXD nurtures additional dimensions of expertise than those typically cultivated through common ID practices. The careful, scientific foundation of the traditional approaches have clearly been valuable when designing learning environments. However, much of the scholarship grounding such techniques has intentionally bracketed out aspects of expert performance that cannot (or at least cannot easily) be objectively measured (Ericsson, 2009). Yet, based on the work of philosophers like Dreyfus (2014) and Wrathall and Londen (2019), it has become clear that there are at least three other dimensions of expertise that elude our ability to measure in controlled, laboratory-like conditions: (a) expertise cannot be completely defined using rules or procedures; (b) expert performance cannot always be predicted in advance; and (c) there is an important role that affect and emotion play in expert response. At least some LXD practices are compatible with these philosophical views, and thus will be able to support the design of learning environments that are consistent with an expanded perspective on the nature of expertise.

As we explore LXD practices that align with these dimensions of expertise, we illustrate each by describing how they have been implemented in a specific learning environment: a type of educational simulation called a playable case study (PCS). Modeled on what is known as alternate reality gaming (Bonsignore et al., 2013), a PCS supports students' cultivation of various forms of professional expertise (e.g., cybersecurity, technical writing) as they interact with fictional professionals and perform authentic job tasks (Balzotti et al., 2022; Giboney et al., 2021). The simulations implement numerous features that are compatible with the expanded view of expertise described above. The PCS design team also included instructional designers along with designers from other fields like HCI and UX design; together they negotiated a joint practice grounded in the flexible and human-centered traditions found in the LXD literature, along with others more commonly found in ID, HCI, and UX (all of which strongly influence the development of LXD; see Schmidt & Huang, 2022). Both reasons suggest the value this case has for understanding how LXD can support designers as they structure effective learning environments.

We do not claim, however, that traditional means of nurturing expertise are less important than the examples we present. Instead, we are interested in how LXD can expand the possibilities designers have, enabling them to address more aspects of learners' expertise than are addressed through other means. Neither do we claim it is impossible for creative designers to use common ID approaches for the ends we describe. Since instructional design is an imaginative enterprise (cf. Nelson & Stolterman, 2012), we acknowledge that motivated and skilled designers can achieve their goals using nearly any approach, even if certain approaches require more work to do so than others. Our focus, instead,

is on how LXD practices might promote, or otherwise legitimize, the pursuit of an expanded view of expertise, where traditional ID may overlook or deemphasize such aims.

LXD Focuses on Different Learning Affordances than Traditional ID

LXD practices for nurturing expertise when it cannot be defined using formal rules helps illustrate how LXD attunes designers to different kinds of learning affordances than are emphasized in traditional ID. This becomes evident when one recognizes that common ID techniques for developing expertise rely on the presumption that experts are very skillful in internalizing the rules and mental models governing a domain, and by so doing, are able to unconsciously retrieve information, process it, and solve situational problems quickly (Jonassen, 2000). But even though a novice may very intentionally apply rules to make decisions or solve problems, this does not imply that experts use the same rules, only faster or better. As Wrathall (2014) stated, "agents who possess different levels of skill are, in a very real sense, engaged in different kinds of activities" (p. 4). Some aspects of expertise just cannot be defined in rule-like ways. As White (2020) described, "it is not that the expert is simply unaware of the rules underlying her decision process. Instead, through vast experience, the expert has great situational understanding that is not grounded in (and is not reducible to) rules" (p. 225). Instead of rule-following, information processing, or other forms of deliberate reasoning, what seems to actually happen is experts experience situational "solicitations," or "attractors," that "draw" out of them an appropriate response, when cognitively they may have barely had time to register what is happening in at all (Wrathall & Londen, 2019, p. 659; see also Dreyfus, 2014).

It is the case that the existing ID knowledge base does include some strategies to hone learners' abilities in identifying situational attractors and mimicking an expert's response, regardless of whether they know the formal rule structure being applied. One is to present learners with numerous examples of skillful action so they can become more sensitive to important cues. Another is for learners to experience simulated environments (either live or recorded) where they observe/interact with models of both skillful and non-skilled performance (see reviews of research on both strategies in Fadde & Sullivan, 2020). Prior research has also provided IDs with guidance on designing visual interfaces to present examples, often from a cognitive perspective to reduce cognitive load (Mayer & Moreno, 2003), or pull learners' attention towards a relevant section of the display (Betrancourt, 2005).

LXD offers more than is available through these kinds of practices, however. Some LXD practices address different interface affordances than those highlighted by typical ID processes; these are important for helping people learn to respond to situations in contextually sensitive ways *without* applying formal decision-making processes. Often, such affordances are related to LXD's sensitivity to the sociocultural nature of learning (Jahnke et al., 2022; Schmidt & Huang, 2022). Of course, sociocultural views are not unheard of in traditional ID, but they do tend to be subordinated to the perspective that learners' individual cognition is the ultimate foundation of learning, which sociocultural factors in turn augment or support (McDonald & Yanchar, 2020). But LXD draws from traditions, like HCI, that center the sociocultural (Gray, 2020), opening the possibility of treating learning as a fundamentally different phenomenon than a change that happens within an individual's mind. Because of this, LXD practices can attune designers to aspects within a learning environment that are highly relevant to learning's sociocultural dimensions, but that are often deemphasized by ID practices that are foremost concerned with optimizing instruction to align with learners' cognitive processing mechanisms. Such dimensions are crucial when a primary goal is to help learners become capable of intuitively responding to situational saliences without making conscious decisions about what rules to apply. This is because they affect how "aspects of the world will show up in . . . ways" that are relevant for learners to become immersed in a community of practice to the point of allowing for intuitive response (Yanchar & Francis, 2022, p. 201).

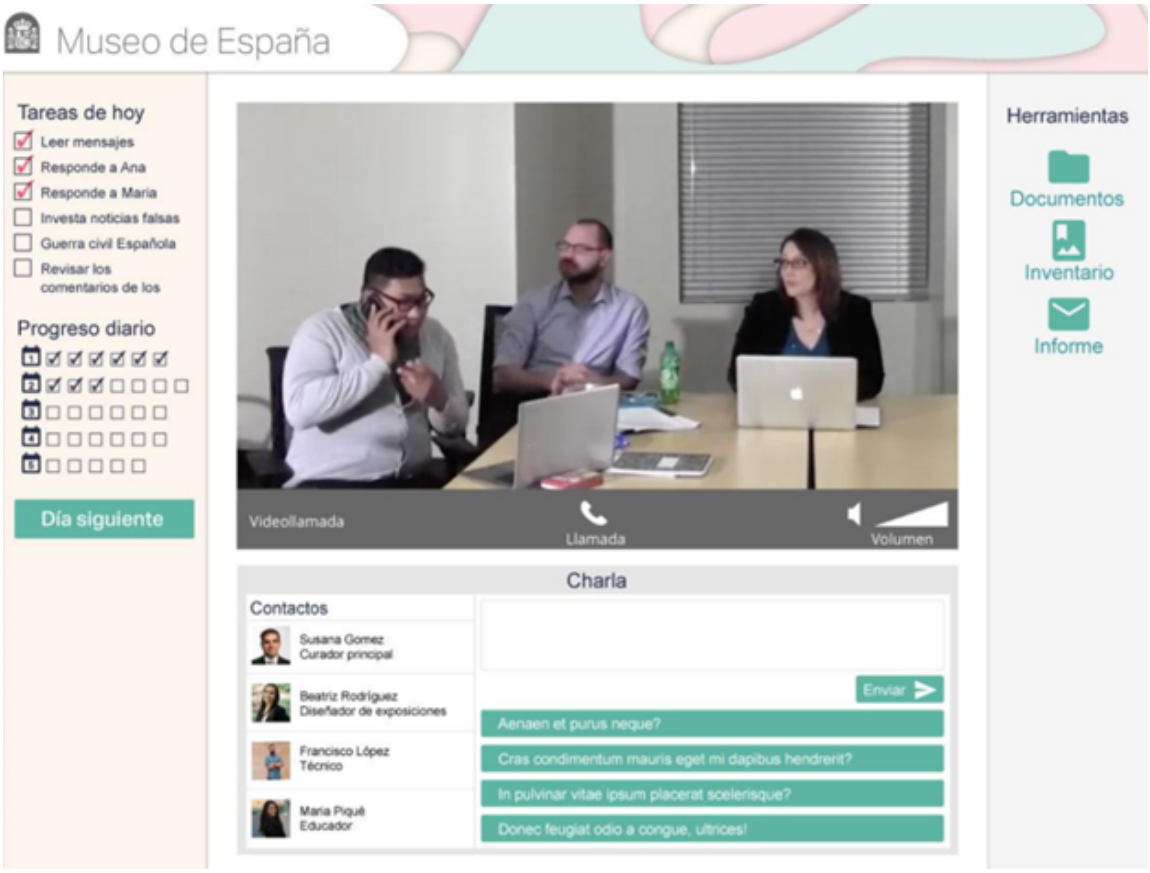
Two examples help illustrate. First, Kimmons (2020) summarized research demonstrating the role that color plays in establishing the meaning of a learning experience. In addition to more cognitive factors, like its ability to draw attention to certain elements within an interface, color is also part of an experience's referential structure, where what one element means is at least partly defined by its relationship to other elements. Thus, whether something within an interface matters to a learner, along with how it matters, can be influenced by the colors associated with it. Designers can use both the cognitive *and* referential affordances of color to help people understand relevant situational details associated with expert response. The cognitive can focus learners' attention towards a situational factor that may not

be immediately evident, while the relational encourages learners' positive attitude towards expert performance. Second, Jahnke et al. (2020) discussed how pedagogical usability includes more than evaluating interfaces for individual psychological factors like their cognitive load, or the simplicity of their controls. In addition, an interface is most pedagogically sound when interface elements lend themselves towards the "socio-technical" aspects of learning—like the tacit messages an interface communicates about the importance of a topic, or learners' abilities to succeed—because such affordances impact how nearly everything else within the learning experience is interpreted.

PCS designs help illustrate these kinds of sociocultural affordances. For example, West's (2019) design case of a museum experience PCS (Figure 1) described the work of creating a visual interface with "museum inspired branding and . . . controls" (p. 18), to encourage students to suspend disbelief in the simulation's artificiality, and thereby pay more attention to the subtle details of simulated interactions within the narrative. It also encouraged students to adopt the identity of a professional who was already a member of the community of practice, not as a student completing an assignment in a classroom. Designing this interface required careful attention to the "affordances represented by icons, colors, and shapes" (West, 2019, pp. 18–19), as well as many other elements including video and sound design. The intent was that these affordances would qualitatively change the way students interacted with simulated characters and tasks, so they became sensitive to important situational cues based on the consequences they experienced, without being formally instructed in a set of rules and principles (cf. Bonsignore et al., 2013). The design approaches to accomplish this could properly be considered LXD practices, since the team intentionally drew on HCI, UX, and graphic design techniques alongside others more commonly found in ID. Using these, the team was able to address socio-technical factors associated with usable interfaces, in conjunction with factors more typically addressed in ID theory, to support the broad learning purpose the interface was aiming towards.

Figure 1

Draft PCS Interface Design. From West, D. (2019). Spanish civil war museum exhibit: Five-day playable case study (PCS). Master's project manuscript, Department of Instructional Psychology and Technology, Brigham Young University, Provo, Utah. Retrieved from https://scholarsarchive.byu.edu/ipt_projects/18. (CC BY-NC-ND 3.0)



LXD Challenges the Universal Applicability of Common ID Techniques

LXD practices for nurturing expertise when it cannot be predicted in advance helps illustrate how LXD can challenge the universal applicability of common ID approaches, showing how they may not be useful or helpful in some contexts. One of the presumptions of the expanded view of expertise presented here is there are situations where an expert's response is not necessarily based on widely accepted definitions of skillful performance (Dreyfus, 2017). Experts may differ on what a proper response is, or even the same expert may perform differently at different times. Consider an author writing her latest masterpiece; at least in part, her expertise may lie in how unique her book is when compared to her contemporaries, or with what she wrote previously. It may also be that an expert reinvents the domain of expertise, so that previously "marginal" practices that were once viewed as deficient become the new standard (Dreyfus, 2017, p. 44; see also Wrathall & Londen, 2019). In cases such as these, as Ericsson (2006) pointed out, "it is rarely possible to identify and study scientifically the key factors that allowed these people to produce [their] achievements" (p. 13). While some scholars attempt to study these forms of expertise through proxy measurements (Ericsson & Smith, 1991), it is likely such proxies only operationalize aspects of expertise that are easy to articulate and model. This means they will omit some aspects of true expert performance.

Given the widespread acceptance in ID that design begins by setting precise, measurable objectives for student learning, not being able to always specify in advance what constitutes an expert response can present difficulties for designs meant to develop expertise. How can designers write measurable performance objectives if some of the standards they hope to achieve are unknown before they begin? While some researchers have attempted to provide alternatives that address this challenge (Gibbons et al., 1995; McCreary, 2022), these have not achieved widespread adoption, as evidenced by how frequently designers are still directed to write specific objectives in popular guides to instructional design (e.g., Curry et al., 2021; Dick et al., 2022; Dirksen, 2016).

LXD practices offer another alternative to the traditional technique of writing specific learning objectives. As described by Chang and Kuwata (2020), this consists of redefining the "learning problem" away from being a matter of "what do learners need to know and do," towards "how do we support learners in negotiating [their own] meaning" from a learning experience. Implied in this statement is that, at times, it may be acceptable for designers to *not* direct their efforts towards a specific, predefined set of knowledge or skills. Some experiences may be valuable even if we cannot state in advance what learning will occur, and perhaps even if there is variability between what students achieve. The alternative to predefined learning objectives is not necessarily chaos; LXD proposes that it is possible to design for a broad, directional aim (e.g., an experience to cultivate management expertise) without demarcating exactly what that means (such as, students will be able to explain the six factors of management success). Given the field's current interest in LXD, perhaps this attempt to challenge the universal value of predefined learning objectives will have more lasting effects than earlier efforts.

This approach of setting a directional aim but not defining every learning objective students will achieve has been used in the design of PCS environments. Basic to the PCS design is that it is valuable for students to experience failure in the simulated tasks they complete, even though different students will experience failure in different ways, and what they learn from failure is not specified in advance. As Arrington and Tawfik (2022) noted, under certain conditions learning from failure "can be just as beneficial if not more beneficial than the traditional [success-oriented] methods" (p. 67). Of course, failure can also be overwhelming and discouraging, so the learning experience should be scaffolded such that failure promotes change and further development instead of becoming an unhelpful struggle. LXD practices are meant to provide this structure. McDonald et al. (2021) described how the PCS team accomplished this in one simulation focused on municipal infrastructure management. By applying UX techniques for immersive learning, the team defined features like types of failure students could experience, the level of challenge different kinds of failure represented, narrative elements to communicate failure, and how the simulation would respond when students failed in different ways. Taken together, all of these features created a flexible experience where the possibility of failure existed but was not predetermined, and where if students did fail it was not a condition from which they could not recover. The space structured by all of these interactions provided more opportunities for students to learn something personally meaningful for their individual path towards expert performance than could have been provided by attempting to define all of those possible outcomes in advance.

LXD Expands Designers' Views of Learning Outcomes

LXD practices for nurturing the affective and emotional dimensions of expertise helps illustrate how LXD expands designers' views of the types of outcomes for which they can legitimately design. Whereas many traditional approaches for developing expertise assume it is primarily a cognitive or a skill-based state, just as important is the emotional dimension of expertise, described by Wrathall (2019) as a kind of "taste" (p. 25) that experts develop. Experts feel there are right, better, more appropriate, or more valuable ways of participating in the domain of their expertise when compared to alternatives. They come to value what experts in that domain should value (see also the related notions of deliberated offhand judgment, compositional judgment, and connoisseurship in Nelson & Stolterman, 2012). Beyond this, as noted earlier, even in routine choices it appears that experts often "feel . . . the affordances of a situation" rather than consciously notice and deliberate about options (White, 2020, p. 227). They respond so as to "relieve . . . the feeling of tension" experienced when their circumstances are not in equilibrium, more than to satisfy any cognitive criteria of success (Wrathall & Londen, 2019, p. 659). These affective dimensions affect experts' actions as much as their more measurable knowledge or skills; yet even with the possibility of studying experts' taste through surveys or interviews, researchers' ability is limited to precisely measure how taste affects performance. Consequently, such aspects are typically set aside in scientific studies of expertise.

Consistent with this, typical ID processes seem to primarily focus on the cognitive and psychomotor aspects of expertise (Fadde & Sullivan, 2020). Of course, instructional designers have long been aware of the affective domain and have explored how to address it in learning environments (Honebein & Honebein, 2015; Martin, 1989; Price, 1998). But often the approaches they adopt seem to be an add-on to their emphasis on cognitive and skill-based dimensions (M. Miller, 2010; Pierre & Oughton, 2007). In contrast, LXD often centers the affective dimension, thus opening possibilities for designers to better attend to such aspects of experts' performance. Central to LXD is an emphasis on the emotional

aspects of experience, and how designers should be sensitive to experiential elements that affect people's emotion (Jahnke et al., 2022; Oprean & Balakrishnan, 2020). Much of the current LXD discourse focuses on whether learning experiences are enjoyable and pleasurable. But it also appears possible to encourage the emotions associated with expert performance, where performers are oriented towards what are the better, preferred, or somehow correct ways of participating in a domain (Park & Lim, 2019). Indeed, such aims already seem legitimized in some of the design traditions from which LXD has drawn insights (see So, 2019; Yilmaz & Seifert, 2011).

The PCS genre provides a suggestive possibility for learning designs that help people develop their dispositional tastes within a domain, meaning their sense of what are the more- or less-preferred ways of acting. Neupane et al. (2021) reported the design of one PCS meant to help students cultivate professional dispositions exhibited by cybersecurity experts, including their commitment to adhere to professional codes of ethics. The goal was not only for students to take the correct actions, but also to be moved by relevant situations, feeling even in a minor way the professional pride experts have when making a correct choice, or, if they erred, that they had an obligation to modify their behavior to align with disciplinary standards.

To do this, the simulation introduced a dilemma: if a trusted colleague told them it was okay, would students violate a service agreement with a company and hack a computer system that was out of scope? (Figure 2) Using UX principles developed in the genre of alternate reality gaming to design compelling narratives (Bonsignore et al., 2013; McDonald et al., 2019), the simulation attempted to create emotional dissonance for the students, where, as Dreyfus (2014) put it, they would have to "[wrestle] with the question of a choice . . . [feel] responsible for [it], and thus emotionally involved in . . . the result of [their] choice" (p. 32). According to Dreyfus, this kind of wrestling is crucial for helping novices move towards developing full expertise. In the case of this PCS, if students were caught they were required to write an email that admitted their fault and what they proposed to do in response (Figure 3). Early evaluations of the dilemma were promising in helping students begin developing their ethical sense (although a complete evaluation would, of course, require sufficient time to situate the PCS's outcomes in students' complete trajectory from novice to expert). This was evidenced by results like a student who, after breaking scope, wrote to the simulated human resources department, "I realize this was out of scope and that criminal prosecution may take place, but I take full responsibility" (Neupane et al., 2021, p. 187).

Figure 2

Ethical Dilemma Message. From Neupane, A., Gedris, K., McDonald, J. K., Hansen, D. L., & Balzotti, J. (2021). Balancing competing goods: Design challenges associated with complex learning. In B. Hokanson, M. Exter, A. Grincewicz, M. Schmidt, & A. A. Tawfik (Eds.), Learning: Design, engagement and definition (pp. 181–190). Springer. https://doi.org/10.1007/978-3-030-85078-4_14

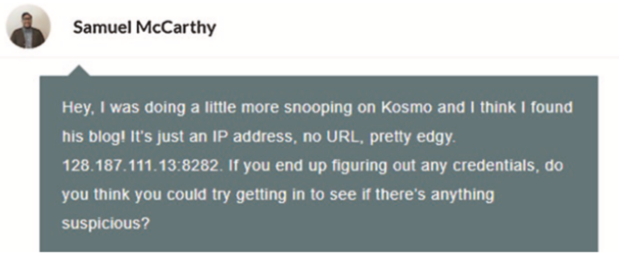


Figure 3

Ethical Dilemma Response. From Neupane, A., Gedris, K., McDonald, J. K., Hansen, D. L., & Balzotti, J. (2021). Balancing competing goods: Design challenges associated with complex learning. In B. Hokanson, M. Exter, A. Grincewicz, M.

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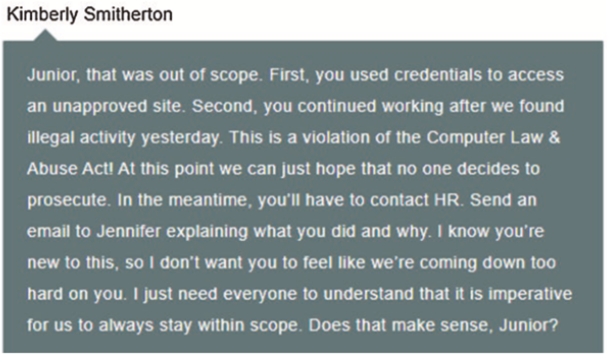

Discussion and Concluding Thoughts

The three insights of this paper help clarify how "LXD sits alongside ID . . . as a complementary approach to design for learning" (Jahnke et al., 2022). The case we examined suggested that LXD (a) attunes designers to different kinds of learning affordances than are emphasized in traditional ID; (b) challenges the universal applicability of common ID techniques; and (c) expands designers' views of the outcomes for which they should be designing. So, LXD's helpfulness seems to be more than only an instrumental one, in the sense that it provides techniques useful for addressing certain design considerations. In addition, LXD can play a refining and orienting function, by highlighting unfamiliar practices, shifting designers' priorities, and refocusing their efforts. Because of this, we call LXD an orienting guide for practice. By this we mean that it "supports practitioners as they learn how to cope with practice in all its color, vibrancy, and liveliness" (McDonald, 2022, p. 40), particularly in "catalyzing a change in how they experience situations . . . so they come to see and feel things" in new ways (p. 34). While such a purpose could also properly be called a theory of practice, we choose to not use that label here so as to avoid a misperception that we are attempting to "artificially harmonize [LXD] into generalizable laws," or settle into a canonical set of "patterns and regularities" (p. 40) that definitively set it apart from other forms of learning design. Instead, we keep our focus on considering how these LXD affordances—along with others like them—can support practitioners in skillfully navigating the distinct and ever-changing situations they face.

In this view, exactly how one defines LXD, or how one draws the boundaries between it and other fields, becomes less important. While we do not discount the value of understanding issues like where LXD came from and where it is going, if LXD has the affordances we have identified here it can still refocus and reframe designers' work, regardless of its conceptual point of origin, or its distinctness from other design traditions. Thus, LXD need not be theoretically unique in an absolute sense to perform its complementary role alongside other ID practices. This is suggested by the PCS case we used as an example throughout. The PCS design team included classically trained instructional designers, working alongside designers from HCI and UX. All these traditions have historically been involved in improving learning, and so all team members were able to offer strategies and techniques from their fields of origin that were advantageous in shaping PCS designs. In one sense, their practice of LXD was generated *in situ*, as they drew on each other's backgrounds to create a living practice (Osguthorpe & Osguthorpe, 2007), one that was informed by their different disciplines, but also tailored to the unique situations they faced. They had little interest in disciplinary purity, nor did anyone involved insist that their approach to learning design was inherently more legitimate or rigorous than others. They were seeking a practical grasp on their lived situations, and a productive amalgam of ID, HCI, and UX (in other words, LXD) was what offered them this grasp.

We find a useful message in this for the scholarly conversation around LXD. Even if one can find some learning design approaches in the overall body of ID research that are similar to those practiced in LXD, this does not mean that LXD serves no purpose, or that designers should disregard it and, instead, devote their efforts towards studying the traditional ID knowledge base. The same is true if one compares LXD to other design traditions; LXD can be a valuable addition to design practice even if practitioners of HCI or UX design wonder how it differs from approaches common in their fields. As McDonald and Yanchar (2020) observed, there is value in "design theory [that] continually revisit[s] basic questions about [a] field's core phenomena." Among other reasons, "this continued work can provide an ever-richer set of conceptual alternatives for . . . designers to draw upon as they exercise judgement-in-practice" (p. 645). This vision of continued exploration of a field is not the same as an ignorant regeneration of the same techniques or strategies again and again. Instead, it is one where the inexhaustible nature of learning and design is fully acknowledged. Further exploration—informed by what has come before—is valuable because it can "provide the occasion for new insights and possibilities to be recognized" (Yanchar & Faulconer, 2011, p. 29). In our view, this means that LXD is not merely a rebranding of either conventional ID processes, or HCI/UX strategies. In light of the synthesized perspectives growing out of LXD's union of ID and other design traditions, even when specific LXD techniques can be found in other settings they will often carry a different meaning when applied in the new context of *learning experience design*.

Thus, we conclude by asking readers to consider: for the specific learning challenges you face, would it be beneficial to become attuned to different kinds of affordances that you can draw upon to improve learning? Is it helpful to consider whether traditional ID techniques are applicable to your current situation? Would it be valuable to expand your view of the kinds of learning outcomes towards which you should be aiming? If any of these situations apply, we recommend you study LXD theories, strategies, processes, and techniques, in all their diversity and variability. We encourage you to do so not with the goal of searching for prescriptions to govern your design practice, but to stimulate a change in you—your ability to perceive and act more expansively and flexibly. Doing this can reframe and refocus your practice towards ends that are either neglected or deemphasized in traditional approaches to ID. We therefore concur with other proponents who promote the flexible and human-centered practices of LXD as a useful complement to other approaches more typically seen in the field.

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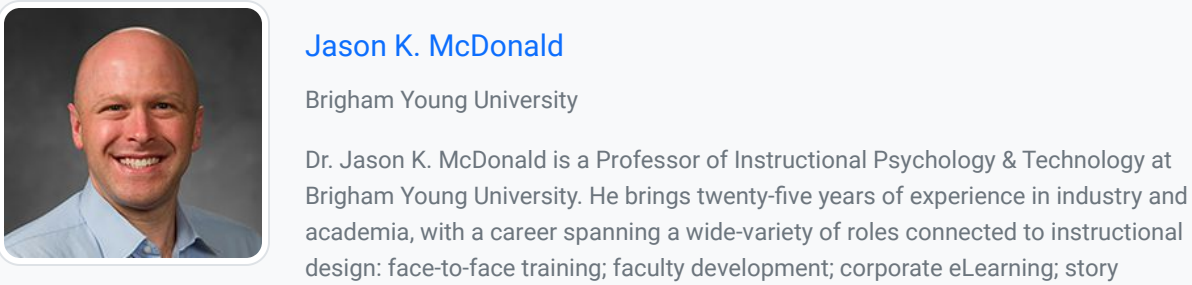

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Learning Experience Design in the Light of Design Knowledge and Philosophy

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Learning Experience Design | Instructional Design Practice | Design Philosophy | Design Knowledge

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Instructional design has been dominated by a philosophy focused on efficiency, effectiveness, and appeal. Learning Experience Design (LXD), emerging recently, offers a different set of values with the potential to enhance and evolve the practice of design for teaching and learning. Using the concepts of knowledge and philosophy from the literature on design theory, we challenge the notion that LXD is a discrete new field separate from instructional design and instead identify LXD as an alternate philosophy of design. We conclude with the opportunity to recognize additional philosophies in the field and consider the impacts of philosophy on knowledge-building practices.

Introduction

Almost since its founding, instructional design (ID) has maintained a focus on a handful of core principles, typically described in contemporary scholarship as efficiency, effectiveness, and learner engagement (Merrill, 2013) . This focus on outputs (i.e., efficiency and effectiveness relating primarily to the designer's goals for the learner and goals for learner engagement) maintains connections to the behaviorist roots of ID as a discipline (cf. McDonald et al., 2005)—which, if left unexamined, may see the work that instructional designers have seen as their core contribution to education increasingly migrate to other design fields such as User Experience (UX) design or Service Design that are typically more human-centered, socially-conscious, and able to address design problems nimbly from multiple perspectives and philosophies. Learning Experience Design (LXD) represents one potential way of approaching ID work which has been underexplored, particularly in relation to extant ID practices and scholarship.

In the last two decades, scholars have increasingly critiqued the views of instruction and learning experiences that focus primarily on efficiency, effectiveness, and learner engagement, expanding the space for instructional designers to consider knowledge the learners bring with them into the learning situation (Svihla et al., 2022), forms of instruction in which depth of learning is prioritized over efficiency (Hmelo-Silver et al., 2007), cultural considerations that relate to

learning experiences (Thomas & Columbus, 2009; Young, 2008), and considering the learning experience itself as a central issue (Parrish, 2008, 2009). At first glance, these expansions of focus may appear to be relatively consistent with the values of efficiency, effectiveness, and engagement. However, as we will seek to articulate in this essay, an appreciative shift from understanding design activity as primarily characterized by learning outcomes to understanding design activity as primarily motivated by the quality of *what is experienced by a learner is powerful*—and we argue that this shift is a difference in philosophical stance. We build on our prior work as design and ID scholars, where we have examined relevant issues relating to the complexity of instructional design practice that typically goes well beyond rote repetition of a process model or even merely an adaptation of the model. There are several key claims that underpin our argument, briefly summarized here. Because ID displays the core properties of design practice (Boling & Smith, 2018), we can interrogate it using design studies and design theory. Empirical evidence demonstrates that designers make extensive use of professional judgments to make sense of a design situation and rely on values or goals extending beyond efficiency, effectiveness, or engagement when making design judgements (Gray et al., 2015). Designers' tacit beliefs and values, their core judgements, shape the design space and outcomes of design in important ways (Boling et al., 2017). These core judgements can be shown to differ across fields of practice. For example, different facets of design complexity appear to be salient when viewing the same artifact through a different evaluative lens. Specifically, Boling and Gray (2021) demonstrate that the same materials, evaluated through the lenses of traditional ID on the one hand and User Experience (UX) lens on the other—appear dramatically different with regard to efficacy, the role of the learner, and the ways in which constraints are activated by designers. Finally, LX designers rely on many sources of knowledge, including ID, HCI and others, and this brings along challenges that impact how they do so (Gray, 2020).

In this essay we address two areas essential to any practice of design and discuss how each of the concepts of design knowledge and design philosophy relate to Instructional Design or Learning Experience Design. First, we first introduce the twin conceptual strands of design theory—design knowledge and design philosophy—demonstrating how they emerge in the practice of design in general and how they relate to one another. Second, through these twin strands of design theory, we then examine LXD in relation to several other design traditions, considering what position(s) or tradition(s) it draws from. Finally, we use this line of argumentation to question whether LXD is emerging as a distinct practice or field, or whether it is in the process of incorporating strands of knowledge into a distinct philosophical position within the field of learning design.

Design Knowledge

Design knowledge refers to the multiple forms of knowledge—encompassing experiences, precedent artifacts, theories, methods, and patterns, among others—that designers leverage or otherwise rely upon to inform their design work (Höök & Löwgren, 2012; Nelson & Stolterman, 2012). It is important to note that these forms of knowledge, and the ways in which they combine, differ in important ways from traditional scientific understandings of knowledge (primarily focused on generalizable truths), and from humanistic notions of creative production (focused in part on individual expression). This results in positioning design knowing as a “third way” that is fully defined neither by science nor by the humanities (Archer, 1979).

We will first outline different types of knowledge that represent differing epistemic positions, demonstrating the epistemological diversity that confronts and enables designers in their work. Then we acknowledge how disciplinary framings impact the collection and uptake of knowledge and how design disciplines are rapidly evolving alongside their respective knowledge bases. Finally, we point towards different interpretations and utilization of design knowledge in specific settings, describing how knowledge is activated in design practices.

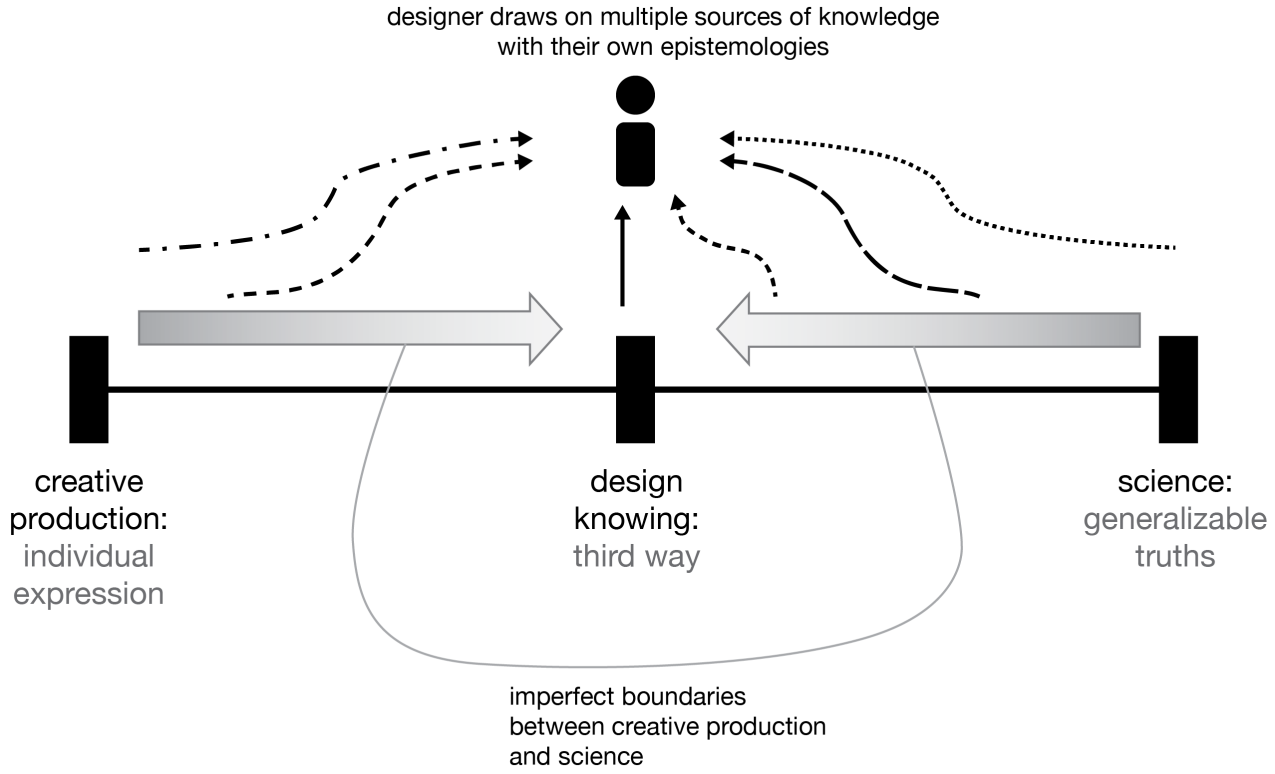
Design Knowledge as Epistemically Diverse

To represent the epistemic diversity of design knowledge, we can ask: What sources or types of knowledge have relevance as *design knowledge*? Löwgren, Höök, and colleagues have identified multiple different types of knowledge that are used in design activity that are instructive here as a point of departure (Höök & Löwgren, 2012; Löwgren, 2013). First, Löwgren builds upon Nelson and Stolterman’s continuum of the “real” and the “true,” describing knowledge at each

boundary: scientific and generalizable theory as an instance of the "true" and specific artifacts that have been created or exist as an instance of the "real." All of the types of knowledge in between these two end states are then described as a zone of *intermediate-level knowledge*, which may include knowledge that is closer to the real (e.g., annotated portfolios, collections of precedent artifacts), closer to the true (e.g., laws or scientifically-guided principles), or somewhere in between (e.g., methods, heuristics, best practices, patterns). As a concrete example, a designer who avoids certain color combinations because individuals with color blindness will not be able to distinguish them is drawing from scientific knowledge established through empirical study. That same designer may employ so-called "warm" colors to convey a visual sense of energy, drawing on a widely agreed-upon construct among creative professionals.

Figure 1

Designers Use Multiple Sources of Knowledge Drawn From Science and Creative Production, but Also From the Intermediate Zone Between These, Using Their Judgment to Select What They Will Use. Knowledge From Different Sources is Epistemologically Different.



All of the forms of knowledge referenced previously *could* have an impact on design situations, but their configuration and potential for utility can vary based on disciplinary and philosophical positioning. Knowledge types also do not make decisions for the designer—instead, each designer employs their professional judgment to consider different forms of knowledge that appear to be salient in a given situation. The designer also has a repertoire of knowledge that informs these judgments which is *inseparable from the designer themself;* this repertoire not only includes objective and shared knowledge that might originate from a discipline or subset of practice, but also their own lived experiences that aid them in understanding a given design situation (Gray, 2016; Schön, 1990). Finally, engagement with knowledge connects the designer to broader ways of being—a praxis known as *ontological designing* which outlines and reifies the creation of new potential futures in ways that are always value-laden; as Willis (2006) articulates, "we design our world, while our world acts back on us and designs us" (p. 70).

Design Knowledge as Related to Discipline

Epistemological pluralism is a characteristic quality of numerous emerging design fields that operate at the intersection of multiple ways of knowing and disciplinary perspectives (Blevis et al., 2014; Varner et al., 2020). Design knowledge types can be viewed through a mono-disciplinary lens (i.e., a discipline may value and support certain knowledge-building practices distinctive to that discipline) or a trans-disciplinary lens (i.e., a discipline might value certain knowledge-building practices from different sources and to differing degrees). Importantly, design knowledge can be seen as related to discipline, or even primarily created by one or more disciplines, but the ways that knowledge is used in design work often disregards these original boundaries.

Additionally, design knowledge and its uptake in education and practice is not static. Over the past two decades, the education of designers has increasingly become an inter- and trans-disciplinary effort across many fields of design and is complicated by rapid shifts in design practitioner roles within organizations and society. As one example of this rapid evolution of design work, Kou and Gray investigated the knowledge creation and utilization practices of UX designers on Stack Exchange (a professional question and answer forum) and Reddit (a general-purpose social media platform). They found that there were not only marked shifts in the kinds of knowledge that were relevant to UX practitioners over a ten year period, but also an incredible diversity of types of knowledge (Gray & Kou, 2017; Kou et al., 2018; Kou & Gray, 2019). This led to the conclusion that a modern design discipline such as UX is no longer able to be singularly defined or "owned" by a single perspective or philosophy, but rather emerges as a *community of volatile practice* (Kou et al., 2018), and this evolutionary and volatile nature of design work has substantial implications for collection and use of design knowledge.

This diversity of knowledge types used by practitioners to inform their work also resonates with what Faiola (2007) described a range of sources of knowledge relevant to HCI education, indicating the role of four interconnected strands of knowledge that should inform the competencies of designers: social, design, business, and computing. In the practice of UX design, this range of knowledge types indicates a landscape where different practitioners may become more or less expert in differing combinations of these strands that reflect an appreciative positioning and framing of their design work. For instance, one could imagine a technically-focused practice of UX design (e.g., a UX Engineer) that is appreciatively framed by the desire for innovation in types of gestural input. This framing is dominated by computing competence with relatively little focus on the other three strands Faiola describes. In contrast, a UX practitioner that takes on a Product Manager role may draw equally on all four perspectives, with the business strand providing a primary appreciative frame to organize their work.

Design Knowledge Activated in Design Practices

These differing forms of knowledge are deployed in design practices that are organized in relation to one or more disciplinary perspectives. At a high level, all of these practices can be understood as *design*, but a deeper inspection of individual or local design work can also indicate design work as springing both from individual designers and interactive collaborations. Viewed as an individual enterprise, a designer engages their repertoire of knowledge and disciplinary expertise to address and frame a design situation, with the goal of creating intentional change. Nelson and Stolterman (2012) refer to this designer's *knowledge set* as the connection between their ability to think and know and their engagement with external entities that are collective in nature. Viewed as a collective and collaborative activity, designers work with others from other disciplinary perspectives (often in cross-functional teams) to achieve their aims, using diverse forms of knowledge to inform their work.

In the context of design activity, the designer and design team may choose to activate many different forms of knowledge based on their goals, understanding of the design situation, and means of navigating design complexity (Stolterman, 2008). However, it is impossible to predict in advance which types of knowledge will be relevant or how they will be useful, but regardless, the knowledge used in design work will be contextualized by the designer's training, prior knowledge, and philosophy. For instance, in framing an ill-structured and "wicked" design problem, the designer must set constraints upon the design situation (Biskjaer & Halskov, 2014) which may frame the problem in a way that privileges a certain disciplinary perspective (Dorst, 2015) or philosophical position. A messy issue such as

disinformation on social media might allow designers to frame the situation in more technical ways that are primarily techno-solutionist in philosophy (e.g., data science), ways that focus on cultures and communities with a philosophy of social good in mind (e.g., anthropology, sociology), or ways that focus on access to specific functionality that could drive different decisions within a utilitarian philosophical perspective (e.g., behavioral economics, usability). Eventually, all of these disciplinary perspectives and related knowledge bases may be employed to understand and act in relation to the design problem, but not all of these perspectives can be addressed by the designer or design team equally—at the same time—in design activity. Instead, the designer chooses, often tacitly rather than consciously, which appreciative frame they want to view the situation through and use their professional judgment to decide how to proceed based on what they learn through that framing (Schön, 1984).

Design Philosophy

As we have already mentioned in the previous section, design philosophy is invoked as we consider different forms and structures of knowledge and how types of design knowledge are activated in design practices. Design philosophy and knowledge are entangled with one another and mutually constitute or inform a designer's base of knowledge, their capacity for professional judgment, and the values that are central to their work.

At a high level, design philosophy distinguishes design activity from other forms of purposeful activity (i.e., science, art, religion); as Nelson and Stolterman (2012) note, "A philosophy of design has a different aim in that it focuses on what distinguishes design from other forms of inquiry and action—for example, to intentionally create change." (p. 217). While design as a philosophy can serve as a useful contrast to other dominant ways of knowing in the sciences or humanities, there are also many differing philosophies within and across design fields. These philosophies often exist in parallel, and some philosophies rise or fall in popularity based on forces such as fashion, geopolitics, social or political values, or technological advances.

All Designers Have Philosophies, and Most Fields Contain Members Who Practice from Differing Philosophies

All design fields have expressed design philosophies that impact what kinds of design goals are seen as relevant, which types of design outcomes are considered most desirable (and why), and what appreciative systems (cf. Schön, 1984; Vickers, 1984) drive the process of design. These philosophies can permeate a field of practice (as with the "efficiency and effectiveness" philosophy in mainstream instructional design), and often enter the mainstream of society through maxims of design.

Consider these examples from multiple fields of design. Noted industrial designer **Dieter Rams** assembled a set of ten principles that included a summative philosophy: *"Good design is as little design as possible."* **Harvey Bernard Gantt** was known for his pioneering work at the intersection of urban planning, architecture, and public policy; as a pioneering African American leader at a time of turbulent change in the Southern US, he led efforts to build socially-focused urban spaces with a philosophy of "*designing buildings that encourage community"* (The Gantt Center, n.d.). **Louis Sullivan**, an influential architect that brought architecture into the modern era, became known for his dictum "form follows function." **Frank Lloyd Wright**, another architect working in the United States in the early 20th century rejected some of the shifts towards modernism at the time which he felt were "harsh," instead considering how to deeply respect the materials, the site, and the people that would use the space through his design work. As Wright notes in his autobiography, "*No house should ever be on a hill or on anything. It should be of the hill. Belonging to it. Hill and house should live together each the happier for the other*" (1943/2005, p. 168). Modern material ecology designer **Neri Oxman** centers principles of design that can be derived from nature, and she sees her role as *"augment[ing] the relationship between built, natural, and biological environments by employing design principles inspired and engineered by Nature"* (MIT Media Lab, n.d.).

Beyond these individual commitments to design, which in some cases have driven whole industries or schools of thought within professions, companies take on design philosophies as well. Whether the now ironic "*Don't Be Evil*" from Google or the "*Move Fast and Break Things*" by Facebook/Meta, corporate positioning of design activities legitimizes

and frames the kinds of design work that are likely to result, while also often ending up with numerous unintended social consequences. From the perspective of style or fashion as a philosophy, we can also see philosophies at work; for example, fashion was central in Apple's design approach as they became a dominant technology force—from the full on embrace of skeuomorphic design (or digital design elements that resemble their physical counterparts) with the introduction of the iPhone in 2007 to the complete shift towards flat and minimalist design by 2013 with the introduction of iOS7.

Philosophies of Design Have Real Impact on Designers' Practices and Shape the Impact Their Design Work Produces

What all of these philosophies have in common is that they have real consequences in how design work happens, what kinds of design work are valued, and what shape design outcomes and their impacts are likely to take. Whether these philosophies rise to the level of a "school of thought" (like Rams' *functionalist approach*), a "style" (like Wright's *Prairie Style*), or a movement (like Gantt's *New South City*) or remain at the level of a maxim or motto, most fields have many extant philosophies in play at the same time, with some more dominant than others based on the fashion, socio-cultural, and political climate. These philosophies can guide which kinds of professional skills are relevant (e.g., Oxman's linking of biology, material science, and design or Gantt's connections between architecture, urban planning, and policy). Design philosophies can also guide which forms of knowledge are relevant or valued (e.g., modernism's commitment to uniformity that often represses or discards local variants, particularly from marginalized or oppressed groups; material- and culture-focused approaches that seek to amplify sites, construction materials, and community norms).

At the level of an individual designer, a design philosophy is what makes that individual's attitude towards design coherent and meaningful. As Nelson and Stolterman (2012) state in the following quote, all designers have a philosophy that informs their action, and the more we are able to externalize and describe our guiding philosophy, the more we are able to reflect on our position, our values, and the ways in which we define success in our outcomes.

> *Becoming a designer does not mean only learning to use and apply 'correct' or even existing schemas produced by design scholars and professionals. It also means constantly engaging in the creation, application, and critique of one's own schemas. It means, as an individual designer, engaging in design scholarship by developing a personal design philosophy that leads to a carefully considered design epistemology to guide design inquiry for wise action. This might sound ambitious, achievable only for experienced design philosophers and thinkers. It is clear, however, that every designer expresses his or her philosophy, epistemology, and scholarship in every design process, even if they are not explicit and externalized. Becoming a designer means that the engagement with practical issues, such as developing hands-on skills and techniques, has to be complemented with the intellectual activities addressed earlier. To become a well-rounded designer means understanding design as a tradition, as a philosophy, with a sense of what constitutes design epistemology and inquiry as well as a concrete practice. (p. 224)*

In a previous study addressing the role of core judgments among instructional designers, we have identified that "...simply acknowledging that practicing instructional designers hold core judgments begs the question of the role of philosophy in our practice" (Boling et al., 2017, p. 211). In our evaluation of extant philosophies of design in relation to LX practice, we can consider the role and character of these core judgments, which we consider more fully in the final section of this essay.

Is LXD a Distinct Discipline or a Philosophy? And Why Does it Matter?

In the previous sections, we have introduced two entangled concepts from the design theory literature: design knowledge and design philosophy. In this section, we will consider the impact of these concepts on the current and future state of ID and LXD practice. First, we will argue that LXD is a distinct philosophy of ID work. Next, we identify

opportunities for multiple philosophies of design for learning and education to flourish. And finally, we conclude by describing the limitations and interactions of philosophies that should be considered as these extensions of ID practice continue to develop in the future.

LXD is a Philosophy of ID Work

Contemporary LXD practice is informed by many different disciplinary perspectives and sources of knowledge—with instructional design and learning theory knowledge playing a central role. In fact, LXD *without* a central focus on learning falls apart as a practice separate from UX design. When considering the relationship of LX to UX practices, for instance, we can identify the same epistemologically pluralistic attitude towards knowledge in each set of professional practices (Gray, 2020). UX designers and LX designers draw broadly on knowledge relating to psychology, visual design, anthropology, ethics, human factors, and computing. Although LX designers draw on a similar diversity of disciplinary knowledge as UX designers, the critical addition for LXD is, in fact, a central focus on learning. *With* this central focus on learning, it is difficult to identify a difference in sources of knowledge regarding learning versus differences in values and judgment regarding the use of that knowledge. Just as UX practice is usefully viewed as a philosophical extension of HCI scholarship (with that philosophy focused on user-centered design), LXD can be defined and discussed as a philosophical extension of instructional design and educational scholarship (with a philosophy focused on learner-centered and experience-centered design).

LXD is a Bellwether for Consideration of Other ID Philosophies

Our argument is that LXD is a means of expressing a design philosophy rather than a new field of design. As a philosophy, LXD patently exists within a field of design which places teaching and learning at its core (versus technology, communication, human spaces, or any other targets of design) and for which the most discernible philosophy—not recognized for what it is—has long been expressed as "efficiency, effectiveness and appeal," a philosophical perspective open to debate and co-existing alternatives. In such an environment, where the idea of alternate philosophies has not been readily available, it is no surprise that a dawning recognition of available tools and value perspectives (e.g., from UX, HCI, social justice) may lead to the perception that a new field of thought, practice, and research, rather than a new philosophy, is emerging, or must emerge. However, instructional design (rapidly being rebranded as learning, design and technology) is a field of design focused on human learning, as architecture is a field of design focused on human spaces. Differing value priorities within these foci are philosophies rather than separate fields of design, even when these philosophies call for differing—even conflicting—processes, conceptual tools, and vocabularies. To ignore this relationship is to avoid clarifying several issues critical both to LXD and to ID—in the first instance, how is LXD to position itself with respect to UX, and with respect to multiple shifts within ID questioning traditional perspectives and making room for revised, new, and possibly synergistic philosophies. In the second instance, it is past time for ID to examine what is now its core and largely unquestioned philosophy of efficiency, effectiveness, and appeal.

Several advantages accrue in the perspective which sees LXD as a philosophical turn. We can make clear what the various positions are, identify what discussions we are having, and debate the impacts of value positions between philosophies—for example, using the clarity of each lens, and the differences between them, who is or is not advantaged by pursuing design from one value position or another. We can recognize and place appropriate value on models, methods, and theories and respect common ground productively versus performatively, retaining and taking advantage of decades of knowledge building—the parts that remain relevant across more than one philosophical position (and many do), and remain in productive tension together to the overall betterment and strength of all designers who focus on teaching and learning. We consider LX as one of many philosophies that ID might create or consider as the profession continues to evolve, identifying a set of many active and overlapping philosophies within the ID as a sign of strength rather than of chaos.

Philosophies Have Limitations and Present Opportunities for Synergies

Philosophies of design are inevitable—and the only way that a designer can bring together their values, design knowledge, and work within a given context to create new potential futures. However, all design philosophies have limits

in that they represent appreciative systems. Issues that emerge as critical or core in one philosophy may be tertiary or fundamentally at odds with the values of another philosophical approach. This difference in focus and resolution may be compared to different knives in the kitchen: all of them are sharp, but some are more flexible when it matters (like a boning knife) and others have the versatility to play across many different tasks (like a chef's knife).

A diversity of philosophies, all with strengths and weaknesses, implies that a range of practitioners interacting from different philosophical positions could result in stronger design teams and different approaches to design knowledge—in other words, "traditional ID" practice can learn something from LXD practice (which has been largely disconnected from ID orthodoxy) and LXD practitioners can enrich their practice with design knowledge from ID. This interaction of philosophies has the potential to be bidirectional and mutually enriching. As illustrative examples of this knowledge exchange, LXD practice can contribute to the creation and use of design methods, an area of knowledge that has been underexplored in ID scholarship. Similarly, ID scholars and practitioners can provide more process structure that is useful in scaling instructional systems, alongside robust commitments to instructional and learning theory, which could advance LXD practice.

Conclusion

In this essay, we introduced two concepts from the design theory literature—design knowledge and design philosophy—to interrogate the potential relationship between ID and LXD practice. We argued that LXD is a philosophical expression of ID work rather than a distinct field or profession, and using this philosophy as a point of entry, we call for ID scholars and practitioners to consider other philosophies of design that may bring a meaningful and synergetic diversity of approaches—operationalized through differing collections of design knowledge—to bear.

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What's the Difference Between Learning Experience Design and Instructional Design?

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Instructional Design | Learning Experience Design | Augmented Reality | Instruction | Learner-centered Paradigm

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Some proponents of learning experience design (LXD) have set it apart as an alternative to instructional design (ID). This article explores the similarities and differences between LXD and ID and whether the two are really in conflict. It begins by defining learning experience (LX). Then it contrasts LX with what instruction should be like. Next, it focuses on defining LXD and contrasting it with ID. It explores some issues that influence the view of LXD as an evolution of ID or as a new discipline or field. Finally, it offers some suggestions for advancing knowledge in this important area.

Introduction

Some proponents of learning experience design (LXD) set it apart as an alternative to instructional design (ID; e.g., Floor, 2023). Perhaps this is because, given its behaviorist roots and its origins over a half century ago, ID has focused on designs for the teacher-centered paradigm of instruction, which unfortunately has an enduring prevalence in schools and universities. The teacher-centered paradigm served society well during the industrial age, when manual labor was the predominant form of work, and we needed an educational system focused on sorting out the future laborers from the future professionals and managers (Reigeluth & Karnopp, 2013). But now, in the post-industrial age, when knowledge work is becoming predominant, we need to educate far more people to far higher levels, and teacher-centered instruction is ill-suited for that (Reigeluth & Karnopp, 2013). Hence, we strongly support the further development of alternatives to the teacher-centered paradigm like LXD. But does that make LXD incompatible with ID?

This article explores the similarities and differences between LXD and ID and whether or not the two are really in conflict. It begins by defining "learning experience" (LX) and contrasting it with "instruction." Then it focuses on defining LXD and contrasting it with ID. Finally, it offers some suggestions for advancing knowledge in this important area.

What is a Learning Experience?

To explore the differences between learning experience (LX) and instruction, we first explore what is a LX. LXD.org (2022) defines it simply as “any situation you encounter that takes a certain amount of time and that leaves some kind of impression” (n.p.). Jahnke and colleagues (2022) elaborate a bit on this by defining it as “any interaction, course, program, or other experience in which learning takes place” (n.p.), but they go on to conclude that “there is as yet no common or shared understanding of how learning experience (LX) or LXD should be defined (Tawfik et al., 2021)” (n.p.). Clark (2022) defines LX as “experiences designed to change us, specifically our long-term memories” (p. 7). Similarly, Jahnke and colleagues (2020) state:

> *Some [e.g., Schatz, 2019, p. 90] 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. (n.p.)*

We propose that, from a design perspective, the definition of LX is far less important than guidance as to what an LX should be like. Whatever definition is used, there are good LXs and bad ones. Designers want to know what good ones are like, and there is some guidance in the LX literature about that, which we describe next. Unfortunately, much of it is offered as “universal” guidance, overlooking the fact that to be good, LXs need to be different in some ways in different situations, depending on the nature of a) the learner, b) what is to be learned, c) the learning environment, d) the constraints of the design and development process for the LX, and e) any institutional requirements (Honebein & Reigeluth, 2021; Reigeluth & Carr-Chellman, 2009).

Gallego (2021) identifies four ingredients of a “memorable” LX. First is breaking the script. This is basically the notion of creating cognitive dissonance. Scripts are things we expect to happen when we go somewhere or do something, like going to a restaurant or a museum. “Breaking the script with a powerful disruptive idea increases the possibility of creating a peak and therefore, a memory” (n.p.).

Second is revelations. This is the notion of an epiphany – an aha! or eureka! moment – in which “the ‘status quo’ of a deep personal belief changes dramatically” (n.p.). According to Gallego, this can only happen through experience, not through explanation, though we are not so sure about that.

Playing with senses is third. Gallego proposes that LX designers should use more than sight and sound to “generate a peak” in the LX.

Fourth is moments of exposure. This fourth ingredient has learners present their project or idea to an audience. There could also be “micro exposure moments” that are on a smaller scale.

In addition, Floor (2023) identifies five characteristics of a “great” LX:

1. Leads to a valuable and meaningful outcome
2. Has a lasting positive impact on the learner and their surroundings
3. Is human-centered and empathic
4. Uses the right technology
5. Is a creative, simple, and original solution to a serious problem.

Also, Clark (2022) argues that we should not be lulled into the "Disneyfication of learning" as entertainment, pointing out that "many learning experiences are designed to impress or dazzle but end up as eye-candy, edu-tainment or enter-train-ment" (p. 7).

Abbott (2020) states, "… core LXD principles are defined across the literature as:

- Human-focused (encompassing personalization, emotion, and experience),
- Enjoyable and/or playful,
- Goal-oriented,
- Situated and relevant to learner's desires,
- Taking place in supported environments and/or platforms." (n.p.)

Please note that what Abbott refers to as LXD principles are really LX principles, because they propose what the LX should be like, rather than what LXD (i.e., the process for designing the LX) should be like.

In addition, as indicated by Jahnke and colleagues (2020), David Kolb, a pioneer in experiential learning, "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" (Jahnke et al., 2020, n.p.). Thus, Kolb (1984) identifies what a good LX is like by describing a cycle of activities in which a learner should engage during an LX.

This is not an exhaustive review of recommendations about what a good LX should be like, but it is enough to reveal that there are many different perspectives on what makes a good LX, and Schmidt and colleagues (2020) conclude that there are presently inadequate guidelines for the design of LXs. Furthermore, we propose that, while there are likely some universal qualities, not all good LXs consist of all those qualities mentioned above, and, more importantly, a good LX will be very different in important ways for different situations (e.g., for different kinds of learning goals and different kinds of learners).

So, what might be some universal or fairly common qualities of a good LX? All four of Gallego's (2021) ingredients of a memorable LX seem important for some kinds of learning experiences, but not all. Floor's (2023) five characteristics of a great LX seem to us to be fairly close to universal, but we are not sure an LX should always have a lasting positive impact on the learner's surroundings or always be an original solution to a serious problem. We agree with Clark (2022) that a good LX should not be too focused on entertainment, but how much is too much? We think all of Abbott's (2020) principles are close to universal, except for "enjoyable and/or playful," because Floor (2023) pointed out that "Sometimes the biggest lessons are learned from sad experiences" (p. 9). Finally, we find Kolb's four-step learning cycle a bit too restrictive – great for some situations but not for others. So where does this leave us?

Based on this limited review of the LX literature, it seems that a good LX:

1. is learner-centered (focused on the learner, including the learner's needs and interests, and on the process that the learner goes through) (Abbott, 2020; Floor, 2023),
2. is goal-oriented (oriented toward a desired learning outcome that is valuable and meaningful) (Abbott, 2020; Floor, 2023),
3. creates cognitive dissonance and epiphany that has a lasting positive impact on the learner (Clark, 2022; Floor, 2023; Gallego, 2021),
4. uses the right technology to create an appropriately supported learning environment (Abbott, 2020; Floor, 2023),
5. is usually a creative solution to an important learning challenge (Floor, 2023),
6. harnesses emotion and enjoyment but does not focus too much on entertainment (Abbott, 2020; Clark, 2022; Jahnke et al., 2020),
7. is a multi-sensory experience situated in a context that is meaningful to the learner (Abbott, 2020; Gallego, 2021),
8. usually engages the learner in Kolb's (1984) four activities: concrete action, reflection on action, abstract conceptualization, and active experimentation.

These close-to-universal qualities of a good LX are admittedly very general and therefore of limited value to a LX designer. For example, "is usually a creative solution to an important learning challenge" tells the designer little about what the LX should be like. Nevertheless, we offer these qualities in the hopes of helping LX researchers to take another step forward in the quest to offer better guidance about what a good LX should be like.

In addition to some close-to-universal qualities, it is clear that what makes a good LX differs greatly from one situation (e.g., one learning goal or one learner) to another. It is beyond the scope of this article to review the literature regarding situational principles for the design of LXs, but there seems to be consensus (e.g., Schmidt et al., 2020) that much research is needed to develop design theory for LXs that specifies different designs for different situations (Honebein & Reigeluth, 2020b, 2021). Design-based research (Collins et al., 2004; Reigeluth & An, 2009; Reigeluth & Frick, 1999) is well suited for this task.

LX Versus Instruction

With this understanding of what a good LX is, we turn to the question, is a good LX different from good instruction? The answer depends to a large extent on your definition of instruction. It is well recognized that the alternative to teacher-centered instruction is learner-centered instruction (Reigeluth, 1994, 1999; Reigeluth & Karnopp, 2013), and we therefore support the definition of instruction as anything that is intentionally done to foster learning (Reigeluth, 1999). Learning, which is done by the learner, is different from instruction, which is done by an agent other than the learner to help the learner learn. A LX is not learning itself, so it is not a learning strategy, it is an instructional strategy, and instruction seems to be the most common term for categorizing it as something that helps people learn. We now turn to the question, how does good instruction compare to the above criteria for a good LX?

Given this definition of instruction, are LX and instruction both learner-centered? We have just established that some instruction is teacher-centered, not learner-centered. But LX is not the only kind of learner-centered instruction. For example, Montessori instruction (Montessori, 1917, 1964) is personalized, hands-on, learning by doing but does not have some of the characteristics identified by LX researchers that we described in the previous section, such as a) creates cognitive dissonance and epiphany that has a lasting positive impact on the learner and b) harnesses emotion and enjoyment but does not focus too much on entertainment. The same is true for Dewey's experiential learning (Dewey, 1916, 1938). Yet another kind of learner-centered instruction is tutorials that are personalized, competency-based and self-directed. Therefore, LX is one kind of learner-centered instruction, which in turn is one kind of instruction

(with teacher-centered instruction as another kind). So, some good instruction meets this criterion – namely, other kinds of learner-centered instruction – but good teacher-centered instruction does not.

As an aside, we believe there are a few situations where teacher-centered instruction is preferable to learner-centered instruction, and there is, consequently, such a thing as good teacher-centered instruction. Also, it is important to keep in mind that much work has been done over the past few decades to promote learner-centered instruction (e.g., An, 2012; An & Reigeluth, 2011; APA Task Force on Psychology in Education, 1993; McCombs & Whisler, 1997; Reigeluth et al., 2017; Reigeluth & An, 2021; Weimer, 2002). Hence, one might question the extent to which LX researchers are using new terms to describe old ideas.

The second criterion is goal-oriented. Like a good LX, good instruction of all kinds is also goal-oriented. The learning goals may be set by the owner of the instruction (e.g., school, college, corporation) or by the instructor, or they may be chosen by the learner – in instruction as well as in an LX, though teacher-centered instruction seldom (but not never) gives the learner option to choose. So, there is essentially no difference here.

Third, some good instruction creates cognitive dissonance and epiphany, but not all good instruction does, particularly when the instruction is focused on lower levels of learning (Bloom et al., 1956), like memorization, which is too often the focus of instruction in schools and universities, perhaps largely because it is easier to teach and test than higher levels of learning that involve analysis, evaluation, and synthesis (Anderson et al., 2021). However, there are some times when memorization is important, and LX is not well suited for such situations, because such learning is best facilitated with drill-and-practice with much repetition, chunking, and mnemonics (Leshin et al., 1992; Reigeluth & An, 2021). In contrast, good instruction (goal-oriented, learner-centered, personalized, competency-based) is well suited to such lower-level learning. Also, some good instruction has a lasting positive impact on the learner, but good instruction is not always lasting. Memory can fade, and skills can decline. So, some good instruction creates epiphany and has a lasting positive impact on the learner, but not all.

Fourth, some LX researchers seem to think that LXs are limited to digital learning experiences, while others think LXs can and should also be designed for non-digital learning environments (Jahnke et al., 2020). We see no reason to avoid using them in non-digital environments, in which case appropriate use of technology is common to both LXs and instruction.

Fifth, not all instruction is a creative solution to an important learning challenge, and perhaps not even all good instruction. We believe that much instruction has not been creative enough, primarily in that it has not motivated the learner sufficiently – that most instruction should be more creative – and that there are some kinds of instruction that need not be very creative to be good instruction. While more-creative solutions are usually preferable to less-creative ones, we propose that not all good instruction has to be highly creative, and, indeed, not all good LXs have to be highly creative. The bottom line: while many kinds of good instruction can benefit from being creative, good LXs may require more creativity because they tend to require more customization to the learner and tend to address higher, more complex levels of learning.

Sixth, like good LXs, good instruction should harness emotion and enjoyment but should not focus too much on entertainment. Unfortunately, much of the instruction we find in schools and universities is not good instruction, primarily regarding its effectiveness and appeal, and could be considerably improved by harnessing emotion and enjoyment (as well as sound instructional strategies). While typical teacher-centered instruction has done poorly by this criterion compared to LXs, good instruction is no different than good LXs in this regard.

Seventh, not all instruction is multi-sensory and situated in a context that is meaningful to the learner. But we believe that all good instruction is. Even memorization, when it is important, benefits from being multi-sensory (e.g., both auditory and visual) (Fleming & Levie, 1978; Paivio, 1971; Schnotz, 2014) and should be situated in a meaningful context that is valued by the learner (Lave & Wenger, 1991). So, no difference here, either.

Finally, in our experience relatively little instruction involves concrete action, reflection on action, abstract conceptualization, and active experimentation, and we would go so far as to say that not all good instruction should

involve all of those, especially instruction for lower levels of learning. However, we believe that good instruction for complex learning should usually involve all of them.

We propose, based on this analysis, that an LX is a kind of instruction, and a very important one, that offers one alternative to the teacher-centered paradigm that unfortunately still dominates much of schooling, higher education, and even corporate training and usually does not qualify as good instruction. Hence, LX is different from some kinds of instruction, but similar in most ways to other kinds of learner-centered instruction. Furthermore, as mentioned earlier, LX is not appropriate for all kinds of learning and learning situations (e.g., Montessori instruction, Dewey's experiential learning, and personalized tutorials). Hence, it is important for LX researchers to clearly state a) the situations in which the LX designs that they propose (typically in the form of LX qualities or features[1]) are believed to be preferable to other designs, b) the situations for which they are believed to not be preferable to other designs, and c) the situations that call for differences in the way an LX is designed.

So, now we turn to the *design process*. Is a good process different for LX than for instruction?

What Is Learning Experience Design?

To explore the differences between learning experience design (LXD) and instructional design (ID), we first explore what LXD is. Jahnke and colleagues (2020) state that LXD is "an intentional design act to present the learner with a process of activities that is designed in a human-centered manner" (n.p.). They go on to say that LXD "relies heavily on the traditions of instructional design and pedagogical methods" (n.p.). And they state that the LXD process should analyze "social and sociocultural aspects of learning, such as sociality, social presence, and social interactivity, as well as how culture influences communication and collaboration" (n.p.). They also state that the design process should encompass "all technical aspects of the learner's interaction-in-context with a digital technology or service" (n.p.) and should "consider pedagogical aspects of digital learning, such as the interaction with the learning space, learning goals, learning activities, forms of assessment, and learner controls" (n.p.).

According to Niels Floor (2023), LXD is "… the process of creating learning experiences that enable the learner to achieve the desired learning outcome in a human centered and goal oriented way" (p. 54). He goes on to say, "it's about using design skills to figure out what experience would work best for a person or group of people in a specific situation" (p. 54). Further, he proposes that "ID has a more scientific perspective as an applied science while LXD has a more creative perspective as an applied art" (p. 71). According to Floor (2023), the LX design process typically includes six basic steps: question, research, design, develop, test, and launch.

Clearly, LXD is defined and characterized differently by authors depending on their backgrounds, and there is no common or shared understanding of LXD yet (Schmidt et al., 2020; Tawfik et al., 2021). However, based on our review of the LXD literature, it seems there is consensus that LXD:

1. Is human-centered – the process is centered on the learner (Abbott, 2020; Floor, 2023; Jahnke et al., 2020; Schmidt & Huang, 2021),
2. Is goal-oriented – the process is centered on the goal of designing a powerful LX (Abbott, 2020; Floor, 2023; Schmidt & Huang, 2021),
3. Is multidisciplinary – the process draws from many disciplines (Floor, 2023; Jahnke et al., 2020; Schmidt & Huang, 2022; Vann & Tawfik, 2020),
4. Is theoretically-grounded – the process draws on design theory and descriptive theory or science (Clark, 2022; Jahnke et al., 2020; Schmidt & Huang, 2021),
5. Is a creative, iterative design process (Floor, 2023), and
6. Addresses social and sociocultural aspects of learning (Jahnke et al., 2020).

However, consensus on these aspects of LXD offers little in the way of guidance for designers. Therefore, it is important that LXD researchers develop more guidance for the LXD process (Schmidt et al., 2020).

So how does LXD compare with the ID process?

Learning Experience Design Versus Instructional Design

Some people consider LXD as an evolution of ID, while others view LXD as a new discipline or field distinct or separate from ID. For example, Jahnke et al. (2020) argue that "LXD sits alongside ID and UX as a complementary approach to design for learning" (n.p.). They state that LXD "relies heavily on the traditions of instructional design and pedagogical methods" (n.p.) and is the logical evolution of ID, combining ID and UX in a new form. On the other hand, Clark (2022) states that "LXD is a new discipline" (p. 10), and Floor (2023) argues that LXD and ID are "fundamentally different fields" (p. 67). In this section, we summarize some of the issues that influence the view of LXD as an evolution of ID or a new discipline or field or perhaps even both.

An Applied Science Versus an Applied Art?

Floor (2023) argues that "ID has a more scientific perspective as an applied science, while LXD has a more creative perspective as an applied art" (p. 71). Further, he states:

ID comes from the field of education and is intended to be used in the field of learning, generally within fairly large institutions. Emphasis is placed on measurable results… LXD comes from the field of design, which is most often practiced by independent professionals or small firms. In all disciplines of design, a high value is placed on creativity and looking at a problem in a new way. (p. 72)

This raises an important question: What is meant by the terms: science, design, and art? These three are different disciplines with different goals and different methods of advancement (Boling & Smith, 2018). Science is descriptive, with the goal of describing "what is" (physical, biological, chemical, social). The primary methods for its advancement are development of descriptive theory (mostly about causes and effects, often probabilistic) and experimental research focused on validity. Design is creative, with the goal of identifying better means for creating "what should be." The primary methods for its advancement include development of design-theory (Reigeluth, 1983, 1999b; Simon, 1969, 1996) and design-based research focused on preferability (Collins, 1992; Collins et al., 2004; Honebein & Reigeluth, 2021; Reigeluth & An, 2009; Reigeluth & Frick, 1999). Art is also creative, but its goals, while less clear, are generally to produce thinking, insight, and enjoyment and can be viewed as falling into three categories: physical (or functional), social, and personal (Esaak, 2019), and the primary methods for its advancement are perhaps improvements in techniques for making it.

Hence, science, design, and art are distinct, but each typically draws on the others for both its practice and its advancement. For example, instructional design theory development and practice are both informed by learning theory, communication theory, and many other advancements in science (descriptive theories) (Reigeluth, 1999). And ID practice, in particular, benefits from art in relation to aesthetic aspects of each design. In our experience, ID has to date almost exclusively drawn from science and design, while LXD has drawn largely from design and art. But we propose that both LXD and ID should draw from both science and art, as well as design. An LX designer can benefit by drawing on science, and an instructional designer can benefit by drawing on art. Furthermore, different design situations may benefit from different proportions of artistic and scientific influences. Thus, while historically there has been a significant difference, we believe that the difference going forward should be small to insignificant.

Different Skills and Methods?

Second, Floor (2023) argues that LXD and ID are fundamentally different in terms of skills and methods, which is related to the amount of structure or flexibility in the design process (and is also related to the science versus art distinction). For example, he states that ID emphasizes a methodical or systematic approach to design and "requires more

analytical, methodical, and scientific skills rather than artistic skills" (p. 73), while LXD requires "having a sharp eye, empathizing with the target audience, generating original ideas, sketching visualizations to clarify and conceptualize these ideas, creating and iterating different designs, crafting elegant and surprising ways to communicate a message" (p. 72). Floor goes on to say:

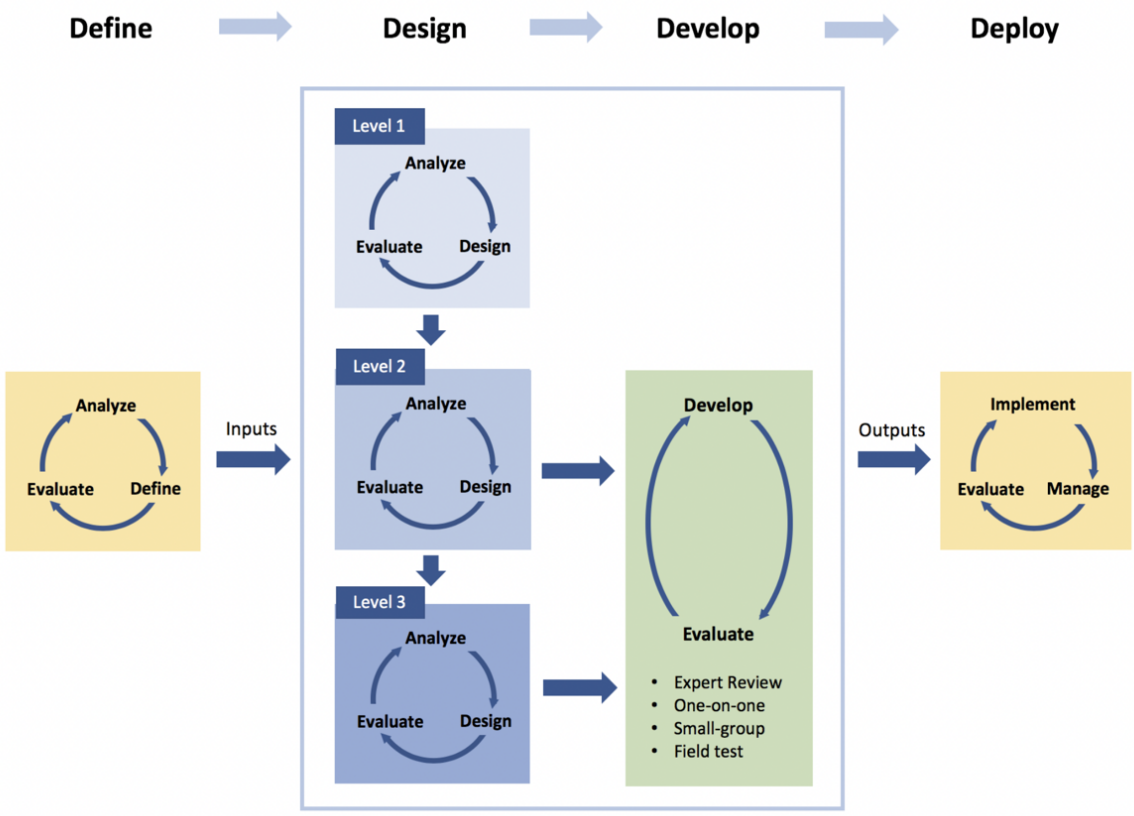
> *While the LXD process is also structured, it does provide more space in its process to be creative and quickly come up with different ideas, designs, and prototypes, which can be improved through iteration. There is a level of unpredictability that [LX] designers love. You're not predetermining what the end result is going to be. The creative and experimental process inspires and guides you towards finding the right shape or form, like a sculptor turning a piece of stone into a sculpture or a painter turning a blank canvas into a painting. (p. 73-74)*

This distinction between LXD and ID has, indeed, been the case, but in fact both skill sets are important for both LXD and ID to best facilitate learning. The bottom-up approach to the ID process (i.e., breaking the desired skills into progressively smaller pieces and designing instruction for each piece) has made it difficult to exercise creativity, and researchers have not added much guidance to their ID models to encourage its use.

But we argue that creativity is very important in ID as well, especially for the learner-centered paradigm with its focus on learning by doing and the creation of immersive learning environments. Thus, we designed the Holistic 4D Model (Reigeluth & An, 2021) to encourage more creativity in the ID process, but also to offer more guidance for science-influenced design-theory (guidance on which instructional methods are preferable for which situations), which has also been sorely lacking. This model encourages creativity by taking a holistic, top-down approach to the ID process, which has three levels of design (see Figure 1). The top level entails creating a fuzzy vision of the entire learning experience, which encourages big-picture, out-of-the-box thinking about what the learning experience should be like. Each level utilizes just-in-time analysis, so the top level begins by gathering just enough information to create the fuzzy vision of what is to be learned and how it is to be learned – the learning experience. This is the most creative level of design. The mid level works out more details for the fuzzy vision, and the lower-level of design is where the designer works out the most detailed blueprint of the instruction, which is based mostly on science (i.e., well researched instructional theory). Interestingly, most ID models have lacked such science, as well as guidance for creativity.

Figure 1

The Holistic 4D Model of Instructional Design



The bottom line is that, while LXD and ID have historically used different skills and methods, we believe the ID process should be less structured and more flexible and creative, and that LXD would benefit by being a bit more structured and design-theory-based.

Design for the Learner or the Teacher?

A third issue for differences in the design process is focus on the learner and the learner experience. The design of teacher-centered instruction focuses on what the teacher should do. In contrast, the design of learner-centered instruction focuses on what the learner should do – the LX – even though the role of teachers or their technological counterparts as facilitators should not be ignored. We believe this essential difference between the teacher-centered and learner-centered paradigms is the most important change to take place in the modern history of education and training – more important even than technological developments, though the latter make it easier and less expensive to make the learning process learner-centered.

Our understanding of the LXD literature is that a designer should start by designing what the learner should experience (from the learner perspective) before designing the instructional methods that will support learning during the LX (from the 'teacher' perspective). This is very different from most ID models, and we have incorporated it into the Holistic 4D Model, though we are currently working on improvements to this guidance. In fact, we find it helpful to think of the design process as:

1. Identifying the kinds of learning that are desired (similar to the LXD emphasis on goal-orientation),
2. then identifying the kinds of mental processes in which the learners need to engage for the desired learning to take place,
3. then designing the kinds of learner experiences that will likely trigger those mental processes, and
4. finally, designing the things that can be done (which we call instructional methods) to support or facilitate learning from those learner experiences.

However, scholars acknowledge that LXD currently offers little in the way of guidance for the process of designing the LXs, and even less for instructional methods to support learning from those experiences (Jahnke et al., 2020; Schmidt, et al., 2020). So, what specifically should LXD researchers work on in the way of such guidance?

Regarding design of the LX, in the Holistic 4D Model, we identify two very different kinds of expertise for training and education: task expertise, which is concerned with how to do things, and topic expertise, which is concerned with understanding things. These require two very different kinds of learning experience. Consequently, we offer guidance for LXs that are task-based and for ones that are topic-based, though much more guidance is still needed. Work on simulations and virtual worlds (including both virtual reality and augmented reality) is also highly relevant here (e.g., Mayer et al., 2022; Myers & Reigeluth, 2017; Radianti et al., 2020; Reigeluth & Schwartz, 1989). We suggest that further guidance for the design of the LX should address the environment in which the LX will take place, the role the learner will play, the resources and tools that will be available to the learner, the people with whom the learner will interact, and others.

For the *design of the instructional supports*, instructional theory already offers much proven guidance that could easily be adapted into LXD models (Merrill, 2020: Reigeluth, 1999; Reigeluth & Carr-Chellman, 2009; Reigeluth, Beatty & Myers, 2017). Such guidance includes the various kinds of scaffolding that will be offered to aid learning during the LX. Such scaffolding may include just-in-time tutorials, which have several advantages: greater transfer of skills and understandings through divergent practice (practice that varies the conditions of performance as much as possible), greater long-term retention, competency-based assessment of each individual member of a team, and even automatization of skills when appropriate, all of which we address in the Holistic 4D Model. Scaffolding may also include the use of various supports for learner performance that are gradually faded over time, among others.

When it comes to guidance for designing the LXs, including their instructional supports, it is important that LX researchers identify the situations for which they recommend each design (each set of guidelines). As discussed earlier, different LX designs will be beneficial for different situations. This situational guidance may take the form of principles, or the form of a set of design features (methods or a model) for a given set of situational variables. It is important that any principles specify the situational variables for which each design feature is believed to be desirable (Honebein & Reigeluth, 2021): If [situation A], then use [design feature X]. The most important situations are likely to include the nature of the learning goals, the nature of the learner, the constraints of the learning situation, and the constraints of the ID or LXD process and resources (Reigeluth & Carr-Chellman, 2009). Honebein and Reigeluth (2023) have added a fifth situational variable, institutional requirements.

Conclusion

We believe the comparison of LXD with ID is confounded with the comparison of the teacher-centered paradigm of education/training with the learner-centered paradigm. The latter entails personalized, competency-based, collaborative, project-based, and self-directed learning. It is an experience-based-learning paradigm, and it requires considerable creativity and extra sensitivity to the learners, but it also benefits from scientific knowledge. Changing the ID process from a bottom-up, piecemeal approach to a top-down, holistic approach is crucial for allowing much more creativity and sensitivity to individual learners in the ID process. Instructional designers need to move beyond the dualistic thinking of either LXD or ID, and embrace the systemic thinking of both LXD and ID. While they may entail different perspectives,

skills, methods and tools (Floor, 2021), they are not incompatible; indeed, they are complementary, and the integration of the two is considerably greater than the sum of the parts, as Schmidt et al. (2020) indicate in their first axiom, transdisciplinarity.

Design thinking, user experience design, interaction design, human-centered design, game design, instructional design – all these are useful, and none preclude use of the others. We can understand why some LXD authors might want to set LXD apart as different from ID, because ID has typically overlooked many of the important tenets of LXD, but they are not incompatible. Whether we choose to call it instructional design or learning experience design or learner-centered design or humanistic design is of little consequence to us. What is important is that it is a different paradigm from teacher-centered instruction and consequently has a different underlying philosophy. Also important is that it should include everything that is helpful for making learning easier, quicker, more motivational, and better (longer retention, better transfer).

We encourage LX researchers to use the Instructional Theory Framework (Honebein & Reigeluth, 2020a, 2020b, 2023) in their efforts to develop better guidelines for LXs and the LXD process. The Framework offers guidance for identifying various kinds of conditions (learner, content, context, ID constraints, and institutional requirements) and values (about learning goals, priorities, methods, power, and institutional priorities) that influence the preferability of various design options – in this case, methods for what the LX should be like. The goal for researchers is to identify different kinds of LXs (different features of LXs) that are preferable for different sets of situation variables (both conditions and values), leaving plenty of room for variability and creative design within the specification of each "kind" of LX. The Framework is equally useful for generating guidance for the LXD process, identifying ways that the process should differ depending on conditions and values for the process.

LXD has great potential to improve learning. We hope these ideas help LX researchers to better realize that potential.

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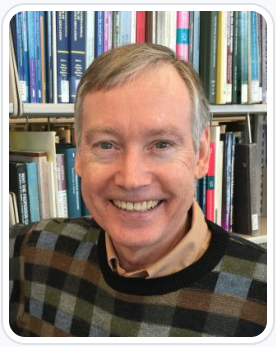
[1] We refer to these as “instructional methods” because they are things that are done purposely to facilitate learning.



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