A Course Reader for Learning Experience Design

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Module 1: Introduction to Learning Experience Design

Module 1 readings are provided in this section.

Becoming a Learning Designer

Ellen D. Wagner

Editor's Note

Because of the close connection between these skills and the discipline of instructional design, many of the chapters in this book refer to the profession as instructional design, and professionals as instructional designers, even though many, like Dr. Wagner, prefer the term learning designer. The actual name of the discipline is continually evolving, as Dr. Wagner addresses in this chapter.

Learning design is the name of the professional practice that, in the views of many education, training, learning, and development professionals, is a next iteration in the evolution of the craft dedicated to creating, producing, evaluating, and improving resources and experiences that help people and organizations learn more and perform better.

A learning design is a creative pathway, with steps along the way, that guides someone from a point of introduction to a permanent change in knowing, doing, or being. By naming learning design as the focus of our collective activity, we make the declaration that our focus is on learning enablement, regardless of where, when, or with whom our design efforts will be taking place. Designs may revolve around the creation of a course, programming an application, or producing a webcast. Resources being designed as catalysts to induce learning may be as small as an element in a presentation or as big as an immersive environment.

Learning design consists of an amalgamation of several contemporary design traditions actively used within current teaching, learning, training, and development professions. As learning designers, we have profound opportunities to develop conditions, strategies, resources, tools, and platforms that will keep learners engaged and inspired. We can help people make new connections and meanings, spark new interests, and develop new abilities so that new learning will occur.

In order to understand what learning design is, it is helpful to understand its precedents and how they are related to each other. In this chapter, I will first describe several of the most notable precedents. From there, we will consider some of the current professional expectations for learning designers in the contemporary learning and development marketplace. I will then reflect upon some of the big variables shaping “Learning Designer Identity.”

Instructional Design

Perhaps the most familiar of learning design’s earlier traditions is *instructional design*. Instructional design (ID) is a foundational part of the profession dedicated to systematically improving the learning and performance outcomes of individuals completing a deliberate course of study. Originally, instructional design described a practice of creating lessons and courses. In this context, design is describing an activity or set of activities that result in a documented set of specifications for creating a lesson or a course. Following are the steps designers take when designing lessons or courses:

1. Assessing Content for the Course: What needs to be covered?
2. Assessing the Learners: Who is taking this course? What will they need to know and do? How will you know if they have accomplished those things?
3. Creating a Design Document: What needs to happen for this course to become real?
4. Asking What Needs to Be Developed: Who is going to produce it? How much will it cost?
5. Implementing the Design: What is needed for the lessons to be offered, for the students to respond, and for the course to be completed?
6. Evaluating the Design: Did the lessons work? How do you know? How could it be better?

At the end of this process, the designer would end up with a design document. This serves as a specification to guide the construction of a course. Design documents are a great way to review how you solved your design challenges—what worked and what didn't work. They are important instruments for formative review and essential for summative review. A design document also forms the basis for a professional portfolio that will serve as evidence of your work over time. It is your record of how you communicated your plans for what needed to get done, both to yourself and to your stakeholders.

Over time, the term instructional design has also come to be used as an overarching term for any formal activity undertaken when designing and building learning resources or experiences, formal or informal. This causes some confusion when it comes to creating job titles for people working in the learning and development field in various capacities. Instructional design positions continue to represent a good percentage of today's jobs in the learning and development industry by virtue of the industry's emphasis upon the creation of digital courseware and digital virtual environments, especially after COVID-19 school and work closures in the spring of 2020. This is the case even for positions which may not actually be engaged in designing or developing formal learning programs, lessons, or courseware.

Additional Resources

For more information on the history of the instructional design approach, refer to the *Foundations of Learning and Instructional Design Technology* textbook available on EdTech Books, particularly the chapters on programmed instruction by Molenda and instructional design models by Dousay. Students might also appreciate perusing back issues of the *Journal of Applied Instructional Design*.

Instructional Systems Design

Given that so many learning experiences transcend instruction and must address bigger contextual consideration, sometimes the activities associated with this practice are described more broadly as Instructional Systems Design (ISD), where a significant nod is given to the impact of the broad conditions under which course, content, and experience conceptualization, as well as prototyping and production will be taking place. ISD is based on a process model for managing the establishment of a system within which instruction is a component. ISD calls for the following:

- Assess the needs and support requirements of target audiences and determine needs for the content presentation.
- Design for interventions or create solutions to improve outcomes, including baselines and methods for instructional measurement.
- Create development specifications: How will this solution be constructed?
- Create implementation plans: How will we get the new system to work? How will we engage learners?
- Determine formative and summative evaluation plans: How will we know if it is working? How will we make our revisions? How will we know if all our efforts have been worth it?

Depending upon the degree to which a program may feature multimedia or web technology systems as a part of their practice, one may still find practitioners of instructional technology—even though many using the moniker "IT" in 2020 are more actively engaged in the practices associated with information technology, the domain of enterprise computing, network management. In education and training, instructional technology is the place where one finds learning management systems, learning content management systems, knowledge management systems and, increasingly, platforms and programs that enable the tracking and analysis of resource use and user performance data.

User Experience Design

Another major set of influences upon the learning design profession have come from the world of User Experience Design. Since the mid-1990s, web browsers brought the World Wide Web to life and as web technologies and service platforms such as content and learning management systems became a more active component in systems developed for sharing, delivering, and distributing content, courses, and experiences. From this evolution, User Experience (UX) Design emerged as a field that has explored and influenced design considerations for how a website, online product, or digital product user would experience a product.

Coined in the mid-1990s by Donald Norman during the time when he was vice president of advanced technology at Apple Computer, UX describes the relationship between a product and a human. Back then, Norman argued that technology must evolve to put user needs first—the opposite of how things were done at the time. It was not until 2005 that UX gained mainstream relevance as 42 million iPods were sold that year and the mass market experienced great design at scale. Not long after, job descriptions and expectations shifted from putting information online to tailoring the online experience to the needs of end users. The field of User Experience Design had been born (Kilgore, 2016).

Additional Resources

For more information on UX design, see the chapter by Earnshaw, Tawfik, and Schmidt (2018), or their full open access book on the topic at https://edtechbooks.org/ux.

Design Thinking

The need for better user experience with technology hardware and software was undeniable in the 1990s and 2000s as tech systems, platforms, and tools evolved from being tools for the technologically proficient to being tools that were intuitive enough for "regular folks." As the focus on considering user experiences shifted product design, a set of processes and design approaches known as "Design Thinking" grew popular.

The Interaction Design Foundation noted that Design Thinking emphasizes developing an understanding of the people for whom products or services are being designed (Dam & Siang, 2020). It helps develop a sense of empathy with the user. Design Thinking helps by continually questioning the problem, assumptions, and implications. Design Thinking is useful for tackling ill-defined or unknown problems, by reframing the problem in human-centric ways, developing many ideas in focus groups, and adopting a hands-on approach in prototyping and testing. Design Thinking also involves ongoing experimentation through sketching, prototyping, and testing new ideas.

All variants of Design Thinking embody similar principles which were first described by Nobel Prize laureate Herbert Simon in *The Sciences of the Artificial* (1969). The Hasso-Plattner Institute of Design at Stanford University, also known as the d.school, was at the forefront of applying and teaching Design Thinking.

The five-phased model developed by the d.school to explain Design Thinking included the following steps:

- empathize with users
- define users' needs and problems, along with your insights about those needs and problems
- ideate by challenging assumptions and creating ideas for innovative solutions
- prototype to start creating solutions
- test solutions

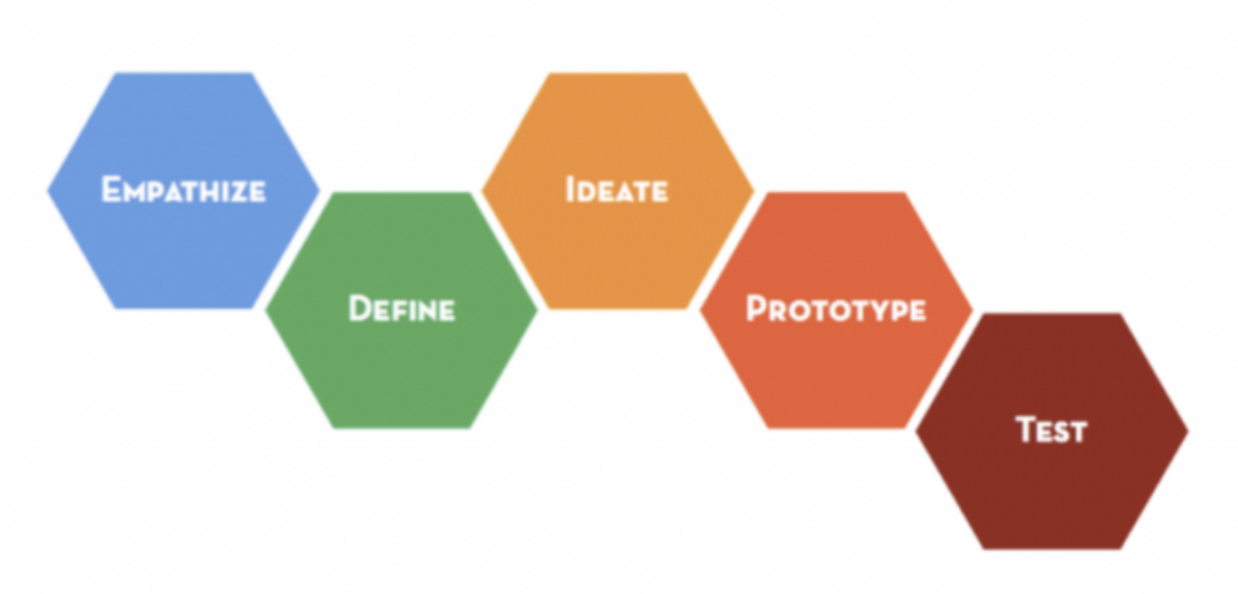
These five phases are not necessarily sequential. They do not have to follow any specific order and can occur in parallel and be iteratively repeated. They are offered as an overarching conceptual framework.

Additional Resources

For more information on Design Thinking approaches, see the chapter by Svihla in this book, along with a similar chapter on agile design approaches by Cullen.

Figure 1

The IDEO Design Thinking Model



While Design Thinking does not address the requirement of designing for learning products, services, or experiences, per se, the recognition of the relationship between experiences that can engage and inspire, and conditions that must be present for learning were recognized in the early days of World Wide Web development.

Learning Experience Design: Unifying Design Traditions

While many informal discussions around learning experience began happening in the mid-2000s[1], Niels Floor and his colleagues in the Netherlands began actively exploring Learning Experience Design (LXD). They met in 2012 to unify the principles of UX Design with learning principles and instructional design principles, even if some of those ID principles might not necessarily be used to create direct instruction (N. Floor, personal communication, February 20, 2019). Where UX designers' responsibilities would include designing prototypes and wireframes, graphic and visual design, constructing user journeys or flows, collaborating with subject matter experts, and carrying out qualitative usability tests (Rosala & Krause, 2019), learning experience designers would bring a focus on rich multimedia experiences, learning outcomes, and performance improvement metrics.

Kilgore (2016) noted that LX designers develop experiential, multi-layered, complex, and contextual courses and lessons that do not necessarily end when a course closes. These experiences aim to provide learners with enhanced engagement, retention, affordance, and overall a more memorable learning experience. This requires advanced skills in planning, production, development, design, and a clearer understanding of modern learners and learning trends than what is required for more traditional instructional design undertakings. LXD appears to be less dependent upon both supporting the infrastructure of technological systems and upon formative and summative evaluation than more traditional ID and ISD practices have purported to be.

Learning Engineering

In recent years, learning engineering has emerged as a practice with the potential to serve as a strong complement to learning design. Learning engineering focuses on using data analytics, computer-human interaction, modeling, measurement, instrumentation, and continuous improvement to optimize learning and learning decision-making. It offers a renewed focus on formative evaluation and on experimentation in the learning workflow.

Learning engineering started to emerge as a new field of interest in the mid-2010s with the increased popularity of MOOCs, which served student populations in the hundreds of thousands in a single course. Suddenly, there were opportunities for conducting “big-data” research and analyses—the scope of which had only previously been available to commercial business analysis firms or to customers of online services. Furthermore, now “big data” were available to educational researchers, meaning that educational research was no longer confined to social science methods based on small sample sizes or random-controlled trial studies. Instead, machine learning, deep learning, data mining, and artificial intelligence could be applied to research on course-related behaviors, achievements, retention, persistence, and completion patterns. Initial contemporary interest in learning engineering began at institutions hosting MOOCs such as Harvard, MIT (EdX), and Stanford (Udacity, Coursera). Carnegie Mellon University had maintained an engineering-as-problem-solving tradition since the 1960s. Their Simon Institute openly licensed CMU’s Open Learning Initiative products in 2019 for educators to bring continuous improvement to classroom instruction (Young, 2019). This was a nod to encouraging continuous improvement and classroom experimentation as an open education practice (OEP) associated with learning engineering and empirical education.

Learning engineering’s first appearance can be traced back to 1966, and, as with Design Thinking, is attributed to Herbert Simon. At the time, Simon was a professor of Computer Science and Psychology in the Graduate School of Industrial Administration at what was then the Carnegie Institute of Technology. He was asked to give a speech (later published as an article) at the Presidents Institute at Princeton University. In this speech, “The Job of a College President,” he took higher education to task for its approach to institutional management and operation: “Comparing colleges with other organizations, one sees that their most striking peculiarity is not their product, but the extent to which they are operated by amateurs. They are institutions run by amateurs to train professionals” (Simon, 1967). Among his suggested strategies for making colleges and universities more professional settings for teaching and learning, Simon believed there might be value in providing college presidents with a learning engineer—an expert professional in the design of learning environments.

As Simon envisioned this role, the learning engineer would be an institutional specialist with several responsibilities related to optimizing university productivity. Specifically, they would be responsible for working collaboratively with faculty to design learning experiences in particular disciplines. They would also be expected to work with administration to improve the design of the broader campus environment to facilitate student learning and faculty improvements. They would also be expected to introduce new disciplines such as cognitive psychology, along with learning machines and computer-assisted instruction (remember, this was 1966), to various disciplines on campus.

Simon and his colleagues instilled a tradition of linking research and measurement of results to the improvement of teaching and learning on his campus. Continuing in his tradition, a center was named for him at Carnegie Mellon to harness his vision for a cross-disciplinary learning engineering ecosystem.

With recent 2019 announcements from Carnegie Mellon University describing the Simon Institute’s plans to open-source their huge collections of digital learning software, there has been much excitement that this will be a catalyst for encouraging interest in continuous formative improvement in direct instruction, learning, and performance support. There is hope that these efforts will have both direct impacts on learning engineering and indirect complementary impacts on learning design practices going forward.

Current Demand in Learning Design Still Calls for Instructional Designers

The term learning designer is still not being used broadly in the learning technology industry. For the most part, job postings continue to seek instructional designers. Dr. Jane Bozarth, Director of Research for the Learning Guild, reported that “In what was no surprise at all, I found the term Instructional Designer encompassed an ever-expanding, soup-to-nuts array of tasks. The title has become a catch-all for anything related to creating, launching, delivering, or even facilitating instruction in any capacity, and at any level of complexity” (Bozarth, 2019).

In a 2019 report from the eLearning Guild, Bozarth noted that in 2014 when applying for ID jobs, instructional designers were expected to be able to do the following:

- Conduct needs analyses
- Conduct task assessments
- Write learning objectives
- Know the ADDIE process
- Understand supplier management
- Use desktop publishing
- Create graphic designs
- Use authoring tools
- Create with PowerPoint
- Produce and manage live & recorded webinars
- Support the training database
- Work with subject matter experts
- Create instructor-led training

The eLearning Guild’s 2019 review shows even more skills lumped into the ID job skill category (Bozarth, 2019). In addition to the list above, postings for jobs focused primarily on instructional design included a desire for expertise in

- Video production and editing
- Audio production and editing
- Web design/HTML5
- Game design/badges
- Dashboard creation
- Digital products
- Mobile app design
- Social and collaboration tools
- Assorted learning platforms
- Data analysis
- Content curation
- Augmented, virtual, and mixed realities

On top of this was the overlap between titles. Designer and developer were often used interchangeably. This is supported by eLearning Guild membership data. Many of those employed as instructional designers say their work actually entails doing “a little of everything,” while those with more task-specific job titles (like multimedia developer) say they spend a lot of their time engaged in instructional design.

Some large technology company HR departments continue to vacillate on whether to classify instructional design positions along with technical communication positions (a fine job classification if you want to be a technical communicator, less so if your design and interactive technology skills are about to be relegated elsewhere). Some IDs are expressing interest in learning engineering job titles, thinking that it may bring a stronger recognition of technical skills back to a job that has been held hostage by job descriptions that, in their worst iterations, have become catch-all positions for “all tech duties as assigned.”

Apart from the job stress of trying to wear a dozen hats, Bozarth has noted that the role confusion about what it is that IDs should do or ought to be doing makes it very difficult to pin down essential competencies (Hogle, 2019), educational and other background requirements, and correlating salary. “Calling yourself a learning experience wizard on Twitter probably isn’t helping,” Bozarth confides, “but calling yourself an instructional technologist, and being able to explain what that means, might” (2019).

Establishing a Learning Designer Identity

What we should remember from Bozarth’s breakdown of instructional design job skill expectations is that the position descriptions advertised on job sites such as LinkedIn and Glass Door are generally defined by hiring managers. Hiring managers are always interested in getting the most out of their hiring dollars. While we must certainly pay attention to what the job postings say a company is looking for, the learning design profession also has a responsibility to articulate what *we* expect from our colleagues. Let us consider learning design with our own professional identity in mind. If we establish our own vision of what we expect from our fellow practitioners of learning design, this will help set expectations for what we want from one another in our work together. The following is a suggested list of expectations for collections of knowledge that we would expect qualified learning designers to obtain.

1. Understanding of Human Learning. We should expect each other to be familiar with the major schools of thought that explain the phenomenon of human learning. Whether we gain our understanding through the study of learning sciences, or through studies of human cognition, human behavior, or some combination thereof, we need to have an appreciation for the myriad explanations for how people learn. Furthermore, we need to appreciate the degree to which learning is likely to manifest in the wide variety of conditions, both formal and informal, that can elicit learning responses. We will need to know about the steps, stages, and processes that constitute the various phases of learning. We need to understand how learning outcomes may change under different conditions, and how conditions change in different populations, at different ages, under different kinds of support structures.
2. Understanding of Design. We should have a basic understanding of what design is. Because design is a creative process, there are many different ways that a design process may manifest. However, there are currently two major schools of thought related to how design processes are categorized.

Schools of Thought Models

One school of thought, called the *Rational Model*, tends to follow a sequence of stages or steps as a means of problem solving. The Rational Model proposes that

1. Designers attempt to optimize a design candidate to account for known constraints and objectives.
2. The design process is plan-driven.
3. The design process is understood in terms of a discrete sequence of stages.

Instructional design process models, such as the Dick and Carey model, the ADDIE model, and the ASSURE model, are all examples of rational process models. Much of instructional design and instructional systems design work over the years has been led by the development of rational process models.

The other common school of design thought is called the *Action-Centric Model*. The Action-Centric Model suggests that

1. Designers use creativity and emotion to generate design candidates.
2. The design process is improvised.
3. No universal sequence of stages is apparent – analysis, design, and implementation are contemporaneous and inextricably linked.

Both rational models and action-centric models see design as informed by research and knowledge. However, with the action-centric model of design, research and knowledge are brought into the design process through the judgment and common sense of designers—by designers "thinking on their feet"—more than through the predictable and controlled process stipulated by the rational model, which is presented as a more formal approach toward hypothesis testing ("Design," n.d.).

While action-centric models have not generally been part of the instructional design and ISD tradition, they have been more commonly found in settings where experience design, learner experience design, and Design Thinking process models are used. With their focus on serving the needs of learners first, the newly emergent fields of open pedagogy (e.g., Jhangiani & Biswas-Diener, 2017) and open education practices (A. Gunder, personal communication, December 30, 2020) are likely to use action-centric design process models as a central part of their orientation.

This shift away from rational process models, especially at a time when learning engineering is likely to provide “data science cover” in post-COVID remote learning explorations, is likely to bring about interesting opportunities for dialogue.

With these key foundational pillars in place, learning designers will continue developing skills in analysis and evaluation, communications and media arts, creative learning design and production, and research and measurement.

Analysis and Evaluation

Much of our work will consist of figuring out how to organize information so that it can be easily understood. Sometimes we may need to determine if what we are dealing with is an information problem or a performance problem. Sometimes we might need to determine if it is a problem for some but not all. Will people be best served with training? Might they be better served with performance support tools? Where and when will they need it?

Understanding techniques of needs assessment and content and task analysis will be essential. So will reviews of literature, knowing how to build a survey, and conducting market analysis. Formative and summative evaluation can help us determine whether or not the designs we provide will achieve the results we hope to achieve.

Communications and Media Arts

Effective communication is central to the role and function of learning design. We are often the people working with subject matters and learners, to help translate complex expertise into more easily understood, step-by-step procedural pathways. Creative arts, including writing, graphic arts, photography, videography, and web design are among the means of expression we have at our disposal for translating ideas and actions into words, images, recordings, and code strings.

Learning designers will find that the time spent developing good writing skills will serve them well. Regardless of the specific role, or the sector in which one is working, writers will always find their skills needed for a wide variety of tasks. These tasks may include, but not be limited by, writing scripts and screenplays; press releases and public relations documents; opinion/editorial articles and columns; research reports; executive briefing documents; grants; professional presentations; and professional articles. The more that one moves away from rational process models and depends on action-centric models that are produced in the moment, the more likely we are to depend upon project documentation to guide progress.

Media professionals will also discover the same value for time spent developing skills in digital photography and videography production and post-production skills. From still images to complex, multi-layered 3-D immersive environments, we can use visual representations to help extend understanding in profound ways.

Creative Learning Design and Production

Learning how to work as a member of a team is an important part of being a learning designer. Production teams bring together groups of individuals who can bring a learning product from concept to product. For example, a relatively small learning product team producing web products may need a product manager, graphic artist, programmer, writer, web designer, and evaluator. These teams come together with a shared design document guiding the production of each stage of development.

Research and Measurement

One of the likely outcomes of the increasing number of enterprise technology systems (including web conferencing, LMS, SIS, ERP, and other similar platforms) is that it is more likely that student/user data is collected within these systems. As a result, the expectation that these data are going to be used in future learning design scenarios is already on the rise. Learning designers may find it beneficial to increase competence in statistical and machine learning skills. Test item development and creation of measurement instruments will be key skills.

Conclusion

The role of a learning designer has continued to evolve to make room for emergent technologies and frameworks. Always the goal has been to design the most effective learning using all theories, processes, or technologies at our disposal. In the modern version of the field, there are simply more of these theories, processes, and increasingly advanced technologies to assist us. Understanding how various design disciplines can inform our work as learning designers is both intimidating and exciting. This is a discipline where one never ceases to learn new skills and ideas. We can never be stagnant as a field and must increasingly improve our ability to learn from and collaborate with designers from a wide variety of backgrounds.

This book focuses on using design to create learning by focusing on key principles and various helpful processes, but most importantly, it focuses on the praxis or application of ideas in practice. Embracing the praxis inherent in action-centric design will help you develop a design identity that will bring you success in your work—no matter what your official job title or design context may be.

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[1] For example, after Adobe System had acquired Macromedia (the company that had previously owned products including Dreamweaver and Flash) in 2005, members of the former Macromedia Global Education team now at Adobe Worldwide Education continued to promote the "web user experience" in learning, and they referred to the work of creating interactive eLearning tools with their then market-leading products as "learner experience design." Wagner and her colleagues were offering presentations at the eLearning Guild Community Gathering conferences in 2005 and 2006, describing learning experience design features related to interaction and engagement.

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Defining Learning Experience Design: Voices from the Field of Learning Design & Technology

Matthew Schmidt & Rui Tammy Huang

User-centered Design | Learning Design | Learner Experience Design | definition

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Abstract

Increasing interest in user experience design (UXD) in the field of learning design and technology (LDT) signals a growing recognition of the importance of the individual experience of using learning technologies to learning—the learner experience (LX). However, a need exists to better define and conceptualize the phenomenon of learning experience design (LXD). Imprecise, interchangeable, and reductive usage of terms and concepts related to LXD frustrates efforts to situate and connect the established traditions of our field with complimentary methods and processes external to LDT (e.g., UXD, human-computer interaction). To approach this need, we performed qualitative content analysis on a corpus of 15 chapters from a recently published edited volume focused specifically on LXD in the field of LDT. Our research questions focused on identifying key terms and concepts, exploring how chapter authors characterized LXD, and examining the perspectives that informed authors' conceptions of LXD. We approached these questions using a rigorous, multi-phase inquiry process in which we conducted systematic, iterative open-coding. These coding efforts led to the emergence of a rich tapestry of terminology, methods, and concepts associated with LXD. Importantly, while book chapter authors drew from outside the field of LDT, the manner in which they intentionally located their work within established traditions of this field was particularly revealing. Grounded in the voices of these researchers and practitioners, we 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. On the basis of this operational definition, directions for future research are proposed.

Introduction

User-centered design (UCD) and user experience (UX) methods increasingly are being applied in learning design contexts (Cheng, 2019; Dimitrijević & Devedžić, 2021; Jahnke et al., 2020; Matthews & Yanchar, 2018; Shernoff et al., 2020; Stefaniak et al., 2020). This signals a shift in the field of learning design and technology (LDT), moving the field towards more human-centered approaches to designing digital environments for learning (Matthews et al., 2017; McDonald et al., 2019; Quintana et al., 2000; Soloway et al., 1994). Human-centered approaches to learning design seek to provide learners pleasing and effective digital learning tools that are easy to use and that efficiently propel them towards their learning goals (Robinson et al., 2017; Roman et al., 2020). Arguably, the move towards more human-centered methods of design in LDT began with the field distancing itself from the term instructional design and its focus on creation and delivery of educational and training materials (Mor & Craft, 2012). In its place, the term learning design is preferred (Bower et al., 2010), with a focus on the design of learning activities (Beetham & Sharpe, 2007; Oliver et al., 2007). While these changes were happening in LDT, usability and UX methods and processes began to gain prominence in the field of software engineering (Hassenzahl, 2013). Learning design practitioners took heed and began adopting these approaches in their own design practice (Kilgore, 2016). Consequently, the title learning experience designer emerged (Korkmaz, 2018) to describe the job of someone engaged in learning experience design (LXD: Georgiou & Ioannou, 2021; Harrati et al., 2016; Minichiello et al., 2018). Interestingly, these terms and associated concepts have become common parlance in the field of learning design, but with surprisingly limited clarity around what LXD actually is or what it entails. We seek to address this issue in the current paper.

In learning design practice, LXD is thriving. A search on prominent job sites (e.g., indeed.com, monster.com) for the term “learning experience designer” yields thousands of results. In practitioner circles, the LXDCON learning experience design conference is currently in its 6th year (lxd.org/lxdcon/). Higher education certificates and degree programs in LXD are increasing (e.g., Oregon State University’s LXD certificate, Brandeis University’s MS in LXD). Technology tools have emerged that brand themselves as learning experience platforms (e.g., lemonadetraining.com, 360learning.com). Further, conversations around LXD abound on social media (e.g., Facebook, LinkedIn). The growing interest in LXD is not limited only to practice, but extends to academic circles as well.

Within the realm of academic scholarship, the use of terms and concepts associated with LXD is increasing (Figure 1). To explore the extent of this, we performed a simple bibliographic analysis. We ran a search using the Web of Science database on educational publications and citations over the past 20 years using the terms user-centered design, user experience design, learner experience design, and learning experience design (Figure 2). Our results showed that these terms began to gain prominence in the educational research literature starting between 2005-2008, with a substantial increase in publications using these terms starting in 2015. The term learning experience design is somewhat widely used in the literature, with more publications and citations than any of the other terms that were reviewed. Prevalence of this term is increasing substantially, with over a 22% increase between 2018-2019. The second-most prevalent term from our analysis is learner experience design. This term also shows a steadily increasing trend in citations and publications, with a 17% increase in 2019 over the previous year.

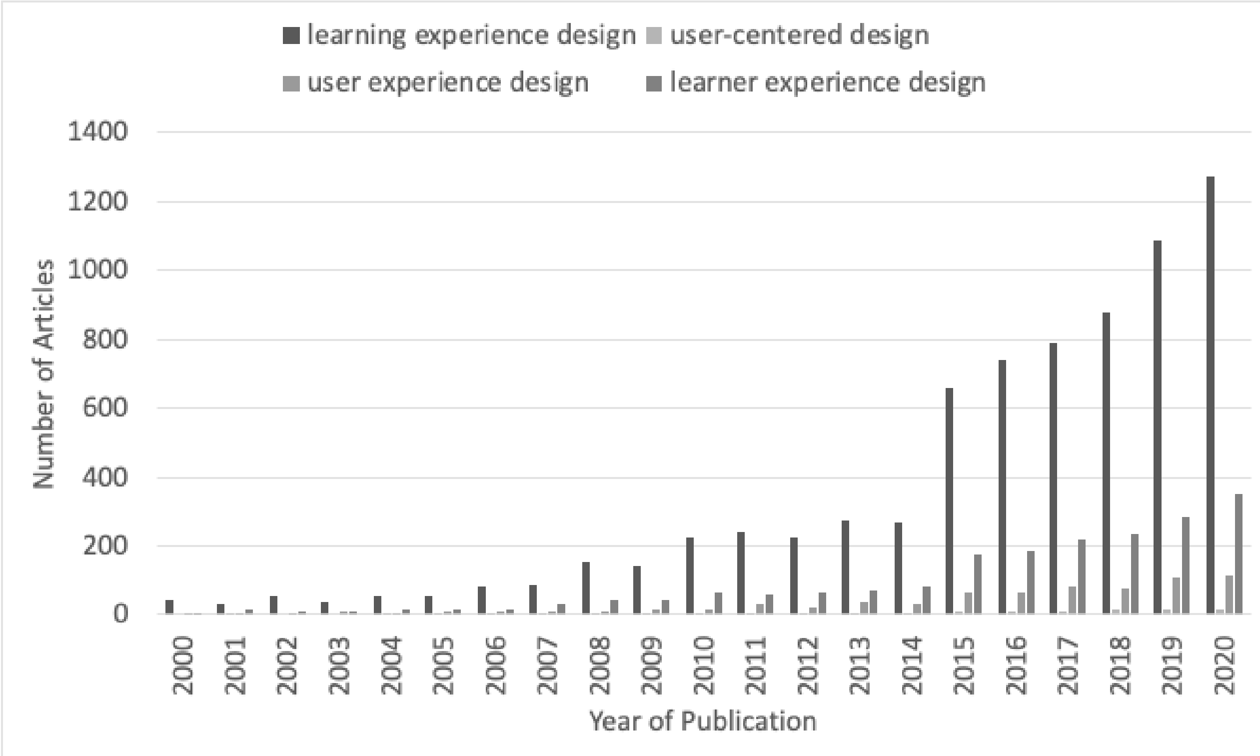

Figure 1. Total number of articles including search term published per year

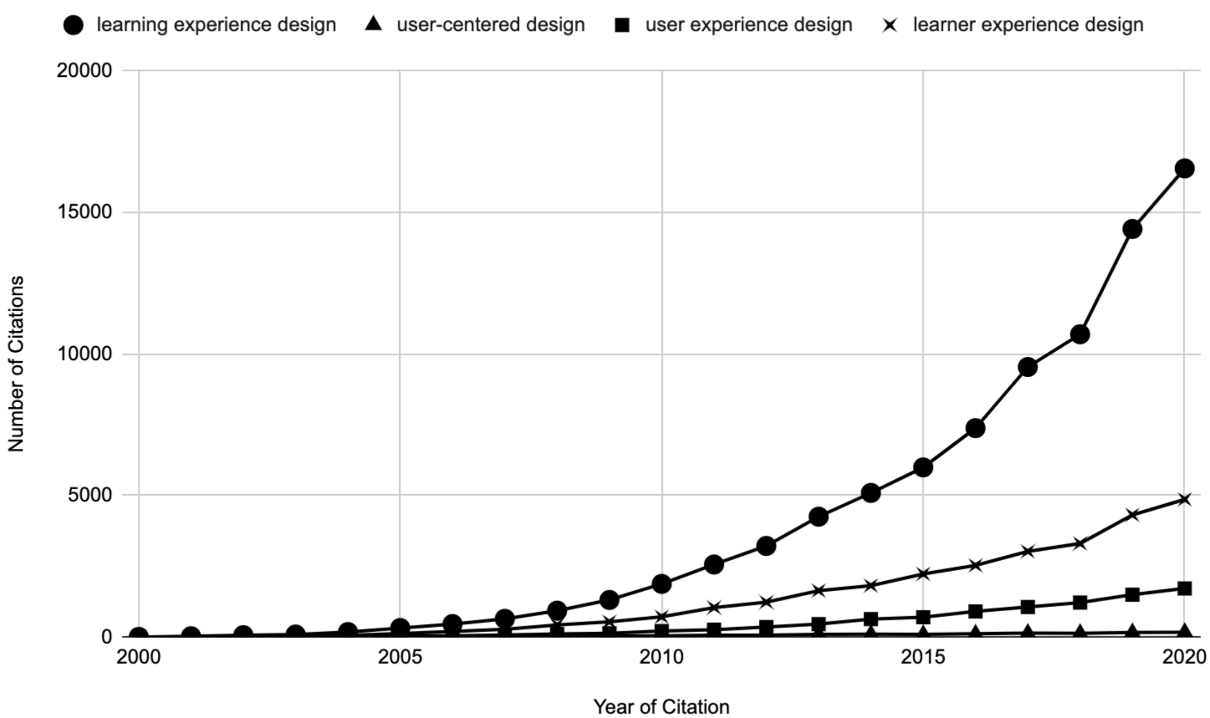

***Figure 2**. Sum of times articles including search term were cited per year*

Law and colleagues state, “It is an intriguing phenomenon that the notion of User Experience (UX) has been widely disseminated and speedily accepted in the Human-Computer Interaction (HCI) community, however, without it being clearly defined or well understood" (2009, p. 709). Arguably, this sentiment also extends to the LDT community. With increasing prevalence and interest in LXD, it is somewhat surprising that terms and concepts related to LXD have not been clearly defined. What is LXD? How does LXD differ from instructional design (ID)? What does a learning experience designer do? Is there a difference between learner experience and learning experience? Answers to these questions are elusive, due in part due to the recency of the LXD phenomenon. Rapid evolution is common in the field of LDT, but can present challenges in establishing common definitions and terminology (Lowenthal & Wilson, 2010; Moore et al., 2011; Volery & Lord, 2000). Furthermore, the field of LDT in some ways is defined by "imported" perspectives (McDonald & Yanchar, 2020) that link the field to outside disciplines. Such imported perspectives are often quite useful in learning design contexts, but understanding their main characteristics, how they compare and differ from one another, and potential deficiencies when applied to learning design is crucial, lest these perspectives be applied to ill effect. Although LXD draws influence from human-computer interaction (HCI), UCD, and UX (Jahnke et al., 2020; Schmidt, Earnshaw, et al., 2020), serious efforts have yet to emerge in the literature to map their characteristics, similarities and differences, and potential flaws in relation to canonical traditions of LDT. Confounding this, terms associated with learning design sometimes have "multiple, complex and sometimes competing roles and meanings" (Cross et al., 2008). For example, the term learning design can be used to describe the practice of design, the product of design, or a field of study (Conole, 2018; Koper & Olivier, 2004).

We argue that a common foundation of consistent terms and distinct concepts is essential to situate and connect LXD work in our own field with that of our sister disciplines (e.g., HCI, UCD, UX, etc.). As noted by Moore and colleagues (2011), ambiguous use of terms and lack of conceptual clarity can confuse efforts to "perform meaningful cross-study comparisons and build on the outcomes from the previous studies" (p. 129). In the vein of promoting consistency and clarity regarding the terms and concepts used in this article, we provide brief definitions in Table 1 below. The authors are well aware that these definitions are not exhaustive and that many of the terms' meanings and definitions remain the subject of some debate. Further, because no definitions for learning experience (LX) or LXD have yet been agreed upon in the literature, the definitions for these terms are provisional. They are synthesized from the findings of the present research and should therefore not be interpreted as conclusive.

Table 1. Terms and concepts pertinent to the notion of LXD

Term	**Definition**
User-Centered Design (UCD)	Offshoot of human-centered design used to describe iterative design practice that actively seeks user validation across all phases of design. Recognizes that users' needs, abilities, and desires should drive design at each stage of the process. Does not prescribe specific methods, but can accommodate a variety of investigative and generative methods (cf. Abras et al., 2004; Chandran et al., 2020; Norman & Draper, 1986; Robinson et al., 2018; Rose et al., 2018; Schmidt et al., 2020; Signoretti et al., 2019; Wang et al., 2018; Zhong & Schmiedel, 2021).
Learner-Centered Design (LCD)	Extension of user-centered design that reconceptualizes the role of the user as a learner. Emphasizes the importance of promoting understanding, performance, and expertise when designing learning technologies. Includes instructional scaffolding, supports, motivation, diversity, and addressing the gap in expertise between learners and experts (cf. Guzdial et al., 1995; Quintana et al., 2000; Soloway et al., 1994).
User Experience (LX)	Individual, perceptive quality that manifests through involvement, interaction, and observable/measurable experience with a technology or product. A consequence of internal factors related to the user, characteristics of the designed system, and the context of interaction. (cf. Hassenzahl, 2008; International Organization for Standardization, 2019; Law et al., 2008, 2009; Tullis & Albert, 2013).

Learner Experience (LX)	An emerging focus area of LIDT located at the crossroads of UX, learning design, and educational technology; concerned with the UX of learners during technology-mediated learning. Focuses on a specific class of user (the learner) engaged in a particular task (related to learning) while using a distinct type of technology (a technology tool designed for learning). Considers issues of how experiential elements might influence learning effectiveness and how perceptual factors might impact learner performance (cf. Jahnke et al., 2020; cf. Schmidt et al., 2020; Tawfik et al., 2021).
User Experience Design (UXD)	Design practice coined by Norman (2013) that seeks to consider every aspect of the relationship between the user-in-context and product. Modern UXD practice adopts a narrower focus on the user's immediate experience of using a technology product's user interface (UI). A variety of methods and processes are canonical to UXD, including design thinking, empathy mapping, usability, user stories, etc. Exact origins and precise definition remain the subject of ongoing debate (cf. Hanlon et al., 2021; Law et al., 2008, 2009; Marcus, 2002).
Learning Design (LD)	Can be used to describe design practice, design product or a discrete field of study. Learning design products are formal, reusable elements that can be meta-tagged, searched for, and shared widely via standardized digital methods. Learning design practice is application of a rule-set to describe the teaching-learning process from an instructor's perspective (cf. Alonso et al., 2008; Conole, 2018; Hummel et al., 2004; Koper, 2005). Serious efforts to define can be found in Koper and Olivier (2004) and the Larnaca Declaration on Learning Design (Dalziel et al., 2016).
Learning Experience Design (LXD)	Situated at the crossroads of learner-centered design and UXD, the term LXD can be used to describe design practice, design product or a discrete field of study. Concerned with both the effectiveness of designed learning interventions and the interconnected and interdependent relationship between the learner-as-user, the designed intervention, and the learning context. Transdisciplinary and complex by nature, LXD practice requires an extensive repertoire of knowledge, skills, and abilities across a range of disciplines. (cf. Abbott, 2020; Chang & Kuwata, 2020; Gray, 2020; Jahnke et al., 2020; Schmidt et al., 2020; Stefaniak & Sentz, 2020; Vann & Tawfik, 2020).

The purpose of this paper is to highlight the need for greater semantic and conceptual clarity around the concepts and language of LXD that increasingly are gaining prominence in the field of LDT and to approach this need through a content analysis of a corpus of recently published literature by active LXD researchers. Given the need for greater semantic and conceptual clarity around the concept of LXD, we performed a qualitative content analysis to articulate the phenomenon of LXD as portrayed in a corpus of 15 book chapters that were recently published in the edited volume Learner and User Experience Research: An Introduction for the Field of Learning Design & Technology (Schmidt et al., 2020). Our approach bears some resemblance to that of Kou and Gray's (2019) analysis of UX practitioners' discussions on StackExchange, an online affinity group where practitioners ask and respond to questions germane to UX design practice. A strength of their work is how they captured and characterized the vocabulary of UX design practice from the voices of actors embedded within a situated context, as opposed to seeking practitioners' opinions in response to predefined questions. We sought to do likewise in our study; however, as no comparable LXD community exists with whom we could engage, we therefore selected what we understand is the only collected body of LXD knowledge to-date, the Learner and User Experience Research edited volume (Schmidt et al., 2020). The purpose of our study, therefore, was to explore how authors conceived of LXD as evidenced by the definitions, characteristics, parameters, and contexts found in their book chapters. The research questions that guided our inquiry were:

RQ1: What key terms and concepts are used across the corpus of book chapters and with what prevalence?

RQ2: How do authors characterize LXD within their book chapters?

RQ3: What perspectives inform authors' conceptions of LXD?

Methodology

The current research was performed by the first and second authors of this paper, the lead researcher (a university professor) and the assistant researcher (a trained doctoral student), respectively. Our methods borrow from the tradition of grounded theory in our application of open-coding techniques (Glaser & Strauss, 2017; Strauss & Corbin, 1998). All data were first reviewed to gain a sense of the whole, with impressions recorded in field notes. These notes were then reviewed and initial interpretations were made. This formed the basis of an emergent coding scheme. After this, all data were re-read and coded. This process unfolded across three phases, in which we performed preliminary open-coding (Phase 1), provisionally applied and refined the coding scheme (Phase 2), and finalized the coding scheme and completed all analyses (Phase 3). We provide a detailed description of our research processes in the following sections.

Phase 1 Procedures

In Phase 1, we performed a preliminary review of our data set and recorded our impressions in field notes. We began by systematically reviewing four chapters to orient our inquiry and identify characteristics such as definitions, operationalizations, and problem statements. Using an iterative process, preliminary categories emerged that first were recorded in a spreadsheet, then refined, and finally used to create a structure for systematically annotating all book chapters. The resulting spreadsheet sections included: definition, positionality, context, theoretical perspective, learning domain/subject matter, areas of convergence/divergence, type of chapter (e.g., conceptual, empirical, case-study), and key terms. Following this, the assistant researcher systematically annotated 12 chapters based on these spreadsheet categories, and the lead researcher annotated three. Over the course of this procedure, the lead and assistant researchers met regularly to discuss the coding process, make refinements to the structured spreadsheet and annotations, and begin developing a preliminary coding scheme for Phase 2 of the research. During these meetings, coding categories were further developed and refined, guidelines for analysis were established, and preliminary findings were recorded. Upon completion of Phase 1, all chapters had been annotated using a structured process, and preliminary coding procedures had been established. These served as the inputs for Phase 2 of our analysis.

Phase 2 Procedures

To facilitate our Phase 2 systematic open-coding process, we used the computer-aided qualitative data analysis software (CAQDAS) tool Dedoose (https://www.dedoose.com/), as illustrated in Figure 3 and Figure 4. The open-coding procedures and development of the coding scheme went through several iterations. First, the initial open-coding scheme from Phase 1 was imported into Dedoose and used to code excerpts of book chapters. The lead researcher first coded one book chapter and made refinements to the coding scheme while the assistant researcher observed. The lead researcher explained procedures and reasoning for coding decisions using a think-aloud process. Next, the assistant researcher applied the coding process from the first stage to one chapter while the lead researcher observed, provided guidance, and answered questions. Both researchers then collaboratively coded one book chapter as a dyad, after which the assistant researcher coded another chapter independently. During this process, the coding scheme was finalized using an iterative process (Table 2). Finally, the lead and assistant researchers independently coded book chapters using the finalized coding scheme. The researchers met regularly to discuss coding discrepancies or issues with the coding scheme and to resolve these issues. Upon completion of the third stage, inter-rater reliability estimates were calculated based on the lead and assistant researchers' coding.

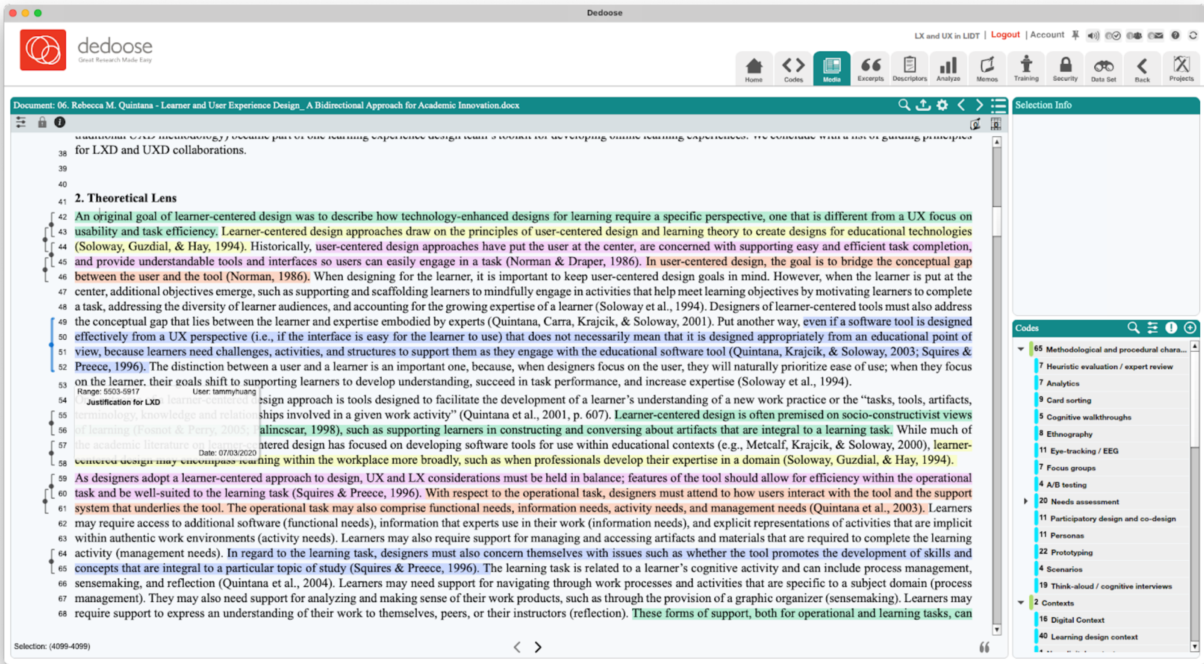

Figure 3. Example of a fully coded chapter in the qualitative analysis software, Dedoose

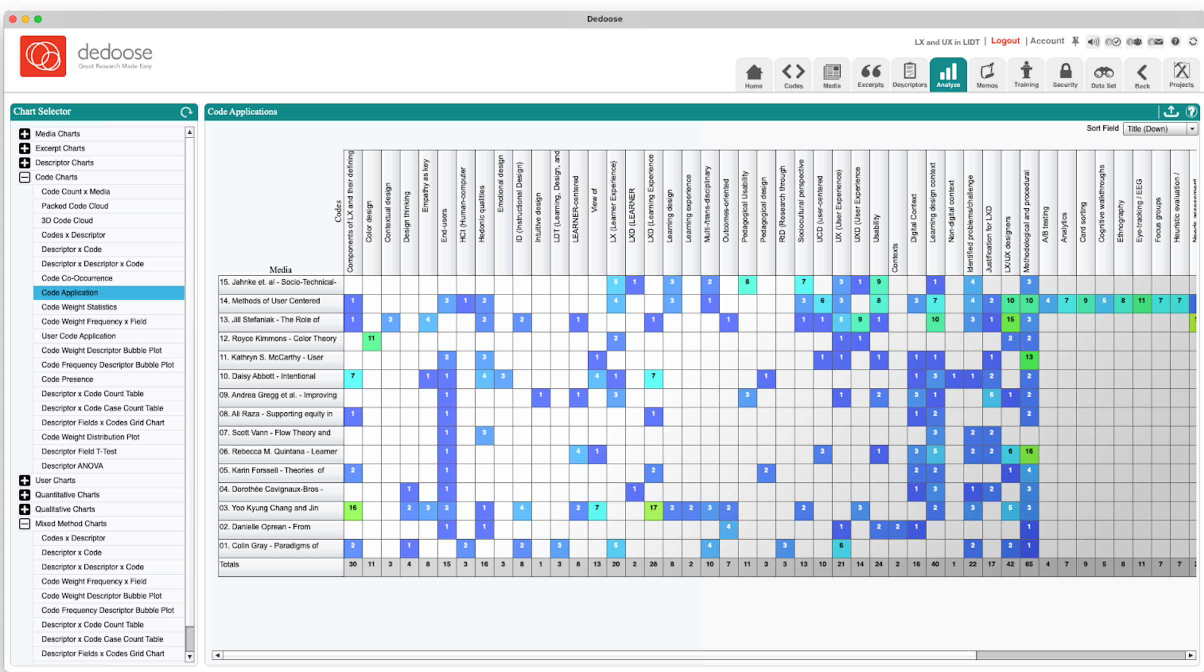

***Figure 4**. Code application chart from qualitative analysis software, Dedoose, showing codes applied across chapters*

Coding category	Examples
Key aspects of LXD	socio-cultural perspectives, technological usability, pedagogical usability, empathy as key component, hedonic qualities, human-/user-centered, personal, cross-/multi-/inter-/trans-

	disciplinarity, learning outcomes-oriented.
Design perspectives of LXD	Color design, contextual design, emotional design, intuitive design, pedagogical design, design thinking, learner-centered design, user-centered design.
Disciplinary perspectives of LXD	HCI, instructional design, learning design, LDT, UX, UXD.
Theoretical perspectives of LXD	Cognitive load theory, community of practice, flow theory, connectivism, activity theory.
Methods/Methodology of LXD	A/B testing, analytics, card sorting, cognitive walkthroughs, ethnography, eye-tracking, EEG, focus groups, heuristic evaluation, expert review, needs assessment, contextual analysis, participatory design, co-design, personas, prototyping, scenarios, think-aloud, cognitive interviews.
Key terminology related to LXD	Design thinking, empathy, learner experience, learning experience, user-centered design, learner-centered design, think-aloud, co-design.

Table 2*. Emergent coding categories and examples.*

Coding Reliability

Mentoring and dyad coding approaches were employed to promote coding reliability as described above. We also performed inter-rater reliability calculations to contribute to the rigor of our coding results. The lead and assistant researcher coded and compared 37% of the entire corpus of excerpts, yielding a Cohen's Kappa estimate of 0.765. These results fall in the category of good agreement according to Landis and Koch (1977) or excellent agreement by Cicchetti (1994).

Phase 3 Procedures

In phase 3 we sought to explore trends across terms coded as key terminology. To generate a precise list and frequency count of these terms, we stripped all references from chapters to avoid inflation of the terms' frequency count and combined them into a single document. We then ran searches on all coded terms and established corresponding frequency counts. Alternate formulations of terms were also used, such as plural forms, alternative spellings, etc. In the third step, all terms were stratified along the dimensions of LXD components, design approaches, methods, methodological approaches, etc. Some terms that were initially coded as key terminology were deemed to be so general that they did not meaningfully contribute to our research question (e.g., fidelity, functionality, flow, etc.), and hence were removed. The remaining results were reviewed and pruned, with coding categories that only described one or two terms being collapsed into existing categories or removed. Category descriptors were revised accordingly. Frequency counts also were updated as the refinement process unfolded.

Findings

RQ1: What key terms and concepts are used across the corpus of book chapters and with what prevalence?

Research question 1 focused on the prevalence of key terms and concepts. These were identified in book chapters and coded as key terminology. A total of 44 terms were identified, which we categorized across four categories: (1) LXD attributes, (2) LXD research and evaluation methods, and (3) LXD approaches.

LXD Attributes

The coding category LXD Attributes represents the terms used by authors that contribute to the overarching gestalt of LXD. These are terms that serve to shape and form the general concept of LXD. Figure 5 presents terms we assigned to the LXD Attributes category and their corresponding frequencies in a descending order. Among all 11 terms in this category, two closely related terms user experience (31.3%) and usability (20.4%) have the highest frequencies. This could suggest that these two related concepts are perhaps predominant aspects of LXD. The third most-mentioned term in this category is learning design (12.6%), perhaps underscoring the critical importance of learning to the phenomenon. Two terms worth special notice are learning experience (8.3%) and learner experience (7.5%). While this could support the centrality of individual experience to LXD, the terms are sometimes used interchangeably, suggesting potential confusion as to how the terms are distinguished from one another (a point we address in the discussion). The remaining terms are used less frequently relative to those discussed above, and while they comprise less than 20% of term frequency in this category, they could imply that design thinking and related concepts of empathy and prototyping play a role in characterizing LXD.

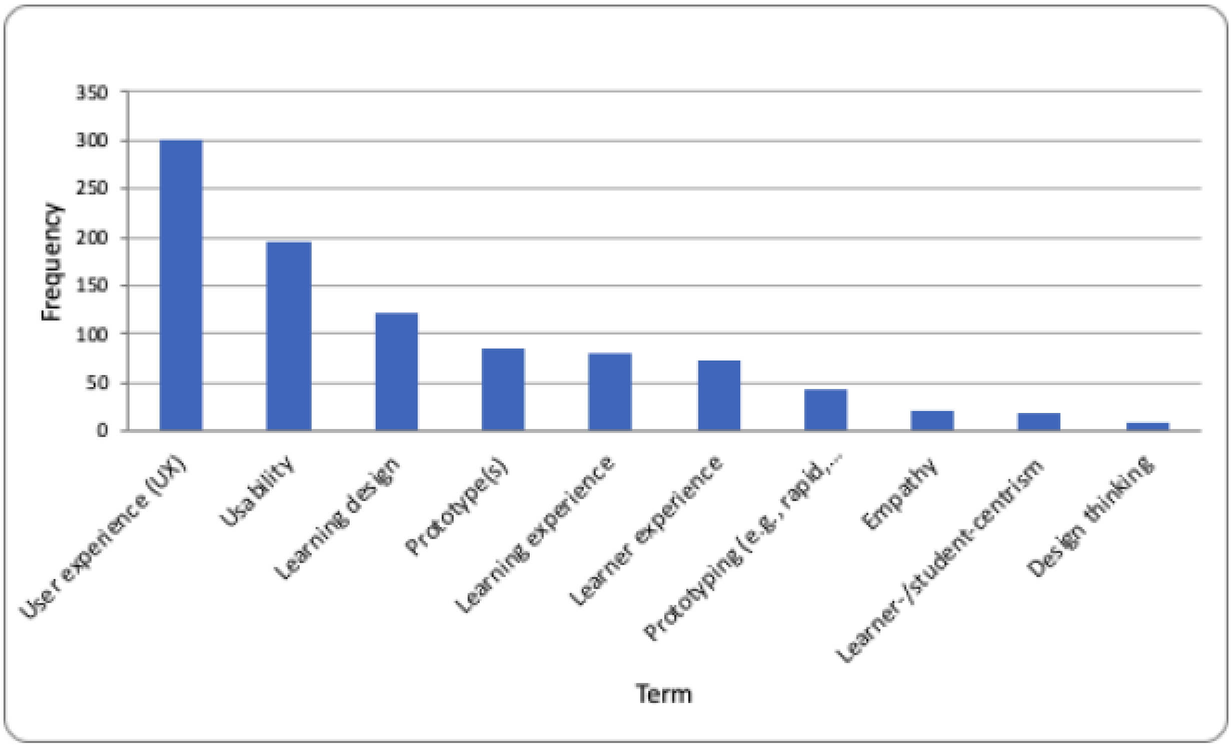

Figure 5. *Frequency of terms related to LXD attributes.*

LXD Research and Evaluation Methods

The coding category LXD Research and Evaluation Methods represents the research and evaluation methods that authors used or discussed related to LXD practice. Figure 6 depicts the frequencies of terms categorized as LXD research and evaluation methods. Twenty terms were assigned to this category. Of these, the top five most frequent terms are personas (16%), analytics (14.8%), think-aloud (13.7), requirements (9.9%), and scenarios (5.3%). Many, if not all, of these terms are related to formative design and evaluation, suggesting that LXD methods could have a particular focus on these aspects of design practice. The next five most frequent terms are cognitive interview, focus group, contextual analysis, card sorting, and cognitive walkthroughs, all of which have similar frequencies (3.8%-4.6%) and, combined, account for 16.7% of the terms in this category. Nearly all of these are evaluation methods, perhaps highlighting the centrality of evaluation to LXD practice. In aggregate, the remaining 10 terms' frequencies account for

19.4% of the total frequencies and provide insight into the multitude of research and evaluation methods that are actively being used in LXD.

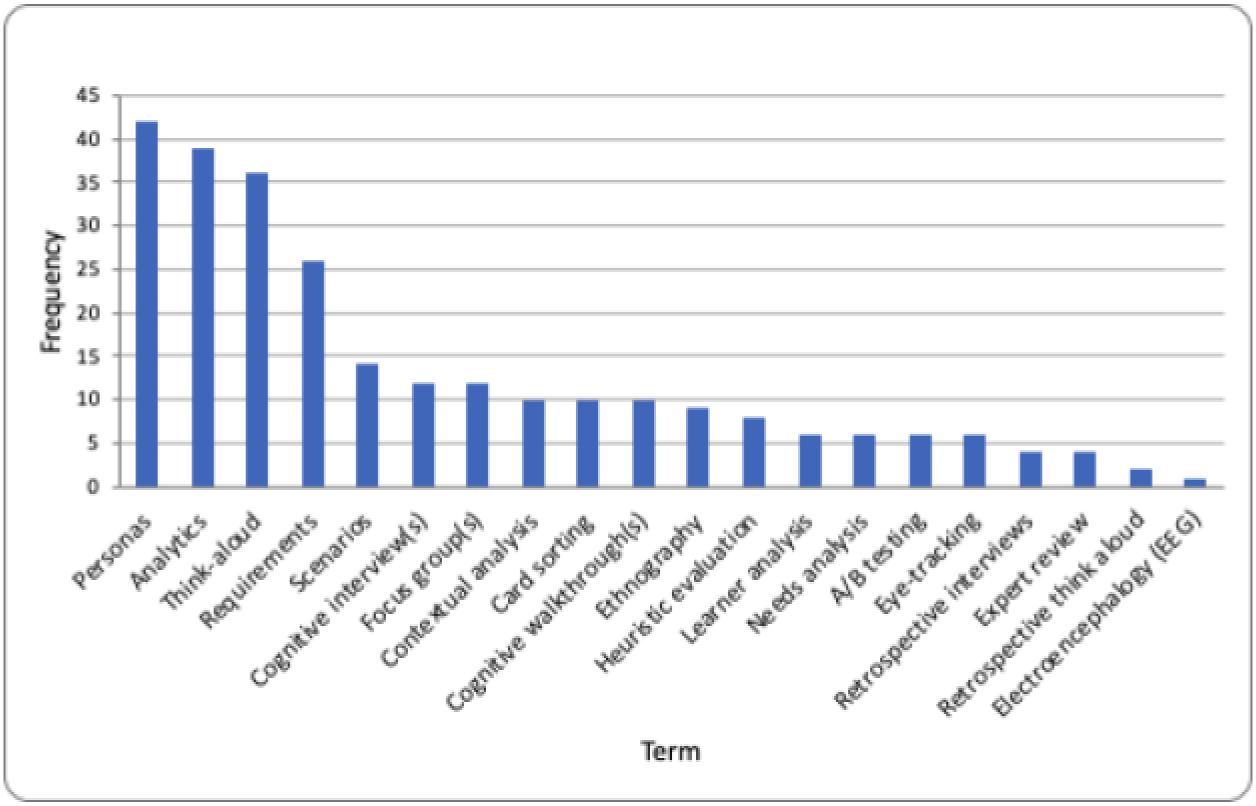

Figure 6. *Frequency of terms related to LXD research and evaluation methods.*

LXD Approaches

The coding category LXD Approaches represents the specific design frameworks or approaches that were used or discussed by authors related to their LXD practice. Table 3 shows the frequency of terms related to LXD approaches, including co-design (58.6%), participatory design (20.7%), emotional design (13.5%), universal design for learning (4.5%), and contextual design (2.7%). The top two design approaches have some similarities and together count for 79.3% of the total frequency. Intentional collaboration with participants during the design process could represent a significant departure from tradition. Indeed, Gray (2020) asserts that "the use of participatory design and co-design approaches [...] is not present in traditional LDT scholarship" (p. 7).

Term	**Description**	**Frequency**
Co-design	Often contrasted with top-down approaches to design in which a user's role is more passive, co-design conceives of users as active participants in the design process who are valued as equal contributors (Roschelle et al., 2006).	58.6%
Participatory design	Similar to co-design, but differentiates itself in that users are not seen as equal contributors. Although user input is solicited in participatory design, the design team is the arbiter of decision-making (Engelbertink et al., 2020).	20.7%
Emotional design	Approach to designing multimedia in an appealing and engaging manner so as to	13.5%

	promote positive emotional responses in learners (Mayer & Estrella, 2014).	
Universal design for learning	An approach to learning design that seeks to account for learner differences by providing multiple means of representation, action and expression, and engagement (D. Rose & Meyer, 2002)	4.5%
Contextual design	A systems-focused design process that prioritizes user data collected in-situ as the base criterion to inform product development (Holtzblatt & Beyer, 2014)	2.7%

Table 3. *Descriptions and frequencies of terms related to LXD approaches.*

RQ2: How do authors characterize LXD within their book chapters?

Research question two focused on authors' characterizations of LXD within their book chapters. Some authors succinctly defined LXD (Table 4), whereas others provided broader descriptions. Generally speaking, analysis of authors' portrayals of LXD revealed substantial agreement. However, while descriptions and definitions of LXD tended to agree that LXD is the result of integrating design practice from other fields (e.g., HCI, architecture, product design, software design, etc.) into instructional and learning design, a point of divergence was how author's described the integration of LXD with disciplinary perspectives from outside the LDT field. Authors described this integration using the terms cross-disciplinary, multi-disciplinary, interdisciplinary, and transdisciplinary. These terms suggest a spectrum of integration. On the cross- or multi-disciplinary end of the spectrum, LXD is viewed as the application of UXD methods in a learning design context, essentially replacing the term user in UXD with the term learner. On the transdisciplinary end of the spectrum, LXD is conceived of as having the potential to become a new and emergent paradigm in our field that derives from HCI, UX design, and LDT, but that ultimately transcends the currently established disciplinary boundaries of LDT. Some authors positioned LXD as interdisciplinary, for example, as a result of the combined inputs from both UX design and learning design, or as an integration of LXD and UX design.

Authors	**Definition**
Vann and Tawfik (2020)	"How the interface design aligns with principles of human-computer interaction and learning processes to support student knowledge construction" (p. 1).
Jahnke et al. (2020)	"Focus on improving the usability and LX of [...] learning technology from the perspective of [...] the learner" (p. 2).
Chang and Kuwata (2020)	"Practice of designing learning as a human-centered experience that leads to a desired goal" (p. 2).
Stefaniak and Sentz (2020)	"Process of designing products that are relevant to the everyday experiences of users or learners [that] encompasses the ability for a designer to address all the ways a learner [...] will interact with the product (intervention) being developed" (p. 1).
Abbott (2020)	"An approach that foregrounds learners and their desired outcomes in a goal-oriented way, acknowledging individual experience" (p. 1).

Table 4. *Examples of LXD characterizations provided by chapter authors*

Although the above points of divergence were noted, we also found that a number of key constructs are shared across authors. One example is using UXD processes and methods in the learning design process, for example, participatory design, co-design, and design thinking. In the following sections we detail how authors characterized LXD in their chapters using four broad themes: (1) human-centric, (2) theoretically-grounded, (3) informed by UX methods, and (4) socio-culturally sensitive. These themes are briefly summarized in Table 5. Interestingly, these themes share similarity with Floor's (Floor, 2018) practitioner description LXD, namely, that LXD is human-centered, goal-oriented, theoretically-grounded, and interdisciplinary.

Theme	**Description**
Human-centric	LXD focuses centrally on human experience from the perspective of the learner, as well as other learning technology users (e.g., teacher, LMS administrator).
Theoretically-grounded	Theory is foundational to LXD, which is principally inspired and guided by theoretical perspectives that have found resonance in the field of LDT (but also draws from theories rooted in outside traditions such as HCI and UX).
Informed by UXD methods	LXD is informed by UXD methods, but these methods are adapted and extended in LXD so as to be more appropriate and effective within a learning design context.
Socio-culturally sensitive	LXD seeks to promote empathetic understanding of the learner, their socio-cultural context, as well as the context in which they engage in socially-mediated meaning making.

Table 5. *Four broad themes that characterize LXD*

Human-centric

Authors' descriptions and definitions of LXD reveal that, much like UXD, human experience is the central focus in the LXD process. However, in a LXD context, key differences are evident. Raza and colleagues assert, "the field has started exploring and adopting human-centered or user experience design methods" (2020, p. 2). While Raza uses the term human-centered, terms such as learner and instructor were used with more prevalence. For example, Abbott emphasizes the learner: "within LXD the learner's needs, experiences, desires, and emotions are crucial" (2020, p. 2). McCarthy, Watanabe, and McNamara emphasize the teacher: "teachers play an important role in the success of educational technology in the classroom, yet instructors are often ignored as both facilitators and end-users" (2020, p. 2). Many authors seem to conceive of users as being a general term and learners being a unique category of user, as illustrated by Jahnke and her colleagues: "The focus of UX is [...] quite broad, with applicability to any technology in any context for any user. [LXD], however, has a narrower focus on improving the usability and LX of only one type of technology—learning technology—from the perspective of only one type of user—the learner (2020, p. 1)." LXD is therefore characterized as being centrally focused on a human in the specific role of the learner, as well as the more general roles of other learning technology users (e.g., teacher, LMS administrator).

Theoretically-grounded

Every book chapter adopted a theoretical lens to describe LXD work, although with varying levels of detail. This suggests that theory is central to LXD practice. The theories that guide LXD draw not only from the tradition of LDT, but also from outside disciplines such as HCI and UCD. For example, Kimmons (2020) discusses a theory that receives little attention outside of the visual arts—color theory. He carefully connects color theory to learning theories of motivation and self regulation: "Though the connection between color and learning may not be obvious at first, by influencing learner emotion, attitude, and interest, color can influence learner behaviors and attitudes, which in turn will influence their learning" (p. 5). Multidisciplinary theoretical perspectives seem necessary in LXD because "designers that approach the interface from only a learning theory perspective may encounter unforeseen obstacles due to user experience (UX) challenges" (Vann & Tawfik, 2020, p. 1). Across chapters, learning theory was consistently privileged over UX design. Bowen and colleagues explain, "while important to user experience (UX) and eventual product viability, [engagement, likability, and usability] should not be the sole focus of early testing. When developing tools intended to foster learning, it is paramount to explicitly define and test the learning theories on which those tools depend through deliberate learning experience (LX) design" (p. 3). Theory guides LXD practice. Although LXD practice draws from theories rooted in outside traditions such as HCI and UX, it is principally inspired and guided by theoretical perspectives that have found resonance in the field of LDT.

Informed by UXD Methods

LXD practice readily adapts learning design processes to align with those of design thinking and adopts design thinking techniques, such as empathy-based approaches for assessing needs. Design thinking was a recurring topic across many of the book chapters. This is perhaps unsurprising, as UX design is heavily influenced by design thinking, as Gray (2020) notes: "'Design thinking' has been taken on perhaps most substantially by practitioners known as user experience (UX) designers" (p. 1). Authors applied design thinking to their own learning designs, such as the MOOC described in Cavignaux-Bros and Cristol (2020). Although design thinking is frequently represented as a process model in the literature, Stefaniak and Sentz' (2020) consideration of this key concept was more nuanced, suggesting that design thinking should be "treated like more of a mindset rather than a specific method" (p. 3).

LXD practice applies various UX design techniques and methods, such as participatory design, co-design, think-aloud, cognitive walkthrough, etc. Across all book chapters, authors described application of UX design methods in learning design contexts (for an overview, see Figure 3). Of these, one method that was frequently discussed and applied was usability evaluation. However, conceptions of usability in learning design contexts deviated from more traditional views (e.g., International Organization for Standardization, 2019). Traditional usability perspectives focus on technological usability. While technological usability was acknowledged as important to LXD, it was conceived of primarily as a prerequisite to or a conduit for learning, but not as a central driver. For example, Oprean and Balakrishnan' (2020) framework for immersive learning underscores the importance of usability in promoting learner engagement. The traditional foci of technological usability—ease-of-use, effectiveness, efficiency, and user satisfaction—were seen as insufficient to inform learning design. As Quintana and colleagues (2020) argue, not all technological usability heuristics "are directly relevant to an educational context [...] they require an integrated approach, one that does not artificially separate usability and learning considerations" (p.3). Gregg and colleagues (2020) state, "online learning design requires more than the implementation of technical usability strategies and techniques" (p. 3). Given the inadequacy of technological usability alone to inform learning design, some authors advocated for the application of alternative forms of usability that specifically target learning design, such as pedagogical usability. According to Gregg and colleagues (2020), pedagogical usability "refers to a category of usability strategies meant to operationalize learning-centered design principles in online learning environments" (p. 3). Extending this, Jahnke and colleagues (2020) argue that "usability evaluation of technology-enhanced learning should embrace a broader conceptualization of usability, considering (a) the social dimension, (b) the technological dimension, and (c) the pedagogical dimension" (p. 2), which they label sociotechnical-pedagogical usability. To summarize, LXD practice is informed by UX design methods, but these methods must be adapted and extended for more appropriate and effective application in learning design contexts .

Socio-culturally Sensitive

While socio-cultural theory is widely used to inform the design of learning and instruction in LDT (e.g., social constructivism, activity theory, distributed cognition), socio-cultural sensitivity is not necessarily intrinsic to the methods and processes of instructional and learning design. In contrast, socio-cultural sensitivity is central to LXD. Gray (2020) asserts: "Rather than assuming that learners have similar characteristics and experiences, which often advantages certain types of students in powerful structural ways, [learning designers should] identify mechanisms whereby learning experiences can value unique and subjective learner qualities" (p. 10). This can be a challenge in learning design contexts in that, as Schmidt and colleagues (2020) maintain, “Learning design teams tend to be small (2-3 members) or consist of an individual learning designer. Such teams can lack sufficient socio-cultural perspective to design for a culturally sensitive and diverse learner experience” (p. 6). Key to developing socio-cultural sensitivity is empathy. Chang and Kuwata (2020) state, “Human-centered LXD includes empathetic understanding of the learner, the socio-cultural and technical context in which they are embedded, and the individual and socially mediated meaning making process as driven by the learners” (p. 3). Development of such empathetic understanding is central to questions of equity. According to Raza and colleagues, such understanding can uncover students’ perceptions and help designers in their “noticing and understanding situations in which learners’ experiences differ based on their race and gender and in turn how these differences impact overall classroom culture” (p. 5). A variety of methods to promote socio-cultural sensitivity were employed by authors. For example, development of personas, which “can provide context for designers to consider [...] socio-cultural perspectives more intentionally in their learning designs” (Schmidt, Earnshaw, et al., 2020, p. 6). Other methods such as as participatory design and co-design were employed by a other authors, which is notable in that such approaches are “discussed infrequently in an LDT context, and [...] almost completely lacking in explicit support through design processes and methods” (Gray, 2020, p. 9).

RQ3: What perspectives inform authors’ conceptions of LXD?

Research question 3 focused on the perspectives that informed authors’ conceptions of LXD. Our open coding procedures revealed two distinct categories that contribute to how authors conceive of LXD. Firstly, we found that author’s conceptions of LXD are, perhaps unsurprisingly, influenced by their conceptions of learning. Authors’ conceptions of learning were stratified into five categories: learning as (1) process, (2) personal endeavor, (3) contextually-situated, (4) experience, and (5) goal oriented. These categories are summarized in Table 6. Secondly, we found that authors’ conceptions of LXD were informed by a variety of perspectives, including (1) design, (2) disciplinary, (3) methodological and procedural, and (4) theoretical. These perspectives are summarized in Table 7.

Learning Perspective	**Description**
Learning as process	• Knowledge construction • A transaction between internal and external factors or an individual and the environment • Transfer of knowledge from the learning space to a real-world environment • A process that occurs within nebulous environments of shifting core elements—not entirely under the control of the individual • Progressive
Learning as personal endeavor	• Effective cognitive processing • Individual meaning-making • Through personal inquiry and mental models
Learning as contextually-situated	• Well-situated within a relevant context • Mediated by intentional interaction and communication with learning technologies and a broader socio-cultural context • A social effort • Occurs one-on-one or in a group/team

Learning as experience	• Emotions influence learning • Aesthetics influence learning • The quality of the experience influences learning, such as cognitive engagement and affective responses
Learning as goal-oriented	• Accomplishing results • Bridge gaps between current and desired knowledge, skills, and abilities • Meet the needs of equity in classroom settings • Effectiveness

***Table 6**. Perspectives on learning that influence authors' conceptions of LXD*

Category	**Description**	**Examples from book chapters**
Design perspectives	Design approaches applied or discussed by authors to inform and/or advance LXD practice.	• Color design • Contextual design • Emotional design • Intuitive design • Pedagogical design • Design thinking • Learner-centered design • User-centered design • User experience design
Disciplinary perspectives	Disciplines explicitly mentioned by authors that contribute to and/or influence LXD.	• Human-computer interaction • Instructional design • Learning design • Learning, design, and technology • User experience

Methodological and Procedural perspectives	Methods and procedures applied or discussed by authors in LXD practice.	• A/B testing • Analytics • Card sorting • Cognitive walkthroughs • Ethnography • Eye-tracking / EEG • Focus groups • Heuristic evaluation / expert review • Needs assessment • Contextual analysis • Participatory design and co-design • Personas • Prototyping • Scenarios • Think-aloud / cognitive interviews
Theoretical perspectives:	Specific theories explicitly applied or discussed by authors to guide LXD practice.	• Cognitive load theory • Color theory • Community of practice • Flow theory • Connectivism • Distributed cognition • Activity theory • Sociotechnical theory • Social constructivism • Actor-network theory

Table 7. *Perspectives informing authors' conceptions of LXD*

Discussion

According to Chang and Kuwata (2020), "There is a need to provide a concrete definition of LXD to guide the conceptualization and practice of learning design" (p. 2). Adapting UX to the field of learning design has led to adoption of associated terminology, but there has been little work to-date in the way of systematically defining LXD in a broad sense, operationalizing LXD in a way that could prove useful from the perspectives of research and practice, or aligning this concept with the theoretical foundations of our field. To approach the need for greater semantic and conceptual clarity around the phenomenon of LXD in the field of LDT, we performed content analysis on a corpus of recently published literature by active LXD researchers. On the basis of this research, we define learning experience design 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 methods.

Our first research question attempted to identify key LXD terminology used in those book chapters and to establish how frequently those terms were used. Findings related to this research question provide insight into key terminology used by authors and the frequency with which various terms were used. Three thematic categories emerged from our coding process related to key terminology: (1) LXD attributes, (2) LXD research and evaluation methods, and (3) LXD approaches. A variety of related terms is found within each of these categories. Analysis of the frequency with which these terms were used provides insight into the prevalence of terms across the book chapters. Our intent with presenting frequencies of terminology usage is not to suggest that certain terms are more or less important to LXD, but instead to present a lexicon of prominent nomenclature used by a segment of the LXD discourse community. However, this lexical repository has limitations. Firstly, it was drawn from a narrow sample of only 15 book chapters. Secondly, and because of this, it is incomplete and biased. For example, some authors might have repeated a term multiple times, whereas others might have only mentioned a term once or twice. We are therefore cautious in our interpretation, lest we conflate the signifiers (the terminology) with what they might signify. Establishing the conceptual relationships between these terms remains a direction for future research.

Our second research question sought to explore how authors characterized LXD in their book chapters. A range of perspectives from both within and outside the field of LDT informed authors' conceptions of LXD, including design perspectives, disciplinary perspectives, methodological and procedural perspectives, and theoretical perspectives. However, eclipsing these were authors' perspectives on learning. These perspectives were explicated in our approach to the third research question, which sought to identify and stratify perspectives that informed authors' conceptions of LXD. Learning takes primacy in LXD as a contextually-situated, personal endeavor towards a learning goal, the process of which is interpreted through the lens of individual experience. Taken together, the two categories of perspectives that emerged from our analysis (i.e., perspectives of learning and perspectives of LXD) represent both central and peripheral influences. That is, peripheral aspects of LXD include design, disciplinary, etc. perspectives, whereas most central to how authors conceived of LXD were perspectives related to learning. This suggests that further inspection of the underlying assumptions of perspectives related to UX could be needed—a direction for future research. Further, future research is warranted that seeks to intentionally combine imported theoretical perspectives (e.g., from UX or HCI) with the canonical perspectives of LDT, similar to Gibbons' (2013) masterful combination of perspectives from fields such as architecture and interaction design with LDT.

Implications for Practice

From a practice perspective, the work presented here contributes substantially not only towards defining the work of LX designers, but also towards more formally endorsing the work that LX designers have been doing for some time as legitimate and relevant manifestations of learning design practice. Applying external methods and processes to learning design practice (i.e., usability testing, cognitive walkthroughs, etc.) can draw criticism in that these approaches do not specifically address learning or performance improvement. Foregrounding the centrality of learning when drawing from external disciplines such as UX and HCI can underscore the relevance of these external methods and processes to learning design, which can further serve as powerful justification for exploring, adopting, and applying such procedures within one's own design practice. Further, this work establishes precedent for LX designers related to terminology, specific methods, design approaches, theories, and perspectives on learning. It also provides a foundation to build upon, perhaps towards development of practitioner guides and textbooks such as the approachable work of Steve Krug (2010, 2014) in the realm of usability evaluation or Tullis and Albert's widely used textbook on user experience evaluation (2013). With a scarcity of resources on LXD in the field of LDT, there are many possibilities for contributing to practice.

Implications for Research

Although the work in this article has sought to provide clarity around terms and concepts related to LXD, further work is needed to define the phenomenon, to identify its component parts, and to articulate its conceptual boundaries. Currently, the primary theoretical inputs for LXD are drawn largely from HCI and UX and then interpreted from the perspective of learning. However, as illustrated by the many examples in the Learner and User Experience Research (Schmidt et al., 2020) edited volume, it is clear that many researchers are operating on what Honebein and Reigeluth (2021) would characterize as their own personal instructional design theories, which are "a set of ideas focused on how to 'create' instruction rather than 'describe' instruction" (p. 3). Extending this is Bowen and colleagues' (2020) notion of "theories of change" in LXD, which serve to frame designers' "early investigations into a specific learning problem, their successive iterations in learning design, and their repeated testing with targeted learners" (p. 1). Explicating these tacit, individual theories and their underlying assumptions and influences presents a potential direction for future research that could productively move the field towards establishing a theory of LXD that is born of the discipline of LDT. This could represent a step towards the "originary theory" for which McDonald and Yanchar (2020) advocate. Originary theory is "(a) a set of models, frameworks, principles, or other products of inquiry that (b) describe, conceptualize, or otherwise structure knowledge from the unique perspective of the field in which the theory is generated, and that (c) offers a contribution to knowledge that cannot be fully reduced to, or explained by, the theoretical contributions of other fields" (p. 638). Not only can such theoretical guidance unveil novel methods and processes to inform practice, it also can serve to shape the field and influence professional identities. In this light, we present in the following section a preliminary conceptual model of LXD.

Towards a Conceptual Model of LXD

This article has provided an overview of the terminology used by authors, the manner in which they characterized LXD, and the perspectives that influenced their conceptions. As a whole, this research could provide a signpost for future researchers seeking further clarity in terms and concepts related to the emerging focus area of LXD. Synthesizing the findings presented here, LXD draws from multiple external disciplines. It is a confluence of disciplinary, design, methodological, and theoretical perspectives that are both internal and external to LDT (Figure 7). As evidenced by the current research, external influences can be found in abundance in LXD practice and are reflected in the terms and concepts used to communicate and characterize the phenomenon. However, LXD is greater than the sum of its parts. Taken together, LXD emerges not as a patchwork of borrowed influences but instead as a distinct, cohesive expression of learning design. Indeed, it is the influence of learning design from which LXD derives its unique character. That is, all external methods, theories, and design approaches are encountered, interpreted, adapted, and applied in LXD through the lens of learning design. We illustrate this point in Figure 7 and discuss the implications in the following paragraphs.

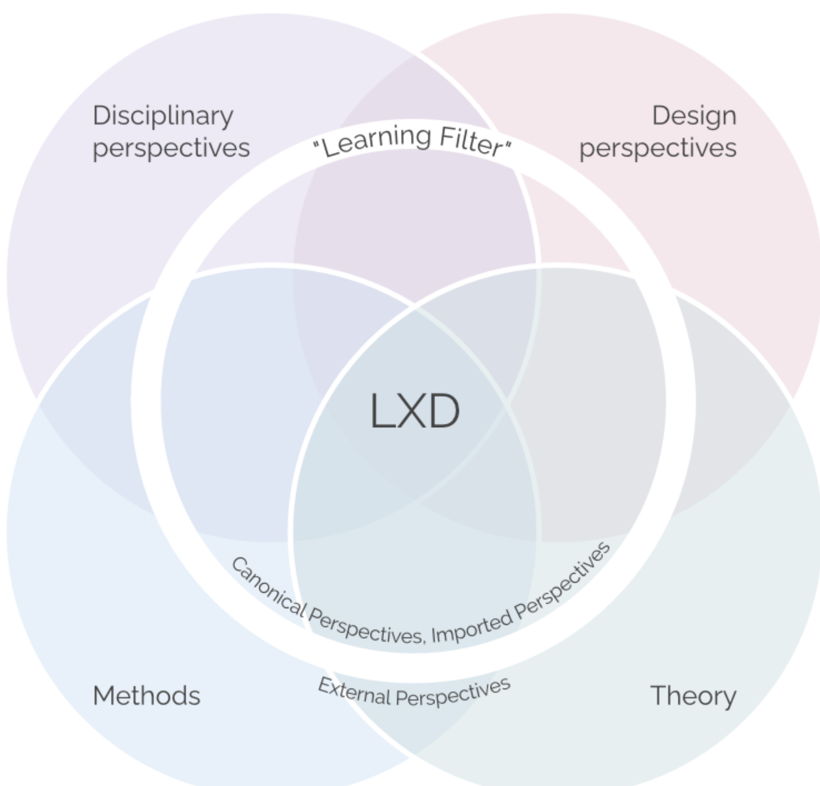

Figure 7. *Conceptual model of LXD as a confluence of disciplinary, design, methodological, and theoretical perspectives, both internal and external to LDT, and with a central focus on learning.*

Figure 7 provides a conceptual model of LXD. Within this model, the four perspectives detailed previously in Table 7 (i.e., design perspectives, disciplinary perspectives, methodological and procedural perspectives, and theoretical perspectives) are illustrated as four intersecting circles. The overlapping sections do not represent the influence or weighting of perspectives, but instead are intended to visually represent their interconnected nature. Superimposed atop these four intersecting circles is a white circle, intended to portray the boundary of LXD much like the plasma membrane of a cell defines the cell boundary. That is, this boundary separates and delineates that which is internal from that which is external to LXD. By external, we refer to the outside perspectives alluded to by McDonald and Yanchar (2020) that are often incorporated into LDT. Although these authors point to theoretical perspectives specifically, LDT also readily imports disciplinary, design, and methodological perspectives; for example, design thinking is a prominent perspective that recently has captured the attention of the LDT community (Hokanson & Gibbons, 2013; Hokanson & Kenny, 2020; McDonald et al., 2019). In order for external perspectives to permeate the boundary of LXD, they pass through what we characterize as a "learning filter." This takes place as external perspectives are considered from the perspective of learning, as detailed in Table 5 (i.e., learning as process, personal endeavor, contextually-situated, experiential, and/or goal oriented), and adapted to the extant methods, processes, and theories that have found resonance in LDT. This is an indirect process that occurs over time as learning designers encounter tensions in adapting external perspectives to their own design practice and make consequent adjustments.

An example of "filtering" an external perspective through a learning lens can be found in Gray's (2020) alignment of HCI and UX methods and concepts to the ADDIE model, in which the need to recognize and reconcile divergent views of design is highlighted. This is achieved through "further engagement in the research-practice divide and the differing definitions and conceptual vocabulary that describes design activity" (p. 6). Another example is found in the application of usability evaluation methods to digital learning environments. The broad focus of usability evaluation on any user in any context has been recognized as dissonant with the needs of learning designers. Usability tends to focus on users and how they generally interact with and experience digital products, systems or services. However, using products to accomplish a range of goals is at odds with the very specific ways that learning technologies are designed to support learners in attaining learning objectives. In LXD, usability does not focus on any user performing any task with any technology, but instead focuses on a specific class of user (the learner) who is engaged in a particular task—related to learning—while using a distinct type of technology (a technology tool designed for learning). In recognition of this tension, some researchers advocate for a form of usability evaluation that focuses more intentionally on learning called pedagogical usability (Lim & Lee, 2007; Moore et al., 2014; Nokelainen, 2006). Others suggest an even broader conceptualization that considers "(a) the social dimension, (b) the technological dimension, and (c) the pedagogical dimension" (Jahnke et al., 2020, p. 2) of learning, or "sociotechnical-pedagogical" usability. Both of these examples serve to illustrate the tensions and complexities associated with filtering external perspectives through a lens of learning. Future research is needed that explicitly considers the various components of the model related to empirical and theoretical support.

Conclusion

Although the work presented here serves as an initial step towards providing greater clarity around terms and concepts related to LXD, a number of questions remain. For example, who is the learner in LXD? Is it only the individual engaged in learning (Tsay et al., 2018; Wood & Shirazi, 2020)? If we accept that UX as an emergent quality predicated by all aspects of the user's interaction with a given technology system (International Organization for Standardization, 2019; Madariaga et al., 2021; Norman & Draper, 1986) and that key to UX is a central focus on the user and the user's needs (Hassenzahl, 2004), then when UX methods are applied in LDT, its focus on the user of a technology system necessarily shifts to a focus on the user of the learning technology. This conceptualization is in accord with Quintana and colleagues' (2020) depiction of learners as a distinct category of users who differ in terms of domain expertise, heterogeneity, motivation, etc., but distinguishes itself in that learning technology users may include not only learners but also teachers, designers, system administrators, etc. (Chew et al., 2018). On this basis, it follows that experience design in the context of learning technologies is not limited to considerations of the end user only in the role of learner, but also to end users in other roles (e.g., teacher, instructor, administrator). This suggests an important conceptual

distinction between the practice of learning experience design and the notion of learner experience. We define learner experience as a quality that is uniquely perceived by an individual actor that, to paraphrase Hassenzahl and Tractinsky (2006), can be conceived of as a “subjective, situated, complex, and dynamic” (p. 95) quality that emerges based on the learner’s internal state, the characteristics of the learning technology, and the context within which the learner interacts with the learning technology. As a manifestation of human-centered learning design practice, it would seem LXD practice should account for the roles of all end users of a learning technology related to how those roles might influence the individual learner experience. In accord with the definition we provide above, however, we argue the concept of learner experience should remain circumscribed to the role of the individual learner.
Findings presented here suggest the field of LDT is shifting toward a more human-centered approach, but the concept of LXD is still emerging. This paper firstly established the increasing prominence of terms associated with LXD and secondly summarized and synthesized current and emerging views of LXD in the field of LDT based on a corpus of 15 book chapters published in a recent Open Access book. The diverse views demonstrate the multiplicity of LXD, which may contribute to a better scoping of this concept. The key constructs presented in this research may serve as a reference for future studies. However, our proposed definition and conceptual model is but the first attempt toward systematically defining and operationalizing LXD, as well better aligning LXD with the theoretical foundations of our field. Further research is warranted.

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Drawing Inspiration for Learning Experience Design (LX) from Diverse Perspectives

June Ahn

UX Design | User Experience | Digital Equity | Culture of Innovation

Editor Note

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Abstract

This article was adapted from a keynote lecture given on June 1, 2018, at the Emerging Learning Design Conference in Montclair, NJ. In this essay, I argue that the emerging practice of learning experience design (LX) affords the opportunity to develop more engaging, innovative, and effective experiences for learners in diverse settings. However, in order to realize this potential, designers must expand our definitions of what counts as a learning experience, for whom, and for what ends. In addition, I challenge us as designers to foreground equity in our designs by beginning with the assumption that whatever learning situations we create will always be usable to some learners (and unusable for others), and will also have unintended consequences (even negative consequences) for some learners.

Introduction

In this essay, I argue that the emerging practice of learning experience design (LX) affords the opportunity to develop more engaging, innovative, and effective experiences for learners in diverse settings. However, in order to realize this potential, as designers we must expand our definitions of what counts as a learning experience, for whom, and for what ends. In addition, I challenge us as designers to foreground equity in our designs by beginning with the assumption that whatever learning situations we create will always be usable to some learners (and unusable for others), and will also have unintended consequences (even negative consequences) for some learners. How might we expand our impact, as LX designers, while making sure to thoughtfully design for the potential harm we do when we create new technologies for learning?

To interrogate this question requires a deeper understanding of what LX design practice affords, how an understanding of equity strengthens our practice as learning designers, and a fuller notion of what we mean by learning and how we see it occur around us. In the following essay, I touch on each of these points from my own experience as an LX designer and researcher. I end with a few heuristics that have been helpful in my own LX design practice, not as an exhaustive list, but as the beginning of a broader discussion that can help LX as a field evolve in the next few years.

Moving from Instructional Design to Learning Experience

The term LX has emerged only recently, with reports that the term was coined around 2015 (see "Learning Experience Design – The Most Valuable Lessons," 2017). The idea of LX came from practitioners to capture the changing nature of design practice, with the terms instructional design (ID) and learning experience design (LX) symbolizing the shifts in popular thinking. In the past, many learning designers focused on creating curriculum and learning experiences in the classroom, and then in formal online course environments (ID). Now, designers are creating learning situations for a wide variety of settings such as: home, work, museums and libraries, public spaces, and in all types of online and virtual environments that go beyond formal classroom situations (LX).

Beyond recognizing that LX practitioners are designing for more diverse contexts – moving from the classroom to out-of-school settings – I also think about LX practice as an evolutionary synthesis of ideas and techniques that come from different fields. The area of learning design is quite diverse and includes practitioners from instructional design backgrounds to learning scientists who have developed notions of design-based research and design experiments for learning (Anderson & Shattuck, 2012; Bell, 2004; Cobb, Confrey, DiSessa, Lehrer, & Schauble, 2003; Collins, Joseph, & Bielaczyc, 2004; Easterday, Rees Lewis, & Gerber, 2014; Hoadley, 2004). Despite this diversity in research traditions, there is a core notion that is most relevant for LX designers. The field of learning sciences (widely conceived) is moving towards documenting and understanding how learning occurs in ever more expansive, diverse, and varied settings. These developments bring new ideas about how learning is connected across settings, technologies, and communities (Ito et al., 2013), how people learn using new tools and pedagogical practices, and how we can recognize what learning looks like beyond what we're used to seeing in formal educational settings.

Taking an expansive view of what learning looks like, how we guide it, and what technologies amplify learning practices coincides nicely with practices in user experience design (UX), which has largely come from technology fields. UX also builds from its own research and scholarly communities such as human-computer interaction, where new design methods are developed that take into account the needs of different users (Ahn & Clegg, 2018; Beyer & Holtzblatt, 1999; Carroll & Rosson, 1992; Druin, 1999; Gelderblom & Kotzé, 2009; Quintana, Eng, Carra, Wu, & Soloway, 1999; Soloway et al., 1996). Coupled with this scholarly work is a robust design field, where UX designers work in a variety of industry settings and develop practices for creating new technologies in more inclusive and effective ways. Concepts of human-centered design (Norman, 2013) and recent frameworks such as design thinking, popularized by the firm IDEO and the d.School at Stanford University ("Design Thinking," n.d.), have seen its way into design practice. I take several inspirations from UX fields, but particularly in: (a) deriving techniques to recognize human experiences, needs, and constraints in new ways, (b) to empathize deeply with those who will use our designs, and (c) to take seriously the notion of usability or how people will come to use our designs (see Figure 1).

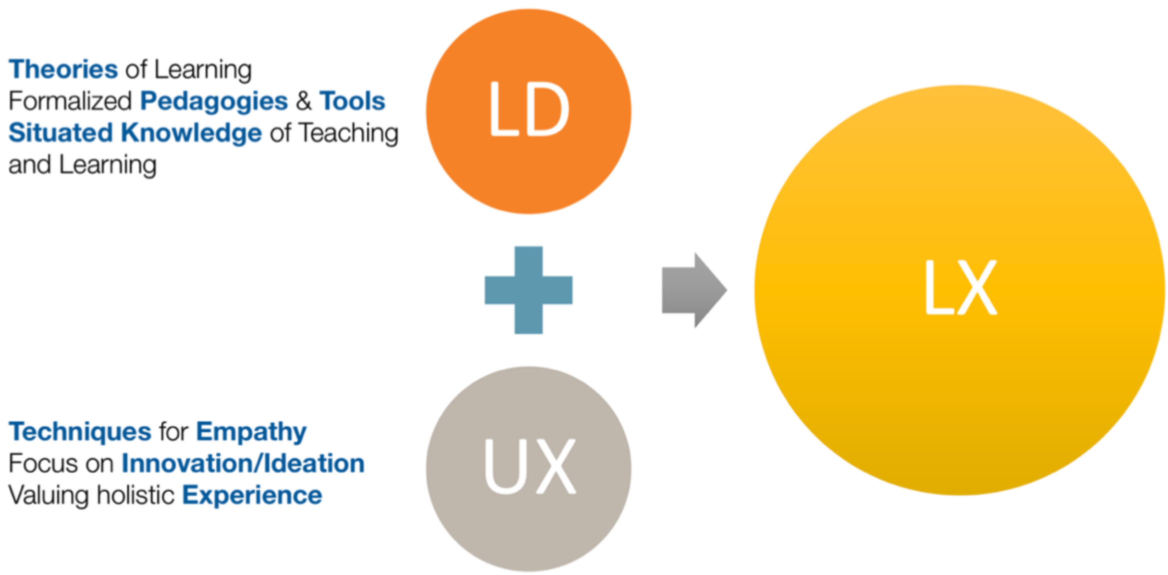

Figure 1. *LX is the Synthesis of Ideas from Learning Design and User Experience Design.*

An LX designer has the double challenge of continually expanding their understanding of how people learn, while also building a repertoire of techniques (often from UX practice) to expand their ability to empathize, understand, and draw inspiration from different users and contexts to somehow create new and innovative ideas. New learning environments have to both draw from a robust theoretical understanding of learning but also be usable, engaging, and impactful for learners to experience.

Seeing Learning from Diverse Lenses and Valuing Different Outcomes

One way that theories of learning and empathy for a broader array of human experience can combine in LX design is to first expand our notions of what learning looks like, and thus what we may design for. In my own LX practice, I have focused on various facets of learning that capture common experiences one might care about (see Figure 2). First, knowledge is often the most common outcome that instructional and LX designers often think about when creating a new technology or educational environment. I include in this idea, both understanding some body of content (facts and ideas) and also knowing how to do something in a domain. Second, a growing number of scholars also observe that interest is both a factor and an outcome of a learning situation (Renninger, 2009). Some learning environments may foster greater interest in a topic, and that interest can be further developed or halted in future experiences (A zevedo, 2011, 2013; Barron, 2006; Edelson & Joseph, 2001). Some learning environments can encourage interest in the short-term, to be engaging in the moment. Other learning environments deepen interest over the long term, touching on core motivations of learners that layer on over time.

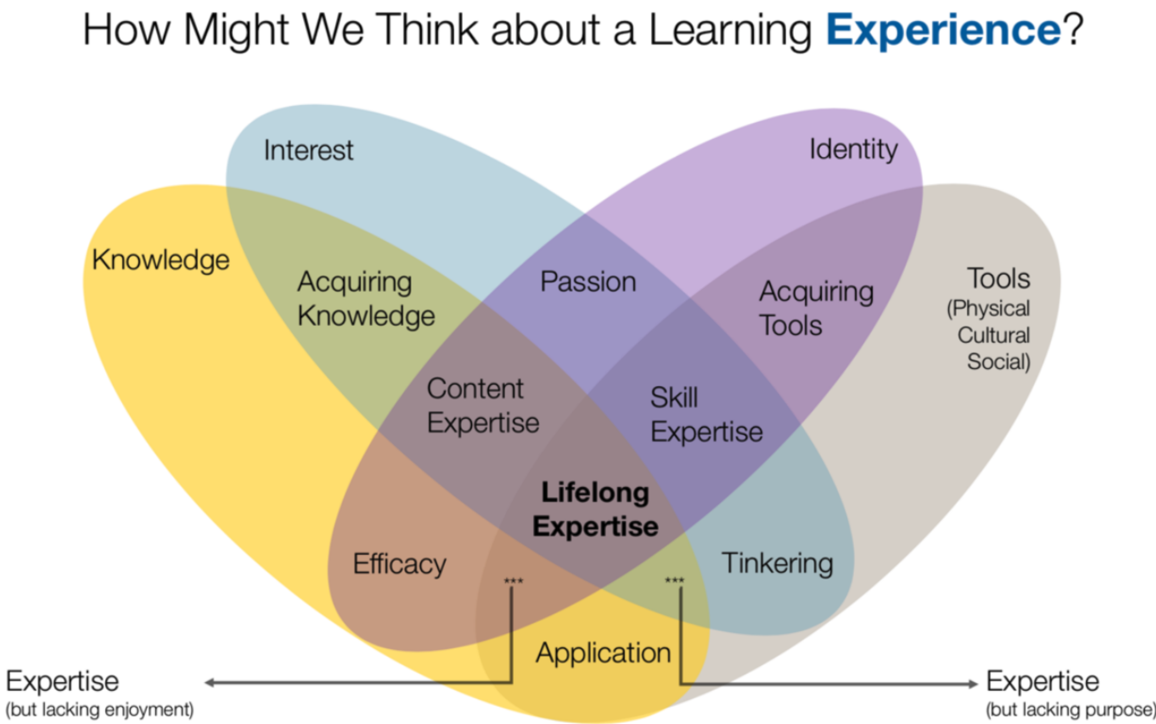

Figure 2. *How might we see facets of learning and subsequently design for it?*

Third, one's identity is also a deep part of learning. People show their identity through objects and social relationships such as the clothes they wear, the tools they use, or the social groups they publicly show their membership in (Gee, 2000). Over time, people "figure" out their worlds, which include which social groups they want to relate to, what social, cultural, and learning activities they want to attend to, and what goals they value (Holland, Lachicotte Jr, Skinner, & Cain, 1998; Nasir & Hand, 2008). Learners show their identity by the stories they tell about themselves and what they publicly voice as their identity (Sfard & Prusak, 2005). Ultimately, some learning environments are supportive in helping learners further develop their identities as someone who wants to pursue a given field (like science) or to become a certain type of person (like a writer or basketball player), and designing these environments opens up new ways to think about an experience (Ahn et al., 2014; Calabrese Barton et al., 2013; Polman & Miller, 2010).

Finally, an area that is a common focus for LX designers is technology. I like to think expansively about technology, as fundamentally the tools we want learners to use to participate in a given field. This view is inspired from scholars who think about new literacies and recognize that a literacy involves knowing how to use different tools that are valued and important to participate in practices and knowledge creation (Coiro, Knobel, Lankshear, & Leu, 2008; Hull & Schultz, 2001; Jenkins, 2009). When thinking about tools and being "literate", we can also think about cultural and social norms as a form of technology. Rules and norms that a social group as constructed and agreed upon, are tools that make it more effective to communicate, collaborate, and make progress in a field. W e see these tools everywhere we look. Scientists of all sorts use physical technologies to conduct their work, software to analyze findings or communicate ideas to each other, and institutions to facilitate the scientific community (universities, labs, journals, conferences etc.), and norms of thinking and communicating that define the community.

An important note is that the four facets of learning that I laid out above are by no means exhaustive. One may think of many other facets of learning that we want to foreground when we're designing a learning environment. The core question is, how might LX designers benefit from thinking about learning more expansively? One way that has been helpful in my practice as a design-based learning researcher is to develop conjectures about what I'd want to see or observe, if I were to think about a successful learner. For example, many designers might say that they'd want to see success as a learner who shows that they know a lot of content or skills (knowledge in Figure 2). We might also see a learner who knows a lot and also shows an interest to acquiring even more knowledge (the intersection of knowledge and interest in Figure 2). We might see learners who know a lot and also communicate that they are confident they can be that kind of person; for example, saying that “I am a science person” or “I can do science” (the intersection of knowledge and identity).

With young people and new technologies, we often first see active use of a new tool like a computer or a 3-d printer. We might observe successful learning when young people tinker, and develop deeper practices with tools (the intersection of tools and interest in Figure 2). Another intersection might be a learner that has a lot of interest and identity in a given domain, and thus shows a lot of passion about participating in it (even if they lack knowledge or tools). As we observe learners that exhibit even more combinations, we would expect to observe more advanced learning behaviors. For example, a learner who has deep knowledge, interest, and identity (but no experience with tools) may show a deep level of content knowledge, but a lack of skills in applying that knowledge. Contrastingly, a learner who has deep understanding of tools, with substantial interest and identity (but less content knowledge), may show a lot of skill expertise, but less understanding of the deeper thought processes involved in a domain. Ultimately, a key challenge for LX designers is to create environments that touch on multiple learning facets that lead to deeper learning behaviors or experiences that we can observe.

Thinking About Equity in LX Design

Seeing learning more expansively also attunes LX designers to imagine the potential downsides of the learning environments and technologies we design. When designers do not anticipate these downsides, inequitable experiences may occur and widen gaps between learners who benefit from our designs and those who are not served well. One common blind spot that LX designers have is to assume that learners are at fault if they do not engage with a tool, or do not gain the intended benefits of some learning experience. For example, one might design an online course that carefully guides learners through a progression of topics or tasks that should effectively educate them about a topic (developing deeper knowledge). But when faced with situations where many learners do not complete the course, or do not engage with it, one can easily revert to statements such as “if only those learners were interested in the content” or “if they were skilled enough to get what we’re trying to do”. Such deficit-model ways of thinking, illuminate how the design of learning environments may optimize for one facet of learning (knowledge acquisition), but fail to consider broader learning experiences that matter (interest, identity, or tools).

The consequences of designing with major blind spots for the broader learning experience can be substantial. Only learners who are already privileged (e.g., already have the requisite knowledge, already have developed interest, already have a deep sense of self and commitment to engage, or are already literate and have skills) will engage with and benefit from a newly designed learning experience. Those who lack any of these facets fall through the cracks. And inequitable learning experiences cascade, combine, and accumulate across learners. To break out of this cycle, and overcome these obstacles, we need to not only design pedagogies and technologies, but also for broader experiences. A key question is how do we do that as LX designers?

Some Heuristics for LX Design Practice

In my own experience as a learning scientist and design-based researcher, a few lessons have stuck with me over the years. First, the theories of learning and social behavior are not tools that tell you (as a designer), exactly what to do and what to design. Instead, I find it more effective to utilize learning and social theories to guide my initial thoughts and to act as a check to see if I’m touching as many facets of the learning experience as possible. It’s likely impossible for any learning designer to perfectly support every different learner in a given situation, but touching on more aspects of their experience is likely to result in better designs.

A second practice that has deepened my own LX practice has been to continually build up a repertoire of strategies for empathy. A common misconception of UX research is that designers are only concerned about shallow notions of usability such as finding out if the user likes this color, or that button on the interface, or the placement of such and such widget. These aspects of usability are quite important, but a deeper UX practice seeks to systematically understand the user, what makes them tick, and what they seek out of an experience. These heuristics also apply to designing for learners. What does our learner need, what are they interested in, how do they see themselves and others, and what are they seeking in this learning experience? Techniques such as participatory design, interviews, and other UX techniques are designed to help an LX designer start from a deeper understanding of people and to meet their needs ("Design Thinking," n.d.; DiSalvo, Yip, Bonsignore, & DiSalvo, 2017). These techniques remind us as LX designers, that when we're creating solutions for learners who are not like us, it's good practice to let them lead and guide you in terms of what an experience might look like.

Finally, it's been helpful for me to continuously remember that there are always unintended consequences that arise from one's design. We might have designed a great experience to help learners efficiently gain knowledge, but may detrimentally affect how interested they are in the topic or whether they identify with the subject area or field. We may have created a great learning experience with an effective use of technology, but realize that only some populations of learners would readily use that tool (and not the population we intended to serve). And a technology that may work well for one problem or goal, may exacerbate an entirely different problem. Researchers of technology in the past have found this phenomenon happen continuously, where new tools and experiences amplify certain issues and exacerbate underlying societal

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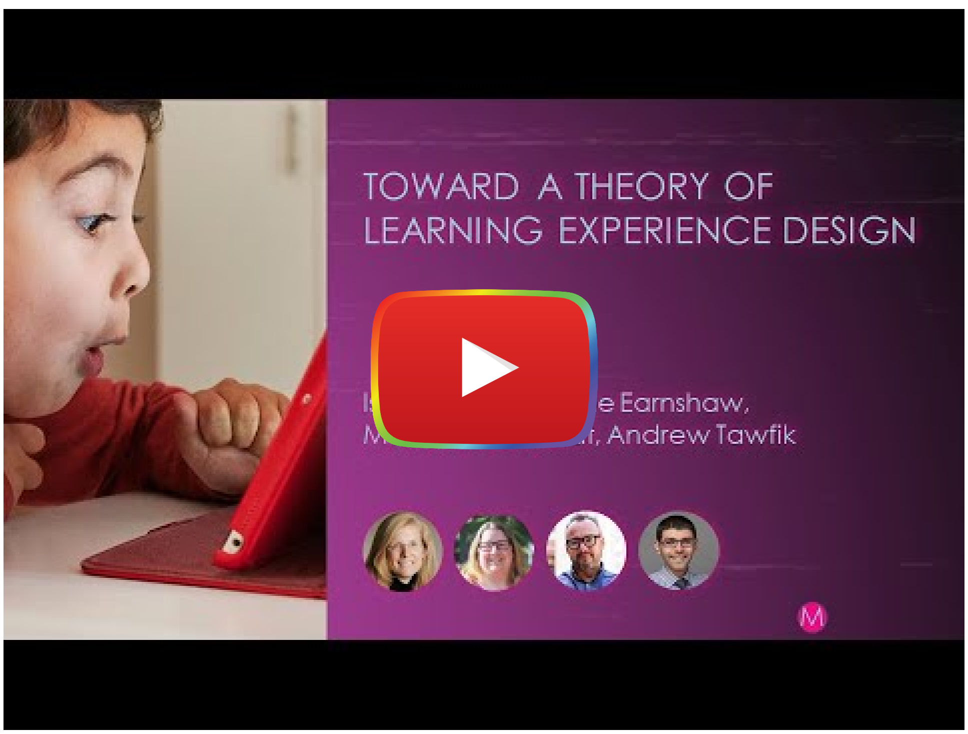
Theoretical Considerations of Learning Experience Design

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

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



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

— Andre Plaut

The emerging field of LXD is located at the crossroads of user experience (UX), learning design, instructional design, and educational technology. In the past few years, studies and projects that call themselves learning experience design

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

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

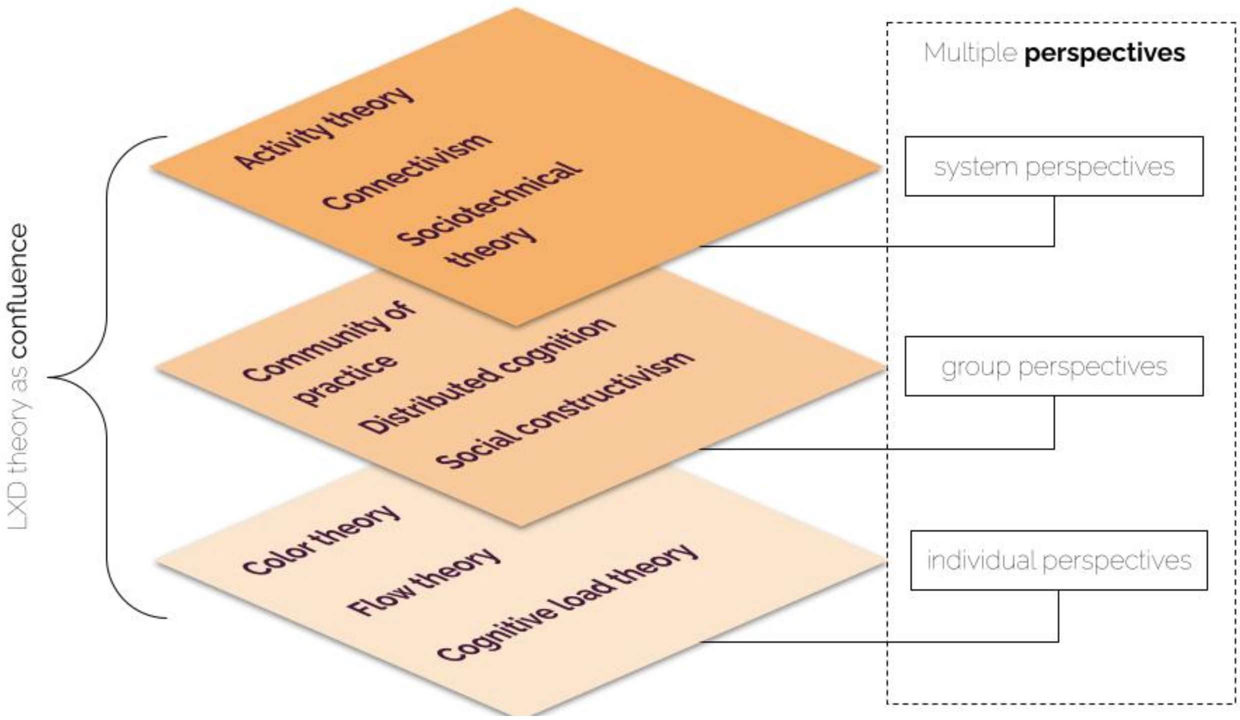
Although LXD is an important part of design, a theoretical foundation is needed to more explicitly elaborate and bound this phenomenon. We therefore suggest a timely and urgent need exists to develop a theory of LXD for framing research, informing design, and predicting experience.

Existing Theories in the Field of Learning Experience Design

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

Figure 1

Learning experience design is a confluence of multiple theoretical perspectives



Groundwork for a Theory of LXD

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

Clarifying experience vs. learning experience vs. learning experience design

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

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

Drawing from this, a **learning experience** is a class of experience that not only leaves an impression on someone, but also puts the person in a practical contact with something. This leads to that person to learn something through shared meaning making, reflective practice and intentional interaction in forms of human-computer interaction or human-human interaction as mediated through digital technologies. Learning experience refers to any interaction, course, program, or other experience in which learning takes place. This is true whether the learning experience occurs in formal settings (schools, classrooms) or non-formal or informal settings (outside-of-school locations, outdoor environments), traditional educational interactions (students learning from teachers and professors) or nontraditional interactions (students learning through games and interactive software applications). In other words, learning experiences are not place-bound, nor are they bound to formal education.

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

Understanding How External Perspectives Contribute to and Differ from LXD

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

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

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

LXD as a Multidimensional, Interrelated, and Complex System

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

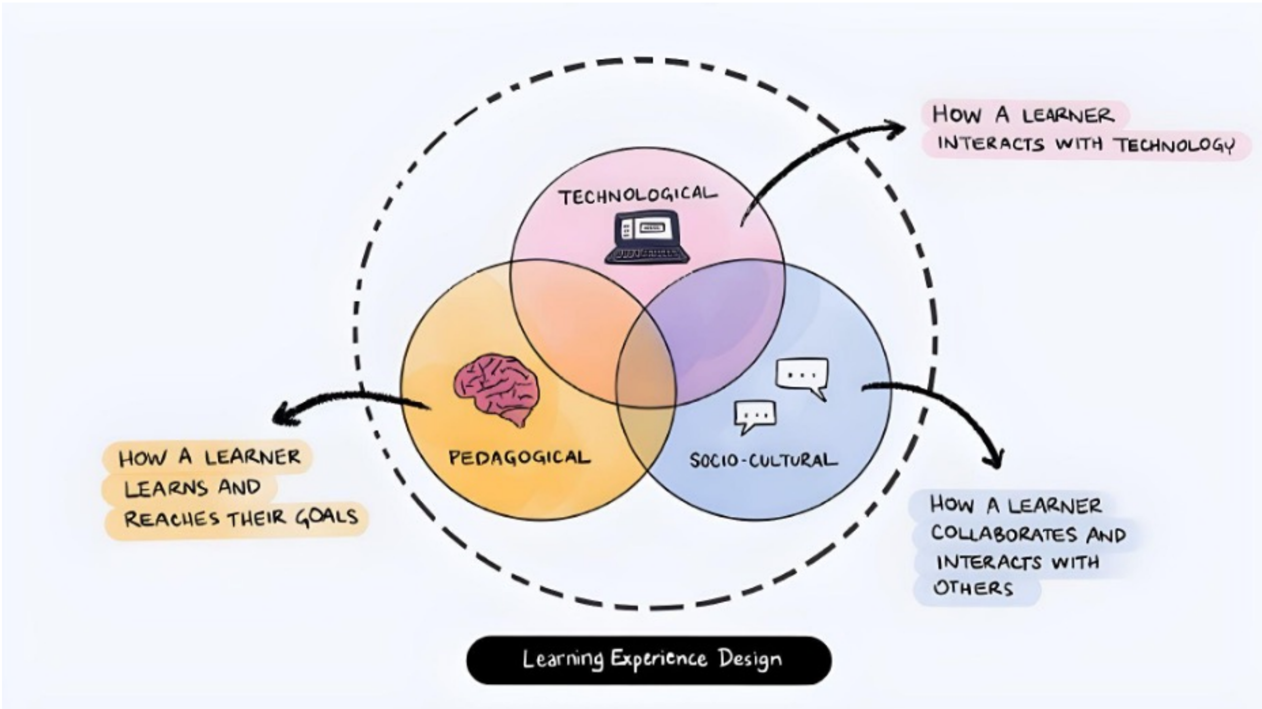
- the social/sociocultural dimension,
- the technological dimension, and
- the pedagogical dimension.

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

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

Figure 2

Sociotechnical-pedagogical dimensions of LXD theory



Socio-technical-pedagogical dimension of LXD

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

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

Second, the technological dimension of LXD focuses on user experience, usability, and HCI-related topics (e.g., Hassenzahl, 2013). Central to this is the question of how to capture the quality of a learner's experience, how easy or difficult a task might be for a learner, and how effective, efficient, or satisfying an educational technology might be. The technological perspective broadly considers any user performing any task to accomplish a range of goals with any product or service. However, a purely technological focus does not account for considerations of learning, which underscores why this dimension alone is insufficient in learning contexts. To further underscore this point:

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

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

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

Conclusion, Final Remarks and Outlook

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

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Module 2: What do Learning Experience Designers Do?

Fundamentals of Exceptional Instructional Design

Essentials of Mindset and Approach

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Editor's Note

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Introduction

"Engineering is figuring out how to do what you want with what you've actually got."

—John Carmack (2019)

John Carmack, a well-known engineer and video game programmer, stated that engineering was ultimately "figuring out how to do what you want with what you've actually got." Instructional design and engineering have much in common when it comes to *ways of thinking*. They both involve encountering a series of design problems, and the way we think about and approach these problems is foundational in achieving exceptionality. Exceptional instructional design is ultimately grounded in a thorough and rich understanding of human learning and approached with sensitivity to and a deep understanding of context (e.g., humans, environments, tools, tasks). The instructional designer need not be focused on applying rigid "rules," but instead should focus on how to *think* like an instructional designer while solving design problems. In the spirit of John Carmack's quote, an instructional designer is, in essence, a type of *educational engineer*. This chapter, rather than merely walking through the aspects or outputs of quality instructional design, outlines how quality instructional design can be achieved by everyone, using six fundamental mindsets and approaches.

Fundamental 1: Make Design Decisions Using Three Lenses of Learning Innovation

Instructional designers blend foundational education theory, models, and frameworks with the reality and nuances of context to support optimal learning outcomes. Excellence emerges from well-applied theory and frameworks. A good way to represent this blending of theoretical conception and contextual application (how instructional designers make good design decisions) is through the "Three Lenses of Innovation" (Kelley & Kelley, 2013, p. 19) and what IDEO describes as "the intersection of design thinking." This model is altered here (see Figure 1) to focus on learners, and by exchanging "desirability" for "learner-centered" (effective, pleasurable, meaningful experiences). There are three key lenses for great instructional design that also guide learning-design thinking and decision-making:

- **Learner-centered**: Focused on effective, pleasurable, and meaningful experiences for the learner;
- **Feasible**: Can be accomplished;
- **Sustainable**: Easy to maintain, support, and grow over time.

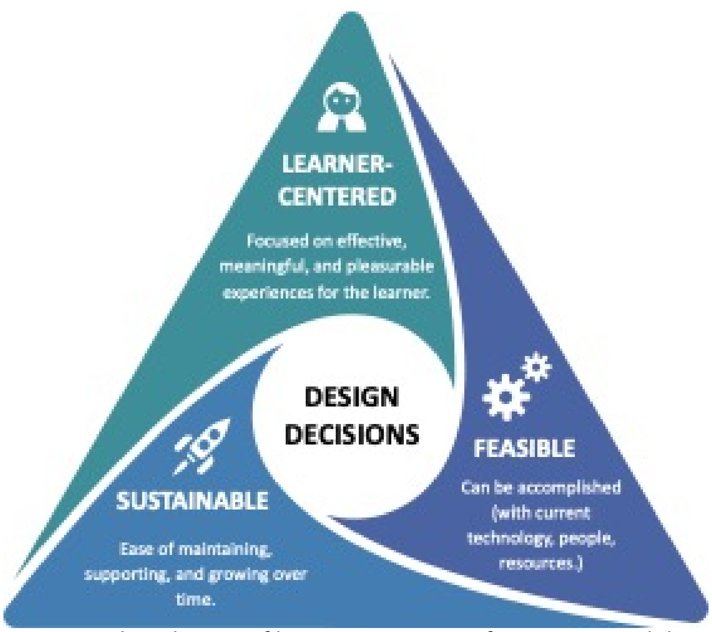

Figure 1. Three lenses of learning innovation for instructional design, modified from The Three Lenses of Innovation (Kelley & Kelley, 2013).

Learner-Centered

To be *learner-centered* is to design while focusing on fulfilling the *learner*'s needs and desired outcomes. In *Seductive Interaction Design* (2011), Stephen Anderson describes the "Learner Hierarchy of Needs" (see Figure 2). As in Maslow's hierarchy of needs (1943, 1954), the base of the pyramid is essential and must be present to successfully support the next level. Once an individual fulfills one level, they look to the next level of fulfillment. For example, in the Learner Hierarchy of Needs, learners need to log in (functional), but they also need the site to have excellent uptime (reliable). When designing for learning, many may stop at "convenient"—meaning that students can log in reliably, they can use the course without difficulty, they can find what they need, and they know where to submit assignments. Students can even use the course across multiple devices and access it anytime, anywhere: it is *convenient* for their lifestyle. Indeed, these are all important and fundamental aspects of excellent, learner-centered experiences.

But the pleasurable, meaningful experiences represented by the top two levels of the hierarchy are where real transformation in identity and outcome occur. Exceptional instructional design never stops at convenience; it continuously strives toward *pleasurable*, *meaningful* learning.

To achieve exceptionality in design, designers must push for all levels of the learner hierarchy of needs to be met, stretching toward designing for those top tiers of the pyramid when creating assessments and activities, and tailoring the structure for *effectiveness*. It is in striving for effectiveness (the ability to achieve learning outcomes) that designers draw upon theory and understanding of human learning, motivation, and key principles of instructional design.

For learning design to be *effective*, there must be solid instruction, activities and opportunities for specific feedback, valid assessments, and clear objectives and outcomes, with strong alignment among them all. To be *meaningful*, the learning design should be relevant, authentic, and connected to students' lives (which requires designers to know who learners are). To be *pleasurable*, the experience should lead learners to experience moments of pride, joy, or connectedness (to name a few positive results). All of these aspects of effectiveness require empathy with regard to learners, where they are, and where we want them to be. Most instructional design work resides in the "learner-centered" lens, but it should not stop there. To be exceptional, the second and third lenses must also be employed in practice.

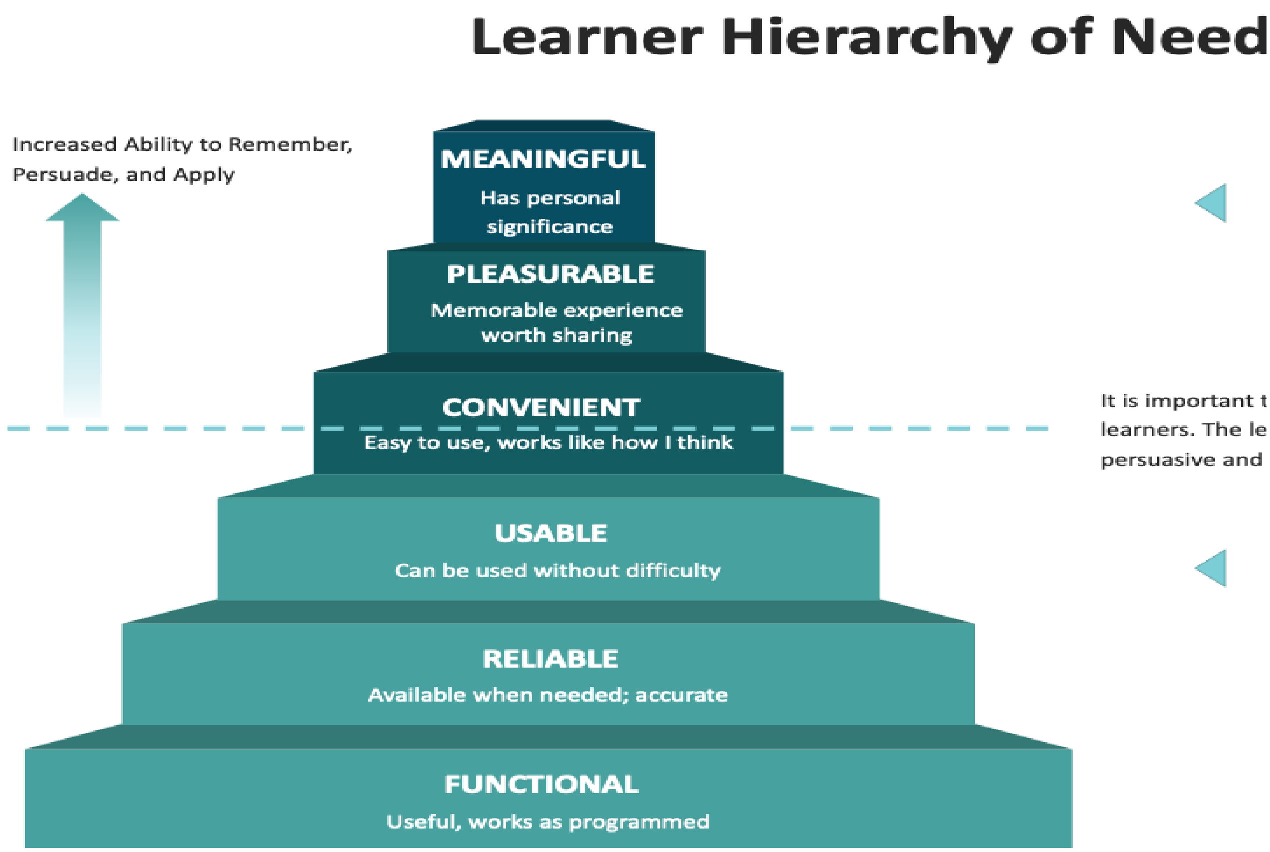

Figure 2. Modified learner hierarchy of needs (based on Anderson, 2011, p. 12).

Feasible

What designers conceptualize should be *possible*. This second lens of feasibility also means that when innovating, new ideas should not be discarded simply because they have yet to be tried. If the innovation is learner-centered and grounded in how people learn, and if the idea is feasible to accomplish given the context, it can be implemented and tested through a *design thinking process.*

Sustainable

Just because you can, doesn't mean you should. In other words, just because something is *feasible*, that doesn't mean it is *sustainable*. Ideas can be learner-centered and feasible, but if an idea or design is not sustainable over time, it likely is not the best choice for learners or those responsible for facilitating it. Determining sustainability requires a deep understanding of and sensitivity toward context. For example, in one instance a group of instructional technologists may not have the capacity to edit and maintain certain types of interactives, whereas other groups may have expertise, funding, and capacity. Each situation requires a consideration of context when making design decisions, as decisions made now have both positive and negative ramifications over time.

Fundamental 2: Use Design Thinking as the "Way of Thinking"

> "Design thinking taps into capacities we all have but that are overlooked by more conventional problem-solving practices. It is not only human-centered; it is deeply human in and of itself. Design thinking relies on our ability to be intuitive, to recognize patterns, to construct ideas that have emotional meaning as well as functionality, to express ourselves in media other than words or symbols."
>
> —Tim Brown, Change by Design (2009)

Design thinking, a term coined by John Arnold in *Creative Engineering* in 1959 (see Arnold, 2016), was first discussed as a "way of thinking" and approaching design problems, and the term was expounded upon in Herbert A. Simon's 1969 book *The Sciences of the Artificial.* Since then, the concept has evolved as it has been applied to a wide array of fields from the sciences to education to the arts. The Interaction Design Foundation (2019) describes design thinking as a nonlinear process of solving design problems through five key, iterative phases (see Figure 3): empathize, define, ideate, prototype, and test.

To think like a designer, one must empathize with learners; this enables the designer to clarify and define the design problem. To empathize with a learner means to understand and feel (as much as possible) what it is like to be that learner. For example, perhaps a particular nursing course has several discussion boards that require students to post six times in a week. The designer thinks through the life, environment, and prior experience of the typical student in this course, and realizes students are working 12- and sometimes 24-hour shifts, and they are often working adults with families. They frequently use mobile phones to access the course, engage with the course during breaks, and often may be away from the online course for an entire day, depending on their workload that day or that week. For half the students, this is their first online course, whereas for the other half, online courses are familiar. Because the students are working nurses, they bring a great deal of experience and background, and want to be treated like knowledgeable professionals, not new students.

By thinking through a typical scenario, the designer gains empathy for the learner, which in turn reveals the problems and helps to shape the design solutions that support the students. Defining the problem allows the designer to generate design ideas and learning solutions, prototype them, and test them. This testing generates more questions or reveals additional problems, as well as refining ideas about how to design.

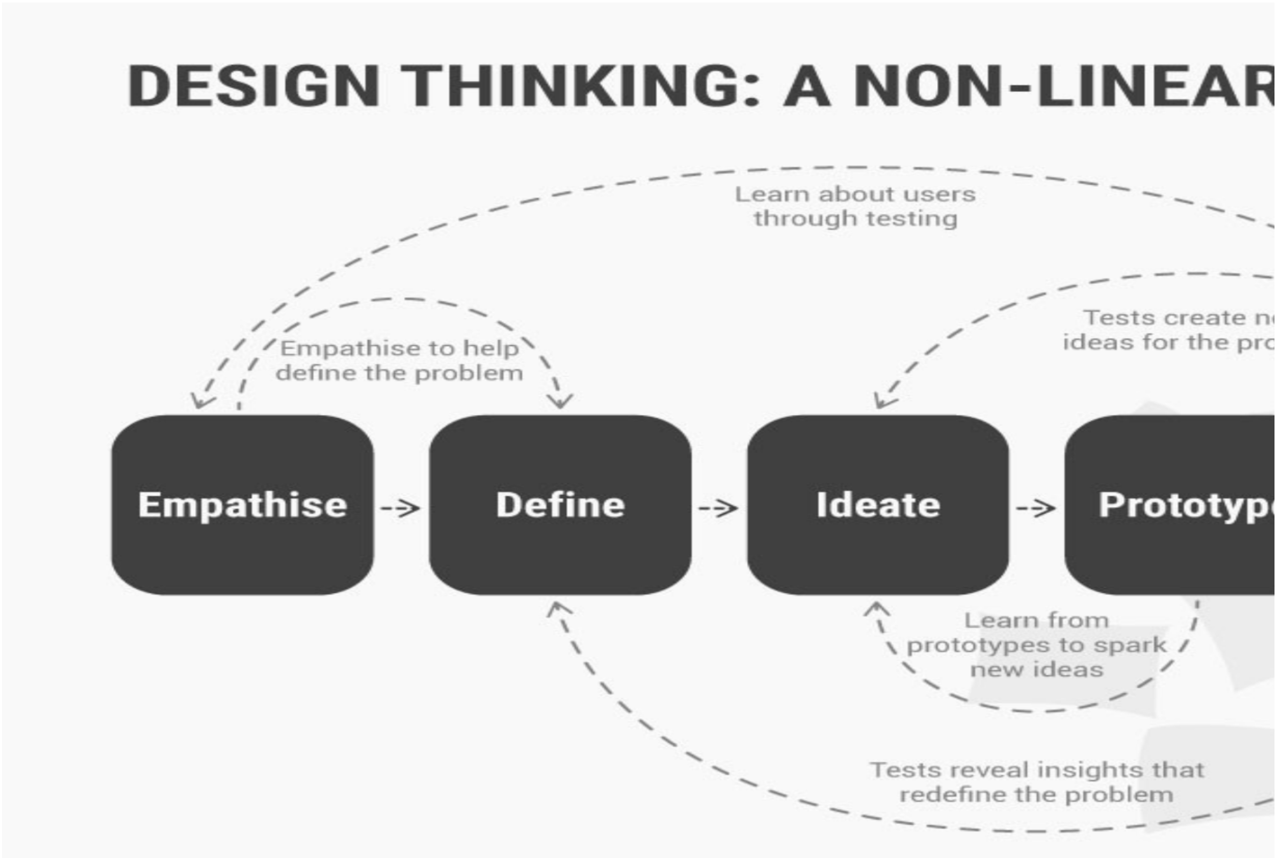

Figure 3. One example of design thinking as applied in the interaction design field. From Interaction Design Foundation (CC BY-NC-SA 3.0, by Teo Yu Siang).

In the *EdSurge* article "UX to LX, The Rise of Learner Experience Design" (2016), Kilgore represented design thinking through the learner experience design lens. This model (Figure 4) closely aligns with how designers approach the application of design thinking in instructional design. While this model is also nonlinear (hence the dotted lines indicating returning to iterate), there are phases in the design process where different aspects of design thinking are emphasized, and discrete stages occur. For example, when beginning a course development project, it is important to engage heavily in the "discovery" phase that involves learning about the learners, empathizing, and "mind-melding" with the subject matter experts (SMEs) to (iteratively) clarify the design problem and goals.

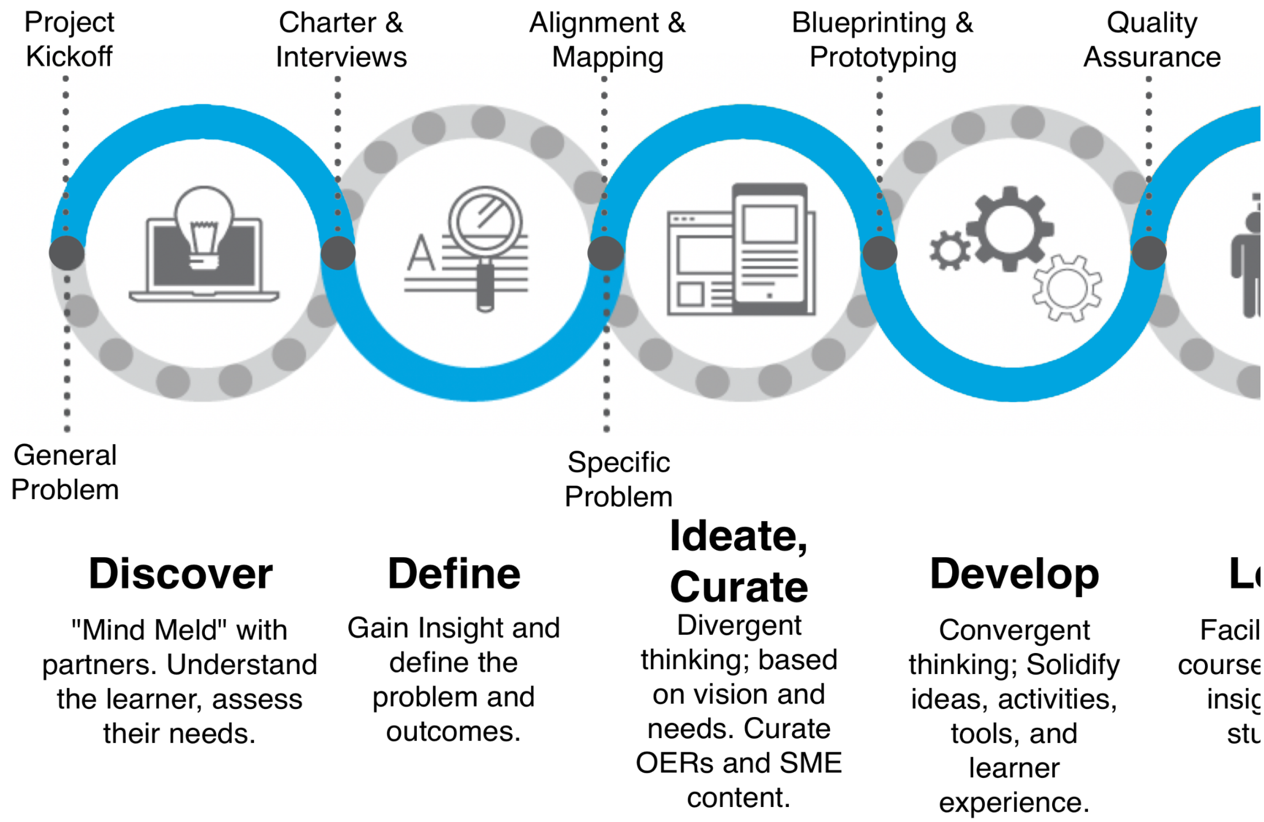

Figure 4. Design thinking in instructional design – empathize, define, ideate and curate, develop, learn, and iterate (modified from Kilgore, 2016). The dark gray dots indicate frequent design events that can occur at the iterative intersections of design thinking processes.

Instructional Design Models to Support Ways of Thinking

Over the last century, learning design models have transformed the way that curriculum development is approached. Some of the most popular are the Successive Approximation Model or SAM (Allen, 2002), Attention, Relevance, Confidence, Satisfaction or ARCS (Keller, 2010), Gagné's nine events (Gagné, 1965), backward design (Wiggins & McTighe, 2011), and Merrill's First Principles of Instruction (Merrill, 2002).

ADDIE (Analysis, Design, Development, Implementation, and Evaluation)

Likely the most "famous" such model is ADDIE, which is also known historically as instructional system design or ISD (Clark, 2015; Dick, Carey, & Carey, 2014). It is widely used and referred to because it is broad in scope and user-friendly, and can be used iteratively through different phases of design and development projects. This model can be applied to education, training, corporate, and other types of projects.

ADDIE represents five common stages of design and development (Figure 5): analysis, design, development, implementation, and evaluation. *Analysis* is the needs assessment and gap analysis. *Design* is the ideation of a solution to those learning and performance gaps. *Development* is the concretization of those ideas, often in the form of a written curriculum, learning management system (LMS) design, or interactive module. *Implementation* is the use of the developed learning object or designed experience with actual learners. *Evaluation* occurs throughout the process, in terms of both formative evaluation (identifying gaps to make things better along the way) and summative evaluation (how and to what degree the intervention was able to create the intended outcomes.)

One of the criticisms of ADDIE is that it was developed as a linear ("waterfall") model, meaning that each stage should be finished and then feed into the next. However, the use of evaluation throughout all stages makes the model slightly iterative by nature. Over time, many have molded the model to work with more nonlinear approaches in order to better apply design thinking to instructional design. (In fact, one might notice some similarities between design thinking and the ADDIE model!)

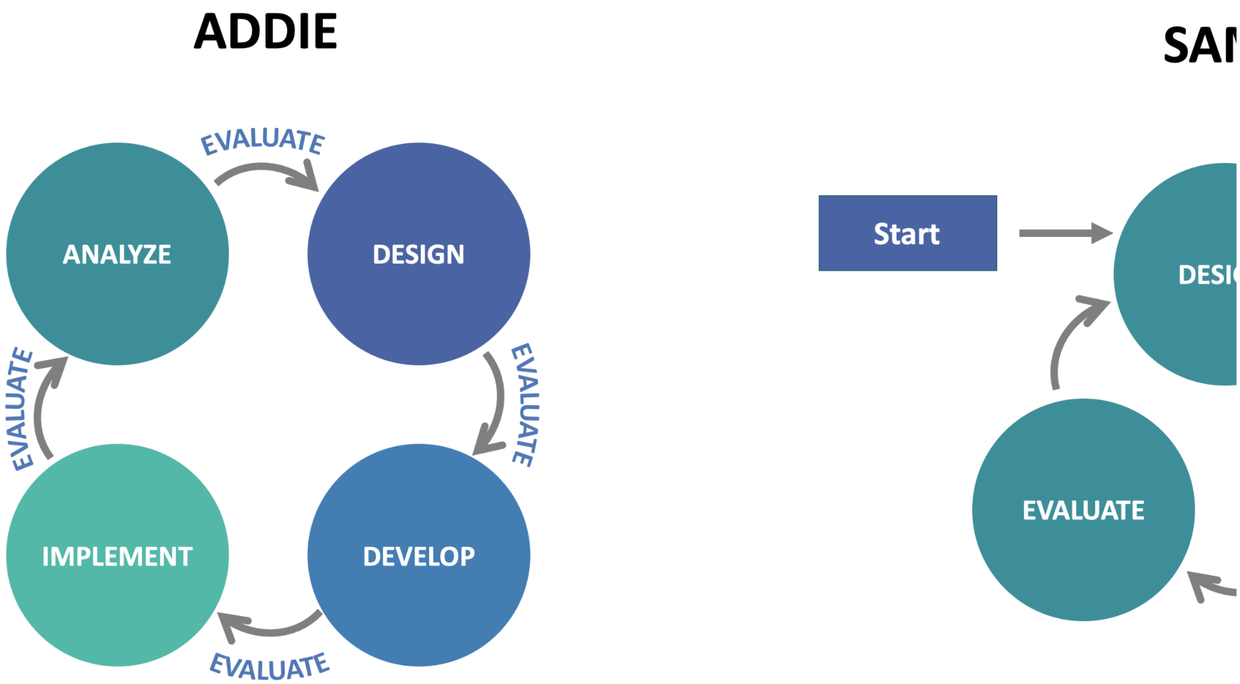

Figure 5. Instructional systems design models: ADDIE (left) and SAM (right).

Successive Approximation Model

The successive approximation model (SAM; Allen, 2012) is a nonlinear, agile approach to instructional design. By defining the need and understanding the learner, and through ideation and testing, designers can make successive approximations toward an optimal learning experience. (Figure 5)

Backward Design

In backward design (Wiggins & McTighe, 2011), the final assessment is considered first. Learning objectives are written and, in many cases, the assessment is created before any content or activities are added to the plan. In this way, students are more likely to successfully meet the goal of the course, as long as everything aligns with the objectives.

While there are additional models and approaches, ultimately each designer should find a model and approach that fits their goals, purposes, and context. There may be times when a linear approach is best (e.g., the problem is well defined or well structured; the solution and processes are known and work well). Other times, a nonlinear approach is best (e.g., the problem is ill-defined or ill-structured, the solution and processes are not known or well understood, or there is a need to be open to new ideas and approaches). No matter the model, design thinking is the foundation needed for creative innovation in design to flourish.

Fundamental 3: Strive for Deep Empathy and Understanding to Accurately Discover and Define Context, Problems, and Goals

Who are you, where are you, where do you want to be, and why is it important to you?

Education is a type of *transformation*. If a learner is not changing in some way, at some level, then learning is not occurring. Luckily, humans learn innately. Every interaction, conversation, and reading changes us in small ways. If students engage in a course where the instructor never shows up to class on time, they learn that they are not important. If they engage in a course where the instructor gives rich feedback and encourages students personally, they learn that they are important. Instructional design is not merely about whether designers and instructors can help students learn in general, but rather about how they can support learners to transform toward highly specific and well-defined outcomes, and how those outcomes and transformations can be measured. Instructional design expertise resides in knowing how to facilitate this type of clearly defined transformation for diverse learners in, typically, a remote or blended learning environment.

Education is also a type of *intervention*. An intervention is something that *intervenes* to achieve a desired outcome that could not be achieved without this help. The intervention changes the normal trajectory or pattern of behavior or learning.

The fundamental role of the instructional designer is to help design experiences that create a meaningful, pleasurable intervention where the learner is transformed toward the desired outcomes. To do this, designers must discover *who* the learners are, *where* they are (in their learning and lives), where they (and the SME and program) want them to be, *how* to help them arrive there, and *why* anyone (especially the learner) should care about any of it at all. The process of uncovering this overarching contextual information is called "discovery." The identification of the gap (between where the learner is and where we want them to be) is the "defining" of the problem.

Discovery Through Charters and Interviews

Ideal approaches to discovery engage the use of interviews and agile project (or team) charters. These strategies help designers to understand the learners and where they come from, and to gain insight into who they are and the context in which they live, work, and learn. Just as one cannot head in the right direction without knowing one's destination, designers cannot make the right design decisions without knowing *who* they are designing for and *why*.

Project or Team Charters

Project or team charters have their origin in agile methodologies, which arose as a pushback against waterfall techniques where an a priori design drove the development process (rather than the human-centered problem driving the development process forward to a human-centered solution.)

"There's really just one thing that matters in creating an agile team charter: anchoring to a problem instead of a solution . . .. Because problems, defined correctly, are durable and keep you focused on what's valuable . . .."

—Alexander Cowan, "Agile Team Charters, The Basics"

Charters help designers establish the *why* behind the design, what the problems are, who they are designing for, the teamwork expectations, and the drivers. Typically lasting just a session or two, charters provide the team of instructional designers, technologists, SMEs, and other stakeholders with a shared understanding of their mission, the key issues, and reasons why the goals are important ones to achieve.

Interviews

Interviews are important components of project charters and are also an excellent tool to use when working with SMEs on course designs. The purpose is the same, but at a more granular, course-specific level. Interviews help SMEs answer the questions "Who are you? Where do students typically start? Where do you want students to go? Why is your topic important?" Instructional designers listen to these answers and, through this discovery process, begin to arrive at the *how*. When initially working with SMEs, designers must listen and question. (It is the *discovery* phase, not the *tell them everything you know* phase!) Ask big, overarching, open-ended questions that lead the SME to begin telling the story of their course. Encourage SMEs to not filter out ideas because they think they cannot be done; encourage big, exploratory thinking and questions at this stage. The first interview is a great place to get SMEs to open up, which allows opportunities to listen and inquire. It is a time to take plenty of notes; these interviews can be a treasure trove of ideas during the ideation stage for authentic projects and activities.

Discovery Through Learner Empathy Mapping and Personas

While project charters and interviews are a great start for understanding learners and their contexts, ultimately an instructional designer needs to deeply understand and empathize with the learner in order to do great design.

Empathy Mapping

One of the primary aspects of the discovery stage in design thinking is empathy mapping (Gibbons, 2018). Figure 6 shows a common structure for a learner-aggregated empathy map, and Figure 7 shows a sample of a completed learner empathy map for prospective students in a nursing course.

Information for empathy maps can be gleaned from interviews with learners, program administrators, SMEs, and instructors, among other stakeholders. Learner empathy mapping also serves as a form of needs assessment during this discovery phase. The sample aggregated learner empathy map demonstrates that some students may be new to online learning, that they are all working adults with a great deal of experience, and that they care deeply about helping others. These facts help to shape the decisions designers make about the optimal design for these learners.

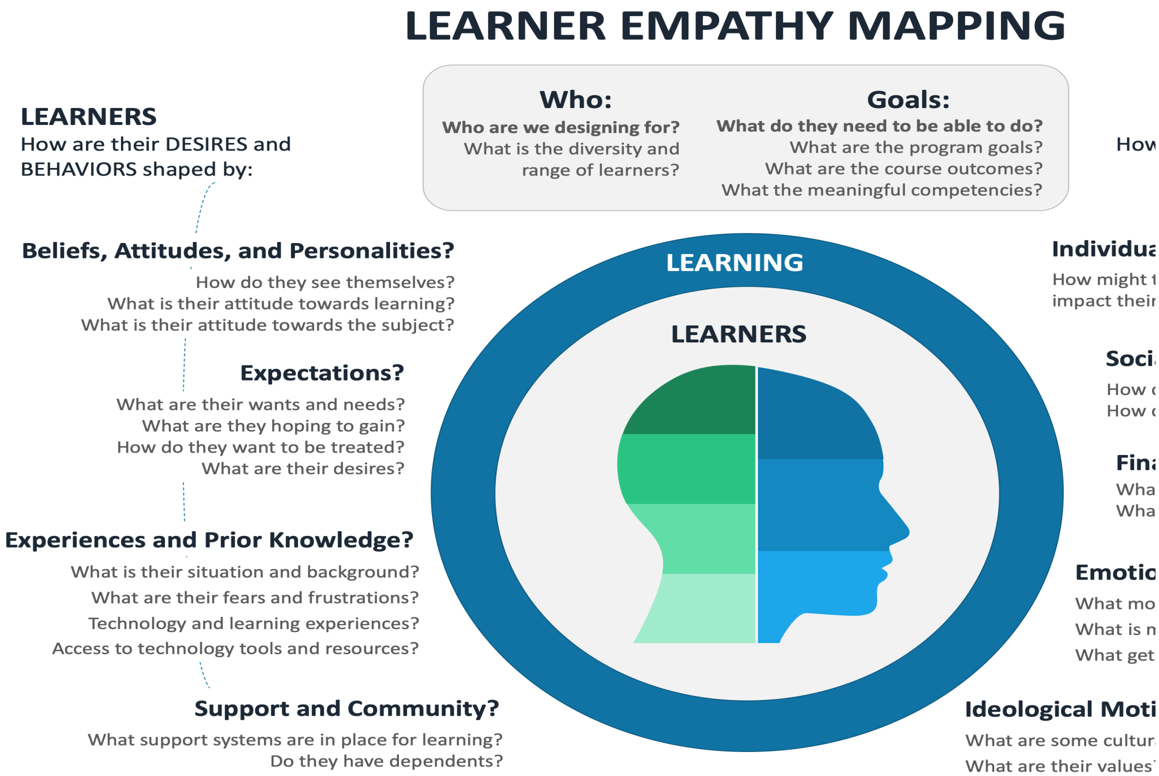

Figure 6: Learner empathy mapping structure.

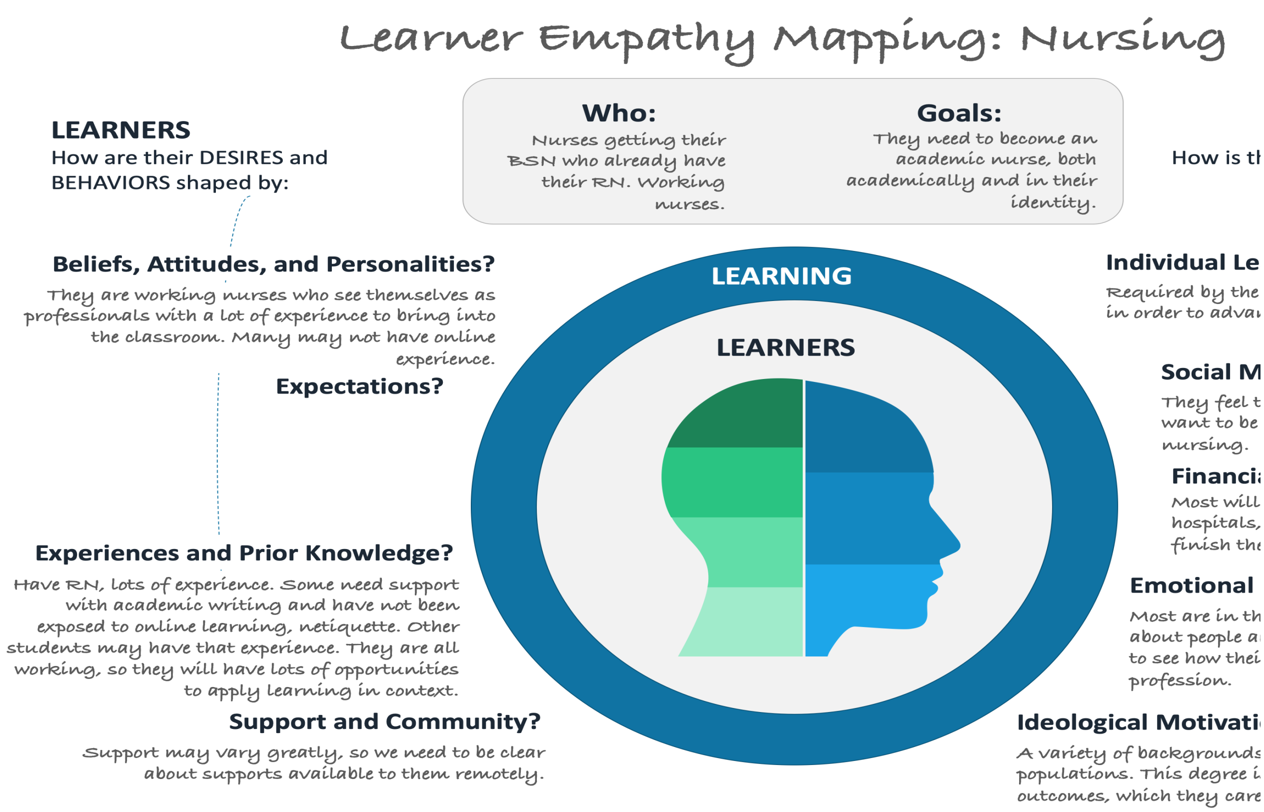

Figure 7: Sample aggregated learner empathy map for prospective learners in a nursing course.

Learner Personas

Empathy maps can be used to create learner personas. Learner personas are essentially learner archetypes that help designers crystallize the abstract and humanize what they've gleaned about the learners into a visual and narrative form. Indeed, it is another form of focusing on the problem rather than on an already identified solution; by keeping the learner front and center, designers are humanizing the design problem. In short, instructional designers help to create *experiences* for real people with actual needs in the hopes that they can achieve their goals. Figure 8 shows a sample learner persona developed for the nursing program, based on prior empathy mapping. In leading the team, instructional designers should continually return to the personas as the team ideates and thinks through design decisions.

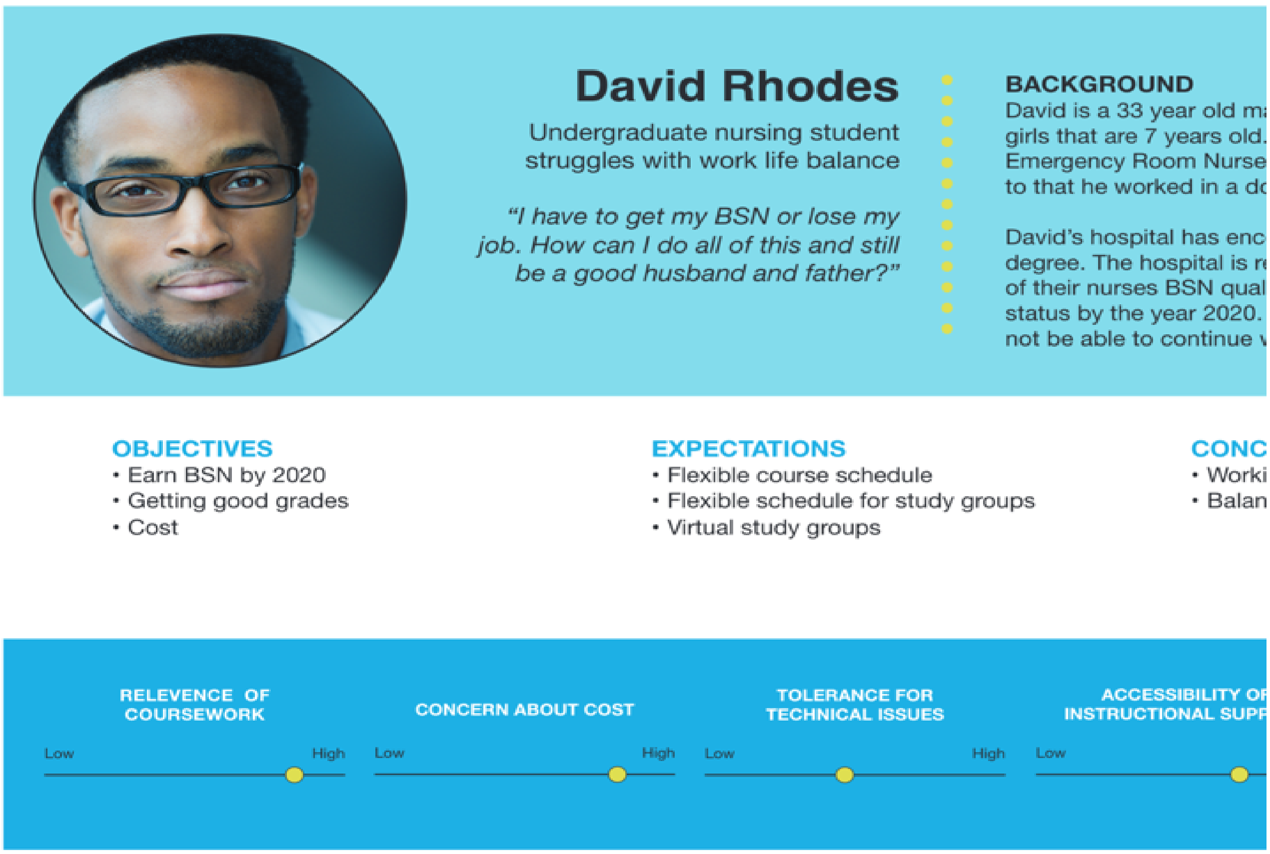

Figure 8: A sample learner persona for a nursing program.

Defining the Problem Through Alignment and Mapping

Alignment

Instructional design is intentional and experiential. The outcomes of learning and curriculum design must be determined in the same way to support institutional and programmatic requirements. Yet alignment is also necessary for accreditation purposes, which has become increasingly important for online programs. Alignment ultimately means taking a human-centered approach and creating meaningful and applicable formative and summative assessments and activities to support and measure learning, often by creating a high-level alignment map to key desired outcomes (see an example in Table 1.) Alignment also means tracking and ensuring that problems are kept front and center in the design solution, in the following ways:

- By teaching the content that students need to learn (instruction, content);
- Allowing students to practice the skills and knowledge needed to perform (formative assessment);
- Making sure the students learn the content and can apply it in context (summative assessment, authentic summative assessment);
- Supporting students in an effective and rigorous yet efficient education;
- Ensuring an intervention that is designed toward the appropriate goals and needs.

Alignment often happens at multiple levels:

- How are the course learning outcomes aligned to the program learning outcomes, professional standards, and institutional learning outcomes?
- How are all the activities and assessments in the course aligned to the course learning outcomes?

Sample Alignment Table

Course learning outcomes (CLOs)	**Program learning outcomes (PLOs)**	**Professional standards 1**	**Professional standards 2**	**Institutional learning outcomes (ILOs)**
Critique and present analysis in a setting with authentic features	2, 5	II, III, IV	1	2, 3

Table 1. Sample alignment of course learning outcomes, program learning outcomes, professional standards, and institutional learning outcomes (ILOs).

Sample high-level map of one course learning objective

Course learning objectives *(What do you want learners to do?)*	**Enabling learning objectives** *(What is the path to the CLOs?)*	**Learning materials** *(How will you teach the learners? What will you need?)*	**Learning activities** *(How will learners practice?)*	**Assessments** *(How do you know learners have met the objectives?)*
Critique and present analysis in a setting with authentic features	Identify and define key terms Describe and discuss key concepts Apply concepts in case scenarios Propose an original use of key concepts Critique proposed use of key concepts	Read text Watch video View lecture	Review a scenario Whole-group discussion Small-group case study activity A written proposal or presentation (team or individual) Peer review of proposal or presentation, with notes for improvement	Knowledge checks (formative) Comments (formative) Worksheet (formative) Paper or presentation (summative) Peer review comments (formative)

Table 2. Sample high-level map of one course learning objective (CLO) demonstrating alignment (from the iDEA Book: iDesignEDU, 2019).

Mapping

A course map (as demonstrated in Table 2) is a high-level view of the learner experience. It showcases the alignment but can also show and highlight the curricular flow and rhythm from module to module. Mapping moves away from discovery and iterates back and forth between divergent ideation and convergent mapping (e.g., defining and describing the assessments and activities). To have a well-structured course, not just a well-aligned course, human learning theory and instructional frameworks should be used to guide the scaffolding, flow, and design decisions. This brings the topic back to the three lenses of innovation.

Objectives

Objectives are the driving force in designing learning, as they describe what learners should be able to demonstrate after a learning experience. They should be meaningful, measurable, and specific. Many designers use learning taxonomies, such as the revised Bloom's taxonomy, to provide a framework when writing learning objectives. Other taxonomies include Miller's pyramid of clinical competence (Miller, 1990), Webb's depth of knowledge (Webb, 2002), and the **S**tructure of the **O**bserved **L**earning **O**utcome (SOLO) taxonomy (Biggs & Collis, 2014).

Assessments

Assessments are the visible manifestations that allow instructors to measure and evaluate learning. Quality assessments should be meaningful, authentic, valid (actually measuring what they are intended to measure), reliable, and aligned to outcomes, and should have clearly communicated success and grading requirements. Assessments can be either formative and lower stakes (used to inform how to improve) or summative (used to evaluate the degree of success in achieving the stated objectives).

Fundamental 4: Establish the Flow Through Vision, Narrative, and Frameworks

"The best courses tell a story, inviting students on an engaging and challenging journey."

—The iDEA Book (iDesignEDU, 2019)

The Relationship between Structure, Narrative, and Vision

Just as alignment and mapping provide the internal structure, like a skeleton, narrative and vision are the connective tissue that unifies the design and experience. Humans learn through stories, and each learning experience should be thought of as a longer, overarching story or narrative experience. This idea of the story is the narrative, and the intention behind the rhythm, flow, look, feel, and experience is the vision. These will serve as guideposts to ensure a pleasurable, meaningful experience. To define a vision, an instructional designer will engage in cycles of divergent and convergent ideation (see Figure 9).

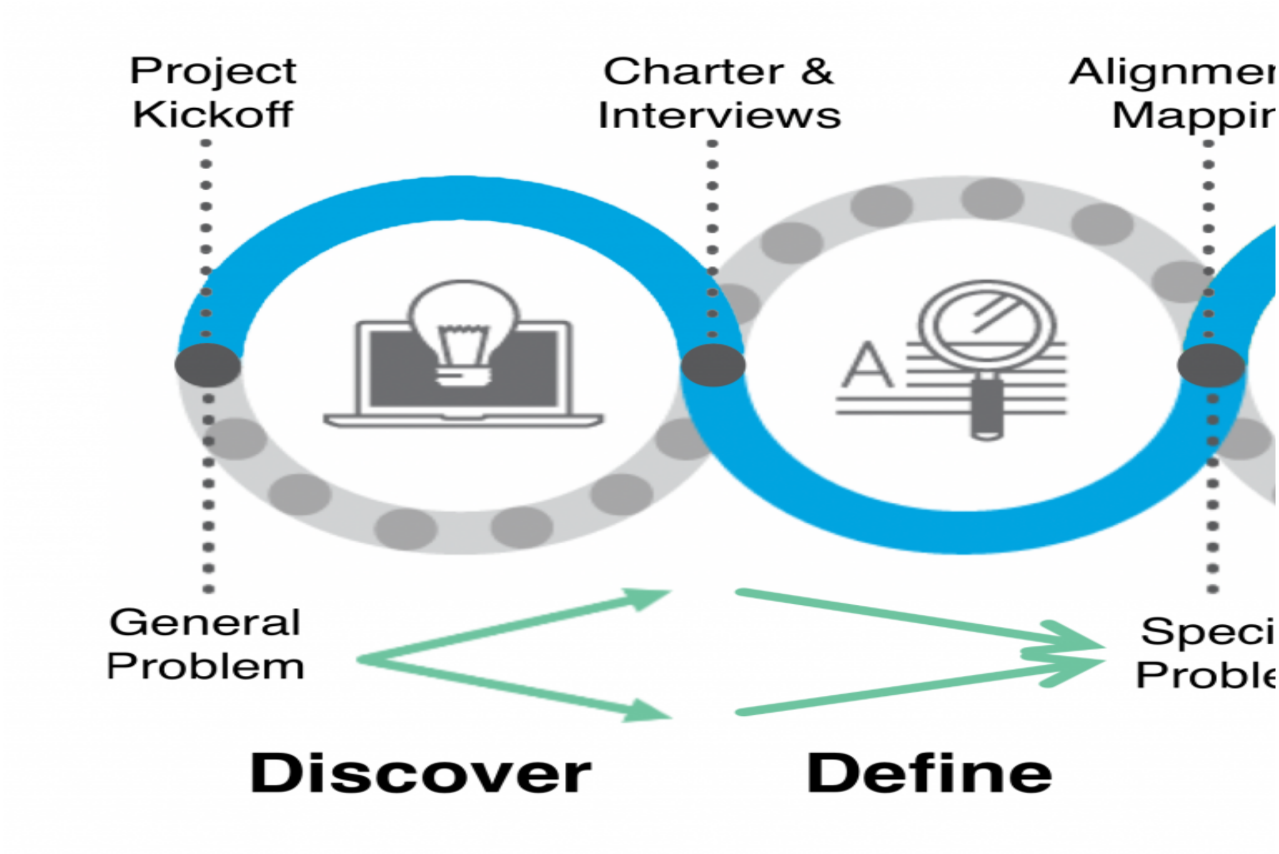

Figure 9. Discovery and defining are iterative; discovery requires divergent thinking while defining requires convergent thinking to define the design problem.

Narrative

A quality narrative is engaging, meaningful, and authentic, and puts the learner in the center of the problems. Quality narratives also are a natural fit with the content, learning objectives, and outcomes. It is not always easy to create a quality narrative, and doing so often requires conversation and collaboration within a team.

Vision

A vision provides direction in the mapping and ideation steps by:

- Defining the learning problem;
- Providing potential instructional frameworks that can be explored based on the defined problem and narrative;
- Providing a mission and overarching direction for the design problem based on the three lenses of innovation;
- Creating visual examples of what the learning experience could look like in the end (more ideation time may be needed for this).

Learning Theories

Learning theories are evidence-based models that attempt to explain, model, and predict how people learn. (It is important to note that different learning theories may also operationalize learning differently from one another.) There are many learning theories; three overarching learning theory paradigms will be reviewed here.

Behaviorism pays attention to behaviors (rather than what is going on in the mind) and focuses on conditioning, stimuli, and responses. *Cognitivism* pays special attention to a person's mind (in particular, their very human and biological strengths and weaknesses) and uses that knowledge—such as memory abilities, when learners might get overwhelmed (cognitive load), and humans' innate need for social interactions (social learning theory)—to inform learning design. *Constructivism* acknowledges that learners can be supported to construct their own knowledge through solving problems (problem-based learning) or exploring cases (case-based learning). *Social constructivism* is focused on scaffolding within a learner's zone of proximal development (Vygotsky, 1978). For instructional designers, it is the source of much analysis of learners, contexts, and the design of pacing and sequence. A designer will look to these key paradigms to inform the learner-centered vision and narrative, which then helps clarify the assessments, assignments, and activities.

Learning Frameworks and Instructional Strategies

A *learning (or instructional) framework* is a system of related theories, concepts, and approaches that drives methods of designing instruction and teaching people. Frameworks are rooted in particular learning and teaching paradigms, include one or more learning theories, and often have affordances and weaknesses in different situations, contexts, and purposes.

For example, problem-based learning (PBL) is often utilized in medical education. PBL is well suited for ill-structured problems, case studies, and nonlinear learning without extensive scaffolding. On the other hand, *direct instruction* is often employed in mathematics education, where it is well suited for well-structured problems, worked examples, modeling, feedback, and systematic scaffolding. This is not to say that medical education does not engage in direct instruction, and of course mathematics education can also engage in problem-based learning. However, there often is a "learning recipe" of frameworks that an instructional designer will choose to guide the vision and narrative of the course.

The period after the interviews, charter, and alignment is a prime opportunity for the designer to establish the beginning of a vision and narrative. Instructional designers should draw upon their knowledge of frameworks and theories to support student outcomes given the content domain, goals, and contextual factors. There are many great learning strategies for designing exceptional experiences. But some learning strategy *must* undergird each experience.

Quality Review: Obtaining Feedback Early and Often

Getting feedback, early and often, is a core principle of an agile approach that dovetails perfectly with instructional design, design thinking, and quality review. As the alignment and mapping phases end, this is the ideal time for an initial quality review. The aim of performing an initial quality review at this stage comes from principles of agile and rapid prototyping: (1) fail fast (in other words, take action and get feedback quickly in order to iterate); and (2) fail often (in other words, leave room for multiple iterations—don't allow only one shot to get things right). Instructional designers must remember that perfection is the enemy of progress. This means that if designers seek perfection in one shot, they will not make great strides in their designs. Designers must give themselves the opportunity and time to fail, try out new ideas through iterations (a central component of design thinking), and let the lenses of innovation guide their decision-making; doing so will lead to amazing progress in their designs.

The end of the alignment and mapping stage is a key flex point before a significant amount of energy is poured into the details of the course in the blueprinting and prototyping stages. Getting feedback for further refinement and confirmation of quality on the course alignment and map can help course-correct a particular design trajectory that may be off or missing important elements.

OSCQR and QM Rubrics

Two well-known tools for quality review are the Open SUNY Course Quality Review (OSCQR) Rubric and the Quality Matters (QM) Rubric. While the OSCQR Rubric leans toward a focus on nonevaluative feedback for continuous improvement, and the QM Rubric has an evaluative nature, both support the review of key quality indicators of course design, such as learner centeredness, alignment, assessments and measurement, design and layout, content and activities, interaction, feedback, and accessibility.

An instructional designer should be well versed in the available quality-review tools, their implementation, and their utility throughout the design and development process to inform quality design decisions.

However, it is important to not lose sight of the early work accomplished with design partners and SMEs in the interview and team charter phase. The quality review tools identify *standard* signals of excellence in online learning design. It is the instructional designer's role to ensure that the design goes *beyond* the standard and is tailored for the needs stated in the charter and interviews.

Fundamental 5: Iteratively Ideate, Curate, and Develop

Ideate Through Blueprinting and Curating

Alignment and mapping are a course's backbone; the vision, narrative, and frameworks are the connective tissue; and the blueprint is its flesh. In this blueprinting stage, the designer works with the SME to flesh out the details of the experience. Most commonly, this work is accomplished via collaborative writing applications such as Google Docs. The blueprinting phase is an iterative process between divergent ideation (brainstorming) and convergent ideation (creation), rendering the vision and narrative concrete through the activities, learning materials, and assessments. When complete, a blueprint should represent the entire course content, directions, materials, activities, and assessments for the final course development. While a completed blueprint may be linear in nature (e.g., progressing from Module 1 to Module 10), the process of creating it involves varying degrees of nonlinearity and iteration. For example, beginning with the final projects and assessments, followed by rubrics, then activities, and finishing with module and course introductions is not an uncommon workflow, especially with *backward design* (Wiggins & McTighe, 2011). Figure 10 illustrates how this process of ideation should ideally target ideas that are effective, meaningful, feasible, and sustainable, all while maintaining the vision and narrative.

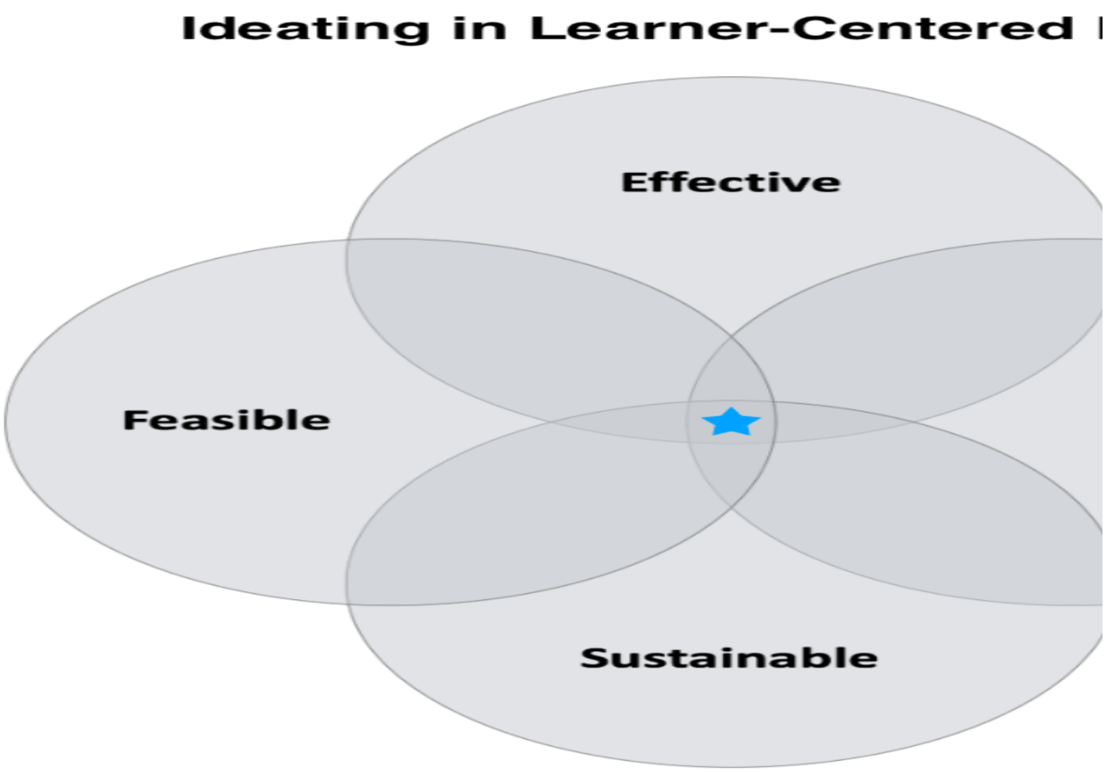

Figure 10. Ideating in learner-centered design involves working toward effective, meaningful, feasible, and sustainable ideas.

Universal Design for Learning

Universal Design for Learning (UDL) is a way of thinking about teaching and designing learning experiences so that all students, of varying abilities and talents, have equal opportunity to learn (CAST, 2019). Universal design is not the same as accessibility (discussed later in this chapter). Whereas accessibility is focused on ensuring *access*, universal design is focused on ensuring *opportunities to learn*. Accessibility is a *prerequisite* to UDL.

UDL involves integrating choice and customizability into learning designs in three key areas: (1) how students are stimulated to engage with the learning and with each other, (2) how to present content in different ways so there is choice, and (3) how students are able to express and demonstrate what they know. For example, changing a synchronous discussion into an asynchronous discussion allows students to engage in additional think time, and means they can respond at any time during the day or night. Providing both video and text presentations of content allows those who prefer print (or don't have the ability to watch a video) to read the content, while others who prefer the sights, sounds, and presence of a video may watch. Allowing students to incorporate their own experiences (a core component of andragogy) and providing choices for how they present their work lets students leverage their skill sets and talents—and enables the instructor to more accurately assess their knowledge in application.

Throughout the mapping and blueprinting process, the three principles of UDL should be kept in mind, as they will support the course's effectiveness in achieving its outcomes.

Reify and Refine the Specific Solution (Experience) Through Prototyping

To reify an idea is to make it less abstract, or more real. The goal of prototyping anything, whether it is a mobile phone or a module within a learning experience, is to reify that *idea* to gain insight. Prototyping helps answer some of the following questions (in addition to generating new and sometimes unexpected ones):

- What might it look like?
- Does it work?
- How does it work?
- How can it work? What are other possibilities?
- How does it feel to use it, to be in it?
- Is there anything unexpected?
- Do we need to rethink some ideas?
- Are some of our ideas not feasible?
- Did the prototype lead to more questions?
- Are there ideas or possibilities we didn't think of before?
- What can we expect?
- What will it look like?
- How can we build or generate better ideas now that we know how it looks/works/feels?
- Can we tweak it to be better?
- Should we scrap our ideas and start again?

Again, in the spirit of rapid prototyping, the goal is to get feedback early and often; as such, designers should prototype as early as possible in the design process. To prototype an idea is to fully build out as much of the learning experience as possible to get a feel for the direction it is heading in, and to test it—for example, building out a module or a portion of an interactive. This also allows the designer to run test learners through a "mini-experience" of the course to gain deeper insight into *how* it is experienced by learners and what should be changed. (In the design thinking model, this is a small instance of *learning* and *iteration*).

There will also be impacts on ideation and blueprinting from the process of prototyping (especially in ill-defined or ill-structured design scenarios). Designers must plan ahead and give themselves time to learn from the prototyping process.

Develop the Final Experience Design

The final learner experience design is the design that learners will actually experience. Often this resides in an LMS, but it can take many different forms. The course may be blended, or it may be a small interactive module. Learning experiences take many shapes.

Development is ideally accomplished by a team. Often an instructional designer and instructional technologist will pair together; there may also be videographers, graphic designers, and sometimes programmers involved if the learning experience is highly technical in nature. In each instance, the final experience will look and feel different. Whatever the final experience, it should be learner-centered (meaningful, pleasurable, effective), achieving the goals and mission stated in interviews and the charters.

Refinement Through Quality Assurance

Throughout the blueprinting and development process, quality reviews should continue; again, in the spirit of rapid prototyping, the goal is to get feedback early and often to guide the way forward. Whether using the QM or the OSCQR rubric, the most important component is obtaining a review that ensures the team is accomplishing what is stated in the charter, interviews, vision, and narrative. That makes for a complex review, but it can be done!

Accessibility

Accessibility, while often addressed later in the development phase, should never be an afterthought. Accessibility ensures that individuals with disabilities have *access* to the learning materials and are able to equally participate and demonstrate their learning achievements. For individuals with vision impairments, this requires ensuring that the learning experience is optimized for screen readers, supports high contrast, pairs imagery with descriptive text, and allows for enlargement of text and text-readable content. For individuals with hearing impairments, this requires ensuring that all audio of the learning experience is captioned and transcribed, and that other audio elements or synchronous sessions allow for equal participation and demonstration of understanding.

Accessibility, especially given the ever-growing use of technology, requires diligence to ensure equal access, and often requires team effort and collaboration. One quality resource for accessibility is the Quality Matters Accessibility and Usability Resource Site (QM AURS; see Quality Matters, 2018), as it focuses on ensuring that learning is accessible for all.

Fundamental 6: Continually Learn and Improve Through Teaching, Reflection, and Learning Analytics

> "Criticism, like rain, should be gentle enough to nourish a man's growth without destroying his roots."
>
> —Frank A. Clark

The purpose of quality instructional design is not just to design learning for students; it is also done to set instructors up for success in teaching. Exceptional instructional design enables the instructor to focus on facilitation, intervention, and feedback in online and blended settings, whatever the learning framework and instructional strategies used. Quality learner experiences often parallel quality teaching experiences.

Refresh Data Inputs: Experiences and Analytics

Two primary types of data should be collected to iterate designs in a data-driven way: experience data and analytics (see Figure 11).

Learner and Teacher Experience Data

Information about the learner and teacher experiences often comes through continual reflection, notes, conversations, interviews, observations, and surveys. Throughout the teaching process, instructional designers can engage in periodic reflections on the following topics:

- What went well?
- What could be better?
- What can we do differently in the future?
- What should stay the same in the future? (What do we NOT want to change?)

Some reflections can be immediately implemented—for example, giving clearer feedback or refining the wording of future announcements. Other reflections will reveal iterations that must wait for a refresh cycle of the course—ideally, immediately after the course is taught for the first time. If the instructor keeps a reflection log of these questions, asked at the end of each module, this log will serve as a valuable data resource for continual improvement.

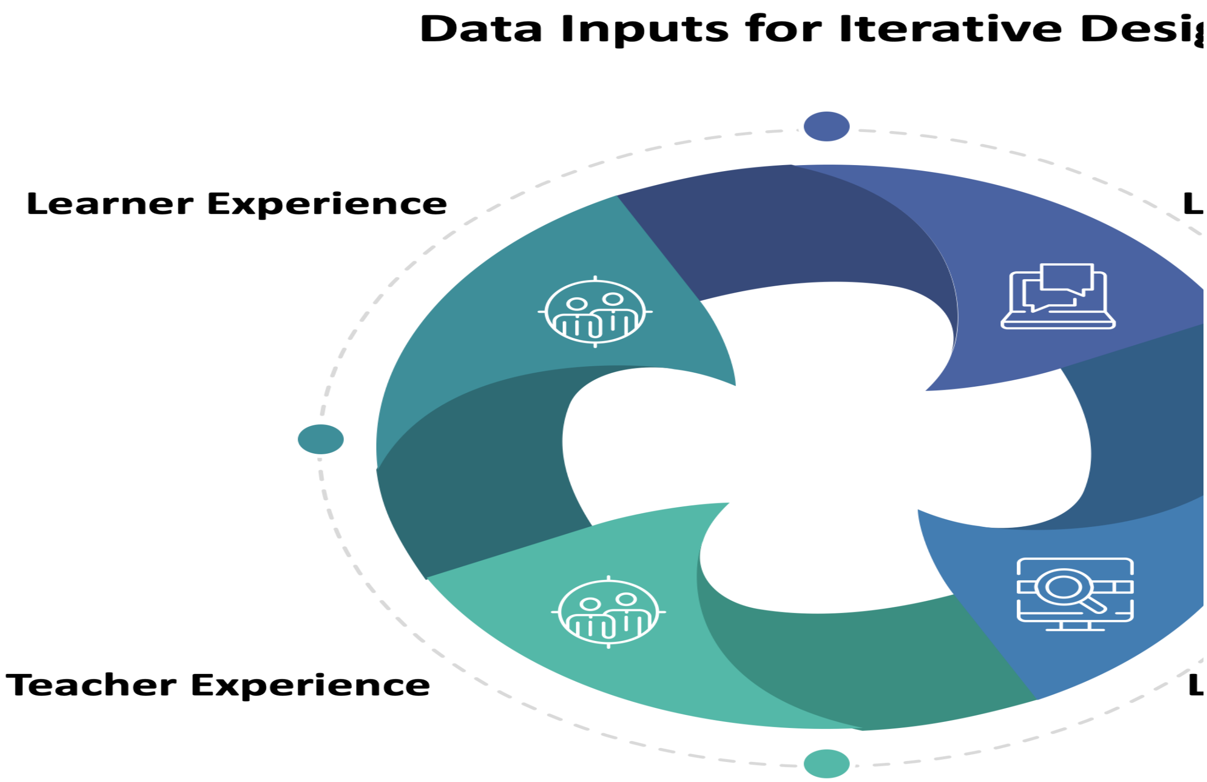

Figure 11. Primary inputs for ideation of continuous improvement in instructional design.

Learning Analytics: Outcomes and Behaviors

Learning analytics is “the measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimizing learning and the environments in which it occurs” (Siemens & Gasevic, 2012). An amazing amount of data is collected that can be used for course iteration, and for the purposes of informing iterations in course designs. Data on performance, engagement, and the degree to which students achieved the outcomes are collected in modern systems (rubric ratings, assessment scores, discussions, sentiment analysis, and group engagement, to name a few). In addition, data on test items and quizzes can also be obtained to continually ensure the validity of both low-stakes and high-stakes test items as well as to flag potential issues in the wording of questions. Continuous improvement uses this information as an input into the discovery stage, and the process begins anew.

Summary

This chapter only scratches the surface of quality instructional design. However, it reviews six fundamentals for exceptional instructional design through mindset and approach:

- **Fundamental 1:** Make design decisions using the three lenses of learning innovation;
- **Fundamental 2:** Use design thinking as the “way of thinking”;
- **Fundamental 3:** Strive for deep empathy and understanding to accurately discover and define context, problems, and goals;
- **Fundamental 4:** Establish flow through vision, narrative, and learning frameworks;
- **Fundamental 5:** Iteratively ideate, curate, and develop;
- **Fundamental 6:** Continually learn and improve through teaching, reflection, and learning analytics.

These fundamentals for mindset and approach, taken together, form a solid foundation for exceptional instructional design.

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The Competencies for Instructional Designers in Higher Education

Albert D. Ritzhaupt, Swapna Kumar, & Florence Martin

Introduction

As the field of instructional design continues to mature and evolve, the professional roles and competencies of the individuals who identify as instructional designers has become increasingly important. In particular, instructional designers working in the professional context of higher education serve important roles within their organizations. A few notable professional organizations provide standards for instructional design professionals (Martin & Ritzhaupt, 2020), yet the unique case of higher education provides several opportunities and obstacles for these professionals to use their academic preparation and experiences to best serve their institutions. This chapter summarizes the roles and competencies of instructional designers working in institutions of higher education based on current research and practice.

Organizational Context and Settings

Instructional designers in higher education can be found all over the organizational charts of an institution of higher education (Anderson et. al, 2019; Kumar & Ritzhaupt, 2017; Ritzhaupt, & Kumar, 2015), including in centers for teaching excellence, online course production centers, centers of teaching and learning, human resources offices, academic libraries, information and academic technology units, and within individual colleges and academic units providing tailored services to their faculty and administration. Additionally, instructional design professionals can be found in all types of institutions of higher education ranging from research institutions to comprehensive universities to community colleges in public and private settings. While these professionals might be identified with different titles (e.g., educational technologist, learning designer) within their academic institutions (Chongwony et al., 2020; Kang & Ritzhaupt, 2015), their roles and responsibilities share many elements in common across these institutions and configurations. Instructional designers in higher education work with faculty across academic disciplines both as their primary stakeholders and as their subject-matter experts, but also acknowledge learners as their final stakeholders (Kumar & Ritzhaupt, 2017; Ritzhaupt & Kumar, 2015).

General Roles and Responsibilities

Instructional designers in higher education provide both professional services and products to their stakeholders in the form of course design, development, and evaluation; professional development opportunities; and technical and pedagogical support for faculty, staff, and students (Anderson et. al, 2019; Kumar & Ritzhaupt, 2017; Ritzhaupt & Kumar, 2015). The courses designed, developed, and evaluated with instructional designers may be fully online, blended, or face-to-face, depending on the needs of the faculty and academic units they serve (Anderson et. al, 2019). Additionally, it is not uncommon for instructional designers to provide ongoing professional development opportunities for faculty to learn about emerging technologies for teaching and learning or instructional strategies to best engage their students through workshops, one-on-one consultations, or teaching and learning certification programs within their institutions.

Providing ongoing technical and pedagogical support is also a common job requirement that involves faculty, students, and staff, such as academic advisors or tutors (Kumar & Ritzhaupt, 2017; Ritzhaupt & Kumar, 2015). This ongoing support might manifest as assisting students or faculty with the use of the institution's Learning Management System (LMS) or in the form of answering direct questions about appropriate technologies to support a specific type of instructional strategy. Additionally, instructional design work necessitates collaborations with non-academic staff, information technology units, administrators, and librarians (Anderson et. al, 2019). As the roles of these professionals appear to be constantly evolving, instructional designers in higher education are in-demand professionals that must possess a wide-range of competencies.

Academic Backgrounds and Professional Experiences

Within the United States, instructional design is most commonly offered as a graduate degree or certificate program within institutions of higher education (Ritzhaupt & Kang, 2015), and while many professionals possess this academic pedigree, this is not the only path to entering the profession. For example, a recent job announcement analysis revealed that several positions in the field only require a bachelor's degree and several years of professional experience (Kang & Ritzhaupt, 2015). Many instructional designers also have extensive prior experience as an actual educator either in K-12 settings or in higher education, which can help as a professional experience in developing a rapport with faculty. The foundational competencies of instructional designers in higher education is a moving target and though we attempt to provide these competencies in the subsequent section, it is important for readers to recognize the role is constantly evolving as the needs of higher education also evolve.

Foundational Competencies for Instructional Designers in Higher Education

In this section, we document foundational competencies of instructional design professionals working in institutions of higher education. These foundational competencies are formulated based on prior research and our interactions and practice with instructional design professionals. These general categories are not mutually exclusive and are not meant to document the only competencies for these nascent professionals. As higher education continues to evolve in the information economy, so do the roles of these professionals serving these institutions.

Strong Communication and Soft Skills

Across several studies of instructional design professionals, often the most highly rated or observed skill is strong written and verbal communication skills (Kang & Ritzhaupt, 2015; Ritzhaupt et al., 2018; Surrency et. al, 2019). These strong communication skills serve as critical to other competencies among these professionals, such as creating effective instructional resources and presentations or communicating to multiple stakeholders involved in typical instructional design projects (Chongwony et. al, 2020). Instructional designers must be able to communicate and collaborate with subject-matter experts, graphic designers, multimedia developers, video producers, students, project managers, and more. They should be able to negotiate and communicate with diverse faculty, administrators, and students in nontechnical language (Surrency et. al, 2019). Communication skills, interpersonal skills, and soft skills are crucial for the building of effective working relationships and teamwork needed to successfully interface with various stakeholders and in a multicultural environment (Anderson et. al, 2019; Chongwony et. al, 2020; Schwier, & Wilson, 2010). In addition to communication skills, instructional designers in higher education must also possess diplomacy, problem-solving, interpersonal, and organizational skills to name a few (Kang & Ritzhaupt, 2015; Ritzhaupt et al., 2018). We place this foundational competency first in our list intentionally because it is perhaps one of the most important identified in current research and practice.

Instructional Design Models and Processes

While there are literally hundreds of instructional design models and processes defined and described in the academic research literature, instructional designers working in higher education need to be aware of these models and processes, and more importantly, know when to use a model or process that is appropriate for their current instructional design project. Prior research has shown that these professionals utilize many different instructional design models (e.g., Dick and Carey or backwards design), but often describe the phases of the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation) to frame their workflow (Bond & Dirkin, 2020; Kumar & Ritzhaupt, 2017; Ritzhaupt & Kumar, 2015). Instructional designers in higher education appreciate the careful alignment among the learning objectives, instructional content, and assessments in any course design and delivery method. The instructional design models and processes they deploy help them ensure this alignment in the creation of their instructional resources, and use evaluation techniques to verify these outcomes are working in their course improvement efforts. These professionals also articulated the importance of being able to clearly explain the models and processes to their faculty stakeholders to have shared understanding of an instructional design project.

Learning Theories and Instructional Strategies

Instructional designers in higher education can express how different theoretical orientations shape their decision-making about appropriate instructional strategies for a given learner population, content domain, and delivery format (e.g., online). A traditional instructional design degree program will trace the history of learning theories from behaviorism to cognitivism to constructivism in the application of useful instructional strategies, and while some instructional designers subscribe to one of these theoretical positions, most take a pragmatic approach that blends ideas from each (Ertmer & Newby, 1993). Additionally, instructional designers are aware of different types of learning outcomes and domains, such as prescribed by the original writings of Bloom's taxonomy and domains (Bond & Dirkin, 2020; Kumar & Ritzhaupt, 2017; Ritzhaupt & Kumar, 2015). Interviews with instructional designers in higher education showed a wide array of theoretical influences, such as Malcolm Knowles's adult learning theory (Knowles, 1978), the Cognitive Theory of Multimedia Learning (CTML; Clark, & Mayer, 2016), and Merrill's first principles of instruction (Kumar & Ritzhaupt, 2017; Merrill, 2002; Ritzhaupt & Kumar, 2015). While these professionals report utilization of a wide-array of instructional strategies, instructional designers interviewed and surveyed in the research highlighted the importance of designing courses with constructivist principles, and student-centered and collaborative learning opportunities they serve (Bond, & Dirkin, 2020; Kumar & Ritzhaupt, 2017; Ritzhaupt & Kumar, 2015). Use of authentic assessments, project-based learning, and reflective learning opportunities like journaling are common student-centered instructional strategies among current practitioners of instructional design in higher education.

Technologies in Instructional Designer Practice

Instructional designers working in higher education must be knowledgeable in multiple forms of technologies, including Learning Management Systems (LMSs) (e.g., Canvas), multimedia authoring and production tools (e.g., Captivate or Photoshop), video production and editing software (e.g., Premiere) standard office productivity tools (e.g., Microsoft Word or Excel), assessment technologies (e.g., Respondus), cloud-based solutions for collaboration and document sharing (e.g., Google Drive or Dropbox), synchronous video conferencing and classroom technologies (e.g., Zoom), and even basic HTML (Hyper-text Markup Language) and CSS (Cascading Style Sheets). While most instructional designers reported that they did not need high-end programming skills (e.g., JavaScript), they did indicate that awareness of these tools was important to their roles (Kumar & Ritzhaupt, 2017; Ritzhaupt & Kumar, 2015). Instructional designers need these technologies to support their abilities to provide communication, collaboration, management, and development of instructional resources for their stakeholders and to provide ongoing technical and pedagogical support (Kumar & Ritzhaupt, 2017; Ritzhaupt & Kumar, 2015; Schwier, & Wilson, 2010).

Project Management in Instructional Design

Although project management coursework is not consistently required across academic degree programs in the field (Van Rooij, 2010), instructional designers in higher education are often assigned to either manage or participate in multiple projects on any typical day of their work. Often instructional designers develop into project managers and need skills and knowledge in managing people, processes, and resources to achieve their objectives within diverse working environments (Chongwony, et. al, 2020; Schwier, & Wilson, 2010; Surrency et. al, 2019). These skills and knowledge include important project management competencies like schedule management, scope management, human resources management, budget management, stakeholder management, and quality management (Kline et al., 2020). Unsurprisingly, these competencies align to contemporary project management literature (e.g., Project Management Body of Knowledge or PMBOK) and certifications (e.g., Project Management Professional or PMP). While those working as project managers in instructional design in higher education have mixed emotions about these professional certifications, there is clearly alignment between the body of research in instructional design and project management (Kline et al., 2020).

Formative and Summative Evaluation

Though formative and summative evaluation is strongly rooted in contemporary instructional design models, we intentionally created a separate section to address this area because of its critical relevance to instructional designers in higher education. Instructional designers assist faculty with not only the original design and development of their courses, but they also assist with the ongoing course improvement efforts from semester-to-semester or quarter-to-quarter (Kumar & Ritzhaupt, 2017; Ritzhaupt & Kumar, 2015; Surrency et. al, 2019). Instructional designers are using a variety of data sources to inform evaluation efforts within the courses they help to create, including survey data or end-of-course evaluations, student performance data on course activities such as projects or quizzes or examinations, and increasingly, learning analytics data derived from the LMS activity logs (Kumar & Ritzhaupt, 2017; Ritzhaupt & Kumar, 2015). All of these data sources serve as evaluation evidence to ensure the learning objectives are achieved by the students within the courses and adjustments are made in a continuous process improvement effort to ensure high-quality learning experiences. These reflective cycles of course improvement are what help faculty create effective learning experiences.

Faculty Professional Development and Support

While not all organizational contexts and settings require instructional designers to provide professional development opportunities for faculty, depending on several factors, instructional design professionals might also be providing workshops or online courses and certification programs within their institutions to build the capacity of their faculty to teach online or use student-centered instructional strategies (Ritzhaupt & Kumar, 2015; Kumar & Ritzhaupt, 2017). The content of these professional development experiences range from technical offerings on how to use tools such as Canvas or Zoom to support teaching and learning to more pedagogical offerings on using project-based learning or effective feedback practices. These offerings are often a part of an institution’s certification program for faculty to teach online or blended coursework. Additionally, some settings have instructional designers provide ongoing support to faculty, students, and staff by answering helpdesk questions or one-on-one consultations (Kumar & Ritzhaupt, 2017; Ritzhaupt & Kumar, 2015).

Change Management and Leadership

Instructional designers in higher education are uniquely positioned to facilitate educational innovations and transformations that involve changes at all levels in teaching and learning in classrooms and online, faculty development, departments and colleges, and in an institutional level. The ability to implement, manage, and lead change is necessary to the successful performance of their role (Anderson et. al, 2019; Kline, et. al, 2020; Schwier, & Wilson, 2010). An analysis of job posts revealed that expertise in general leadership and management was among the three top desired competencies that occurred frequently among leaders of instructional design (Chongwony et. al, 2020).

Gaining the Competencies and Experiences for the Role

This section provides a brief overview of how individuals interested in the profession of instructional design in higher education can gain the necessary competencies and experiences to serve in this role. Additionally, we review the role of professional associations in supporting the professional networking, leadership, and career development needs of emerging instructional designers in higher education.

Academic Preparation

While the traditional route to become an instructional designer is the completion of a graduate degree in the field, there are other avenues to gain the academic preparation necessary to effectively serve in this capacity. As previously noted, many of the instructional designers have extensive teaching experiences in either higher education or K-12 and use these experiences to inform their approach to the craft. In addition to the typical graduate degree, many academic institutions also offer graduate certificate programs with select coursework to prepare instructional designers. These programs require fewer academic credits to earn the credential and skills and knowledge to begin in this domain. We also note that several professional associations offer certification and professional development programs and some existing educational platforms such as Coursera or LinkedIn Learning offer lower cost options.

Connecting to Professional Associations

Instructional designers in higher education have several choices for a professional association to nurture their professional networking, leadership, and career development needs (Ritzhaupt et al., 2020). These professional associations provide a wide range of services including:

1. Professional networking services

2. Growth and advocacy services

3. Professional communication services

4. Ancillary discount services

5. Leadership and mentoring services

6. Relevant literature services

7. Training and credentialing services

8. Vendor and continuing education services (Ritzhaupt et al., 2020).

Table 1 provides a list of some of the major professional associations available within the field. Emerging instructional designers are encouraged to select one or more professional associations that match their needs and career goals.

Table 1

Professional associations related to the field of instructional design

Professional Association Name
Association for Talent Development
Association for the Advancement of Computing in Education
Association for Educational Communications and Technology
EDUCAUSE
International Society for Performance Improvement

International Society for Technology in Education
Online Learning Consortium
Learning Guild
United States Distance Learning Association

Aligning Professional Experiences

A common problem across many professions is gaining the professional experiences to enter the market as a competitive job applicant. One common practice in instructional design degree programs is to encourage students to develop an e-portfolio to document their projects and experiences. Additionally, these degree programs will often provide authentic learning opportunities where students can work on real-world projects. There are also service opportunities within professional associations in which students can work on collaborative, real-world projects for service learning opportunities. The key is that emerging instructional designers must be intentional about both gaining real-world professional experiences and documenting these experiences to showcase to potential employers. As is true in many professions, an academic degree alone is often insufficient to secure employment opportunities.

Improving Competencies on the Job

Despite the academic and certificate programs that prepare instructional designers and professional networks that provide professional development opportunities, instructional designers can find it difficult to apply what they have learned when they begin a job, given the complexity of instructional design projects and the diverse stakeholders involved (Stefaniak, 2017). Research on novice and expert instructional designers illustrates ways in which instructional designers can improve and develop their competencies on the job (Hoard et al., 2019; Lowell, & Ashby, 2018). Professional development models that practice cognitive apprenticeship on the job, such as the Development of Instructional Designers Apprenticeship (DIDA) model also highlight the value of coaching and reflection for the competency development of instructional designers (Mancilla, & Frey, 2020).

Closing Remarks

Working as an instructional designer in higher education provides many growth opportunities and non-pecuniary benefits beyond just a competitive salary. For instance, a professional instructional designer would benefit from the rich-learning environment at an institution of higher education and resources (e.g., academic library) available. Listed as number 38 out of 100 in CNN Best Jobs in America in 2012 (CNN Best Jobs, 2012), instructional designers are increasingly becoming a mission-critical resource to institutions of higher education. We hope this chapter provides a snapshot of the many competencies and roles required by these professionals to better prepare academic and professional experiences to align to the work of an instructional designer in higher education.

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Curriculum Design Processes

Bucky J. Dodd

Whether you realize it or not, we experience curriculum every single day. Curriculum influences the most obvious learning situations like classroom lessons and workplace training sessions, but it also influences a variety of less-obvious situations such as how we learn about products, how we learn from online tutorials (yes, to an extent this applies to using YouTube to fix a leaky faucet!), and how organizations plan large-scale change efforts. Curriculum influences how people learn and grow from very young ages and continues to shape learning experiences throughout our lives.

The purpose of this chapter is to provide a survey of curriculum design processes across diverse educational and professional contexts and to highlight essential curriculum design skills embedded in these processes. Curriculum design is a core pillar of how we educate, train, and engage in formal learning experiences. At the core of curriculum design is a mental model for how people learn and a design representation for how knowledge and skill transfer occurs from theory into practice.

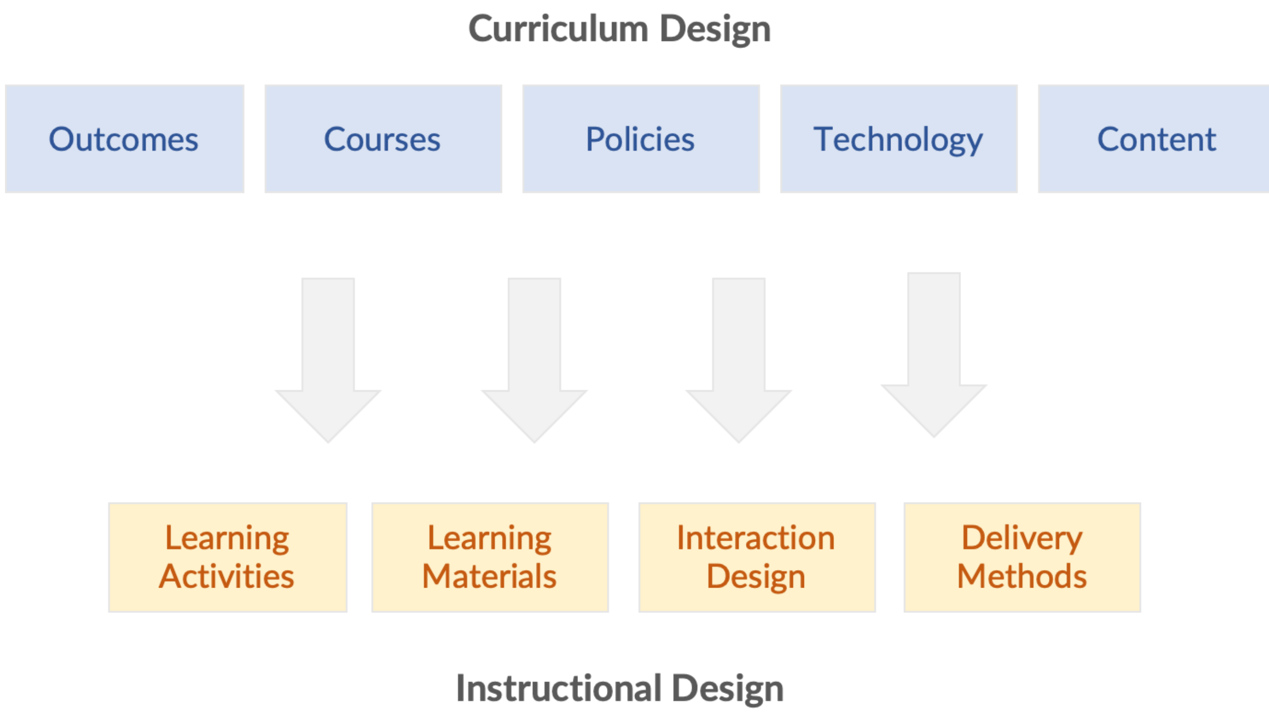
For emerging professionals in the instructional design field, curriculum design is one of a series of core competencies that are necessary for professional success (Burning Glass, 2019). In the most basic of terms, curriculum design is the process of planning formal learning experiences. Yet, there are many tacit criteria that differentiate between effective and ineffective curriculum design processes. For the purposes of this chapter, we will examine curriculum design as a strategic-level process for how learning experiences are designed. This differentiates from instructional design processes, which tend to involve more operational-level processes. For example, you can differentiate curriculum design from instructional design as curriculum design is more "big picture thinking" while instructional design is concerned with more tactical decisions within instructional materials and interactions.

Defining Curriculum Design

Curriculum design is operationally defined for this chapter as the intentional planning, organization, and design of learning strategies, processes, materials, and experiences towards defined learning and/or performance outcomes. Curriculum design is concerned with much more than learning materials. In one sense, curriculum design is creating a holistic plan for the environments where learning happens. This includes considering the physical, digital, social, and psychological factors that define the spaces and places where people learn (American Educational Research Association, n.d.).

Figure 1

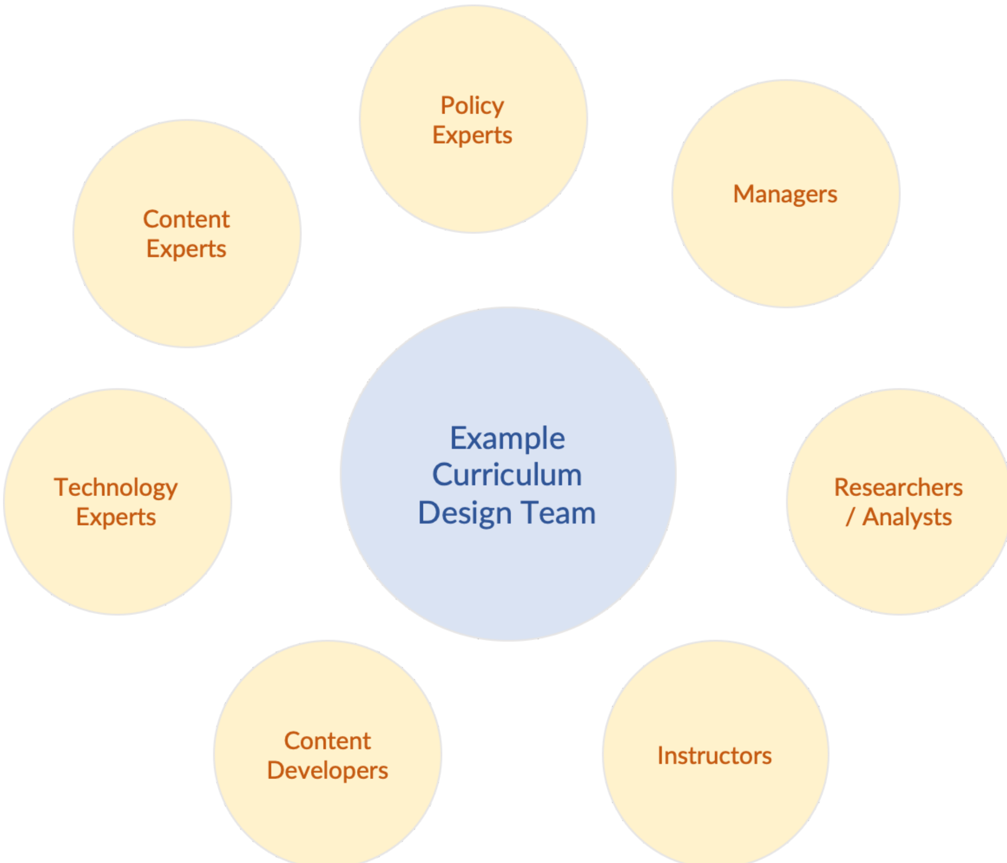
Diagram Illustrating Elements of Curriculum Design vs. Instructional Design



Curriculum design is a team sport. The teams who engage in curriculum design processes are comprised of people with diverse areas of expertise. Typically, a curriculum design team will include subject matter experts (e.g. faculty member), curriculum coordinator/director, curriculum oversight groups, instructional design and development specialists, and teaching/facilitation personnel. Depending on the nature of the curriculum, this can also include information technology specialists, organizational development specialists, data and research specialists, and senior leadership.

Figure 2

Diagram Illustrating an Example Curriculum Design Team



Curriculum design, when done well, is a process that is collaborative, results-oriented and transforms diverse ideas into a focused vision for learning.

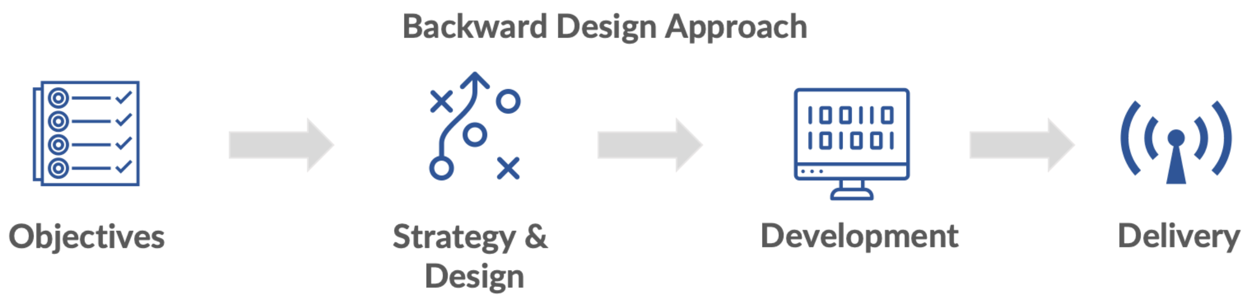
Designing Curriculum with the End in Mind

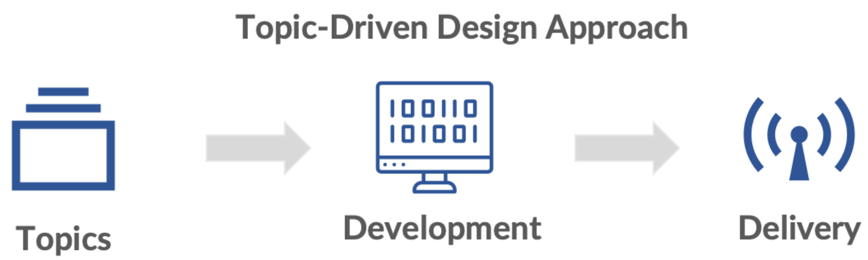
The primary goal of curriculum design is aligning learning strategies, materials, and experiences to defined outcomes. From this standpoint, good curriculum should be results-focused and efficient. To accomplish this, curriculum designers often use tools such as learner personas, needs analysis, and existing assessment data to determine the scope of a project. From there, it becomes important to develop learning strategies that connect to the characteristics of the intended learners to help them reach the desired outcomes.

Designing curriculum with the end in mind involves managing, designing, and organizing learning objectives, competencies, and standards within a curriculum. The process of designing curriculum with the end in mind is commonly referred to as "backward design" (Wiggins & McTighe, 1998). The major concept important to curriculum designers is that instead of starting with content or topics (common historical practice by many educators), backward design starts with the outcomes and then works backwards to address the content, topics, strategies, and materials.

Figure 3

Diagram Comparing Design Approaches

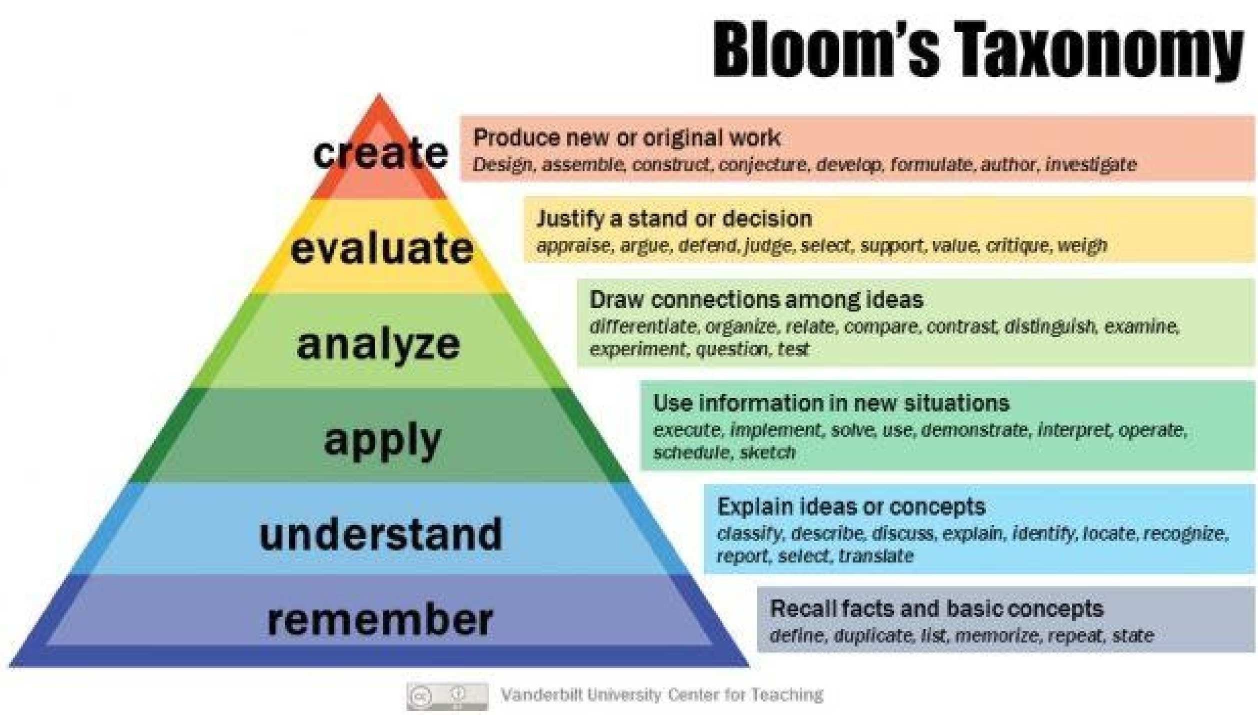




One of the key tools important to backward design is the use of learning objectives taxonomies. One of the most widely used of these taxonomies is Bloom's Taxonomy (Bloom, 1956). Bloom's Taxonomy organizes learning objectives based on a "level of learning." The revised version classifies these as: remember, understand, apply, analyze, evaluate, and create. These levels describe cognitive learning processes that are demonstrated through various forms of behaviors.

Figure 4

Bloom's Taxonomy (Source: https://edtechbooks.org/-dpW)



Taxonomies like Bloom's provide a framework for organizing types of learning outcomes and selecting appropriate curriculum strategies for a specific level of learning. For example, a learning objective at the understand level will likely be designed far differently than an objective at the evaluate or create levels. This not only influences the types of strategies used, but also the alignment of curriculum elements and appropriate level of learner (i.e. novice, intermediate, advanced).

Standards and competency frameworks are common resources curriculum designers use in the process of conducting their work. These frameworks vary across countries and disciplines; however, they often serve a common purpose of aligning curriculum to common outcomes and learning/performance goals (e.g. Common Core Standards, Talent Develop Capability Model).

Representing and Mapping Curriculum

Curriculum design can be a complex process that includes many different forms of data, information, and goals. On a practical level, curriculum designers often use forms of representations or diagrams to help manage the complexity and decision-making processes. Curriculum representations provide a method for communicating and collaborating with others during the curriculum design process. This often includes representing plans for how curriculum will be organized and made available to the learner.

When mapping curriculum, there are several major and interdependent variables of curriculum that can be important to visualize. These variables are referred to as design "layers" (Gibbons, 2014). While there can be many different aspects important to represent in curriculum design processes, the following list outlines major considerations, or design variables.

- Outcomes—the intended learning or performance result from the curriculum
- Content—the topics or information included in the curriculum
- Instructional Strategies—how the curriculum is organized, structured, and/or presented to achieve a defined result
- Technology—the digital or analog tools used to support the curriculum delivery, development, or assessment
- Data—how metrics and data elements are captured, organized, stored, and represented
- Media—the physical or digital assets used to present curriculum to the learner
- Policy—the guiding principles, rules, or regulations that frame the design of the curriculum

These "layers" represent the essential variables that effective curriculum designers consider when working on curriculum projects and initiatives. Each of these layers are interdependent and should be considered in concert with one another and not independently. For example, both outcomes and content should align to ensure the content being presented supports learners as they work towards achieving specified learning outcomes.

In the process of designing curriculum layers, curriculum designers often use representation tools and methods to organize ideas and communicate this information to stakeholders. While there are many different approaches to representing curriculum, the following list highlights common frameworks used in the curriculum design field.

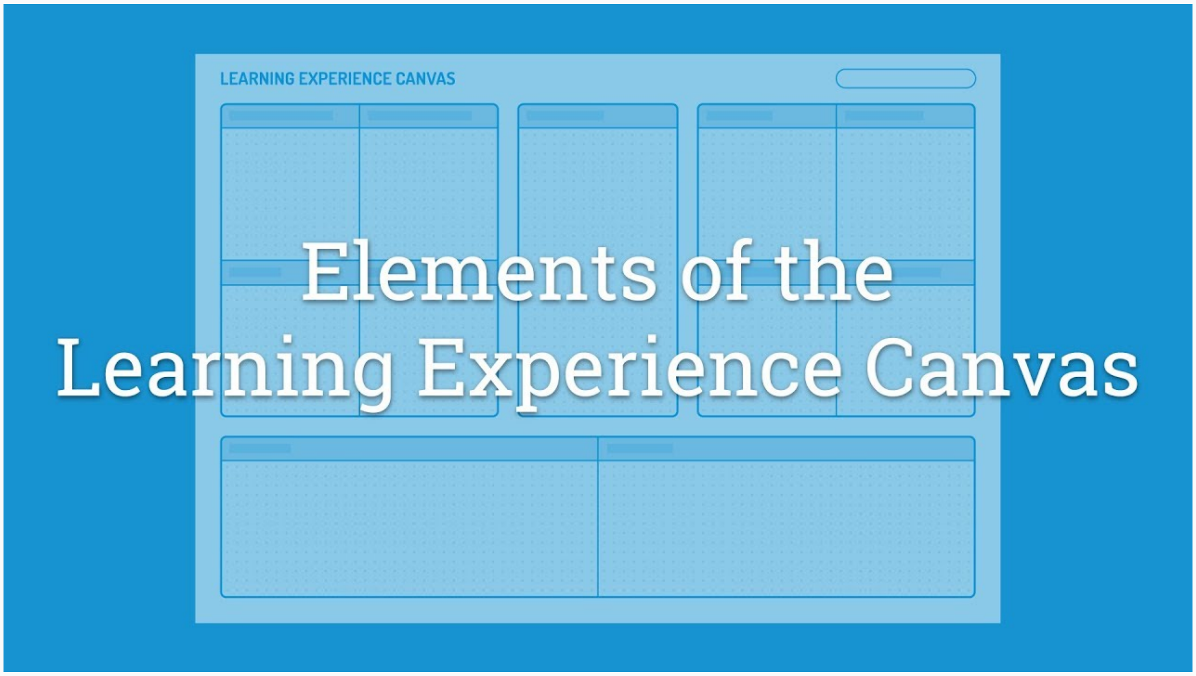
- "The Canvas." Canvas tools are analog or digital documents that organize various elements of curriculum design decisions in a single visual field. The purpose of curriculum canvas documents is to provide a structured way of organizing ideas at a conceptual level and establishing a common vision for the curriculum. Canvas tools are often used to support collaboration and brainstorming processes; however, they can also be used as a way to organize individual ideas and communicate those to others in structured ways.

Figure 5

Conceptual illustration of a Canvas Curriculum Planning Tool

Visit http://www.lxcanvas.com/ for an example of a canvas-based curriculum design tool. The following video explains the elements of the Learning Experience Canvas.

Elements of the Learning Experience Canvas



Watch on YouTube

- "The Lesson Plan." Lesson plans are one of the most common forms of curriculum representations across various education and training contexts. There are many, many different formats and approaches to creating curriculum lesson plans. These can range from simple outlines, to structured documents that represent many elements of curriculum including learning outcomes, instructional sequence, facilitator prompts, time markers, and teaching notes. How a lesson plan should be created is largely dependent on the intended uses and audiences for the documents.

Figure 6

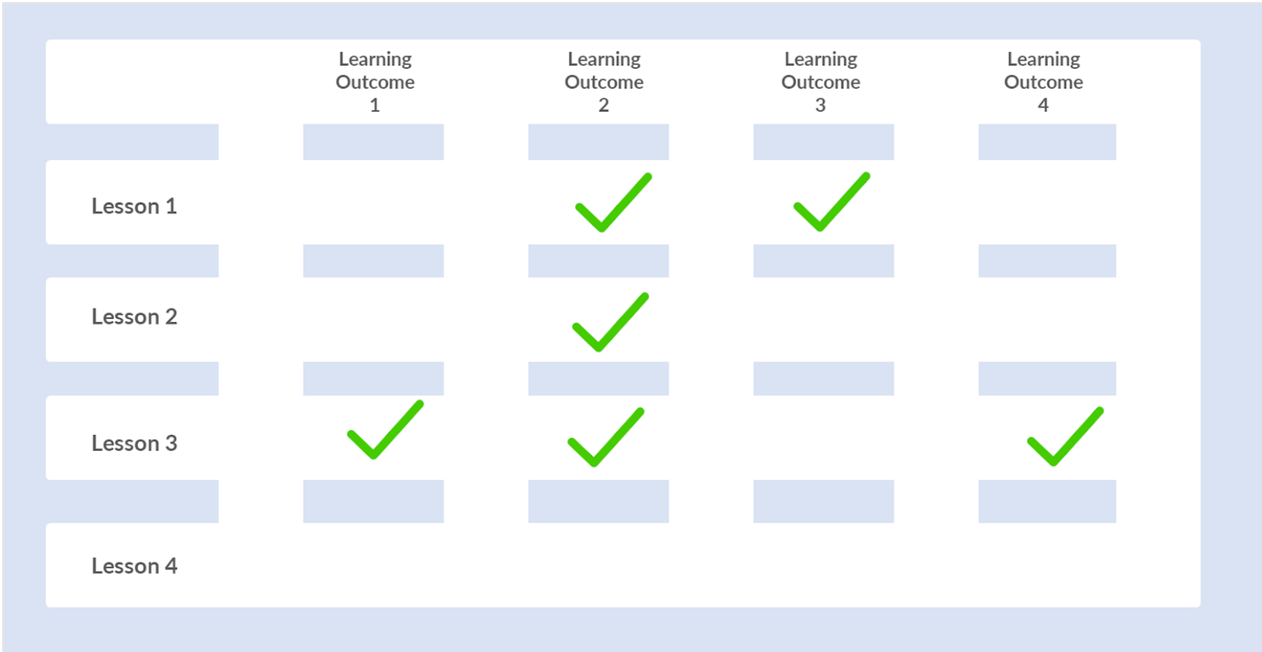
Conceptual Illustration of a Lesson Plan

Visit https://edtechbooks.org/-TTeu for example lesson plan formats.

- "The Curriculum Matrix." Curriculum matrices are documents that represent relationships and alignment between key variables in the curriculum. This representation is often presented as crosstabulation tables that have one variable across the top row and another down the left column. Next, relationship indicators are placed in the interesting cells to show a relationship between the two variable elements. A curriculum matrix representation is commonly used to show how learning outcomes are represented across courses or units in the curriculum.

Figure 7

Conceptual Illustration of a Curriculum Matrix

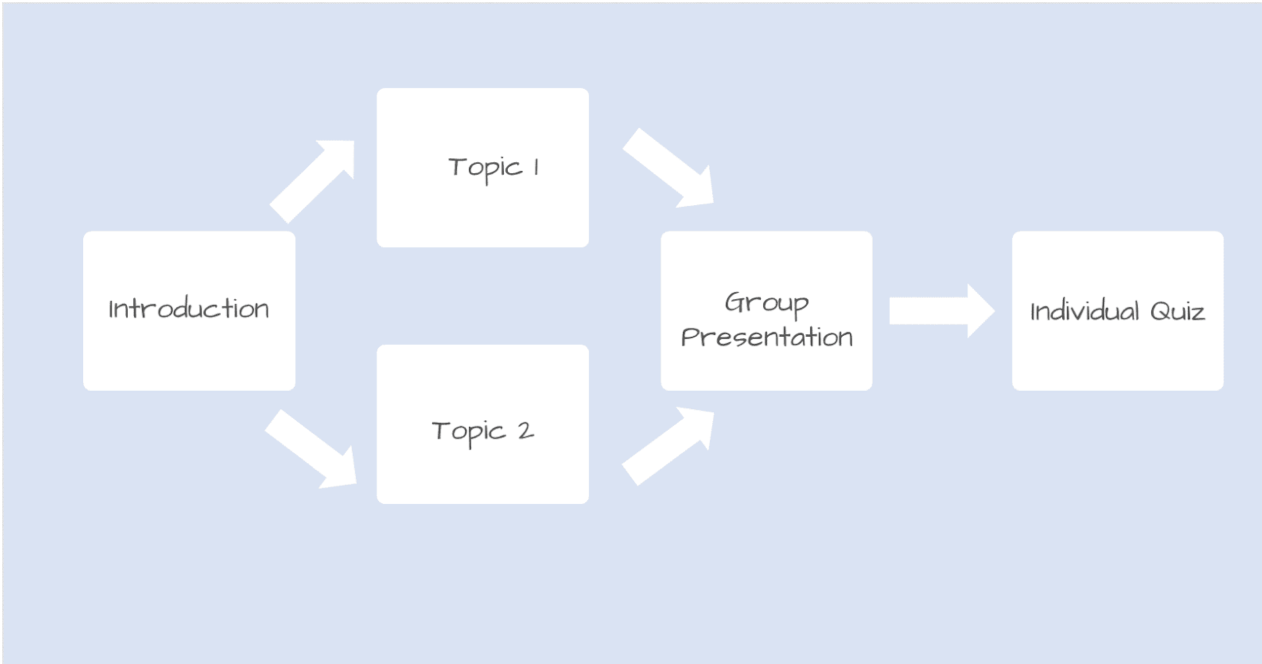


Visit https://edtechbooks.org/-Jewdb for an example curriculum matrix.

- “The Blueprint.” Blueprint-style curriculum representations integrate a number of design variables in a single diagram, or “blueprint.” The primary purpose of this type of representation is to create documentation that can be used to develop and implement curriculum. Blueprint representations often contain instructional elements organized in segments and sequences as well as production notes to guide how the curriculum should be developed and/or implemented. They often also represent relationships between the various curriculum elements. For example, a blueprint may note that a learner must complete a certain set of exercises successfully at a given mastery level before progressing to the next set of exercises. The blueprint represents the curriculum design strategy in an actionable format.

Figure 8

Conceptual Illustration of a Blueprint Curriculum Diagram



Visit https://edtechbooks.org/-LyV for an example curriculum blueprint.

Comparing and Selecting Curriculum Mapping Tools

Selecting the most appropriate curriculum mapping method is often determined based on the current phase and goals of the curriculum design process. The following table compares the curriculum mapping tools discussed in this chapter and presents selection considerations.

Table 1

Comparison of Curriculum Mapping Tools

	Canvas	Lesson Plan	Matrix	Blueprint
Uses	Use early in the design process for brainstorming and ideation	Use to plan and facilitate specific lessons	Use to align curriculum to outcomes Use for assessment of learning outcomes	Use to plan the sequence and arrangement of curriculum
Pros	Encourage group collaboration and interaction	Common format for many professionals in education and training	Clearly shows alignment between curriculum and outcomes	Visually shows curriculum elements, flows, and sequence.
Cons	Can lack specifics needed to implement curriculum	Some may see lesson plan as limiting creativity or adaptability of curriculum	Some matrix documents can be very complex which may limit their application in practice	Blueprints can be visually complex and unfamiliar for some audiences.

Learning Environment Modeling™—A Method for Creating Curriculum Blueprints

A particularly critical challenge faced by many curriculum designers is the lack of a generally accepted design language and system in the field (Gibbons, 2014). For example, many design professions have a language to represent their work so that the audience versed in the language can easily understand and build from their work. Architects, engineers, and software programmers are all examples of professionals that use design languages to communicate ideas.

Learning Environment Modeling™ was created to advance a solution to the absence of a shared design language for curriculum and instructional design. At the core of Learning Environment Modeling™ is a language that represents five "building blocks" of curriculum, four learning contexts, three transitional actions, and two standard notations. These language elements are combined together in a blueprint that shows how the curriculum is to be organized and implemented.

Visit https://edtechbooks.org/-rqn to learn more about Learning Environment Modeling™ and how it can be used to design curriculum.

Over the previous several years, a number of digital platforms have become available on the market to manage curriculum design processes. While these platforms vary in strategy, most seek to increase efficiency and provide a common digital hub for managing information and communication about curriculum processes. These platforms are currently distinct from content authoring tools used for creating materials, in that they focus solely on the curriculum organization and design, rather than content development and delivery. In addition to standalone curriculum design platforms, many learning management systems are incorporating similar features as part of their capabilities.

Examples of Curriculum Design Platforms

- Coursetune
- eLumens
- Synapes

Examples of Learning Management Systems with Integrated Curriculum Design Capabilities

- Moodle
- Canvas
- Brightspace by D2L
- Blackboard

Innovation Considerations for Curriculum Design Processes

As innovations in learning design and technology are created and scaled, curriculum design processes must adapt to ensure these methods remain grounded in effective learning practices. This section discusses several innovation trends and their possible implications on curriculum design processes.

One of the foundational innovations influencing curriculum design processes is a shift from individual-focused design to team-based curriculum design. Curriculum design is becoming more and more a "team sport" where people from diverse backgrounds, professions, and areas of expertise work together to create curriculum. The increasing influence of technology continues to not only incorporate new backgrounds (e.g. technologists), but also allows people from all around the world to collaborate on curriculum more efficiently. Successful curriculum design professionals are master facilitators across different types of contexts and through the effective use of collaborative technologies.

In addition to curriculum design becoming more collaborative, it is also becoming a more strategic and holistic activity. Traditionally curriculum was viewed like a product that was self-contained and independent. As such, curriculum design processes mirrored product development cycles and approaches. As organizations, learning needs, and technologies change, curriculum design is moving more towards a holistic perspective of learning environment design. This mindset goes beyond curriculum as a product, and more about designing the collective spaces and places where people learn at a strategic level. While this may seem like semantics at first, the implications for how curriculum is designed and connected with other elements in a learning environment is profound.

Moving from curriculum design to learning environment design requires a systems thinking perspective that involves not only designing elements in the learning environment, but also designing how those elements interact together. A good example of this is the emergence of blended learning as a common instructional practice. Blended learning is the combination of classroom and digital learning experience in a unified strategy. Curriculum designers must not only be considered with the design of classroom curriculum and digital curriculum, but also how they interact together in a unified learning environment.

The broad adoption of mobile devices have also caused innovations in curriculum design. For example, designing curriculum that is responsive across different types of devices with different screen sizes is a basic innovation influencing the field. In addition, designing curriculum for other mobile device features such as geo-positioning, imaging, and content creation capabilities offer exciting and often challenging situations. Many modern mobile devices now have immersive virtual space capabilities such as virtual reality and augmented reality. These capabilities highlight the need for new curriculum design approaches that have not traditionally been required. Mobile and extended reality learning capabilities will continue to be a major consideration for tomorrow's curriculum designers.

In addition to collaborative design processes, mobile learning, and extended reality innovations, one of the more profound innovations influencing curriculum design processes is adaptive learning. Adaptive learning is a general concept that describes the process of providing learners with dynamic learning experiences based on their prior performance (Educause, 2017). This is commonly used for recommending remediated learning experiences and encouraging peak learning performance. The reason adaptive learning is such a profound innovation for curriculum design processes is because it introduces the dynamic layers that have not traditionally been used. For example, a curriculum designer would create a defined path for learners to follow based on assumptions and requirements set forth in the design process. Adaptive learning shifts this decision making to programmatic algorithms or a more complex map of learning experience options. This requires curriculum designers to think and make design decisions about much more complex and dynamic learning environments.

Conclusion

Curriculum design processes are essential to effective learning experiences across education and professional contexts. Without effective curriculum design processes, learners often lack the structure and guidance necessary for optimal learning and organizations lack the ability to effectively measure results and optimize their return on investments. While we have all experienced curriculum, the process of designing curriculum is changing, becoming more complex, and incorporating new technologies and strategies. One of the most profound shifts is expanding the scope of curriculum design to consider how curriculum connects to broader and more networked learning environments. Curriculum design is an essential skill for emerging education and learning professionals and will continue to be a dynamic, innovative, and exciting field of practice for years to come.

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Five critical questions you need to ask yourself before you design a learning experience

Niels Floor

Module 3: Empathy and Personas

Module 2 readings are provided in this section.

Building Empathy and Developing Instructional Design Experience and Skills

A Case Study of Using Personas to Design Open Education Resources

John Baaki & Jennifer Maddrell

Grown-ups love figures. When you tell them that you have made a new friend, they never ask you any questions about essential matters. They never say to you, “What does his voice sound like? What game does he love best? Does he collect butterflies?” Instead, they demand: “How old is he? How many brothers has he? How much does he weigh? How much money does his father make?” Only from these figures do they think they have learned anything about him. (de Saint-Exupéry, 1943, p. 17-18)

Introduction

De Saint-Exupéry (1943) captures the essence of what matters when we learn and make meaning about a new friend or a companion, a colleague, or someone we may meet on a city street. Learning about and relating to a new friend is not about figures (e.g., “How old is he?”), but rather about finding out why a new friend loves collecting butterflies or what game he loves best. Learning about a new friend means we are able to make meaning of his or her thoughts and feelings. We put ourselves in his or her shoes.

This case study involves our participation and observation of an 18-week Designers for Learning 2016 course on *Canvas Network*, a massive open online course (MOOC) platform. Designers for Learning was a nonprofit organization that had a twofold charitable purpose. First, Designers for Learning provided instructional design support to underserved social needs and a mission to provide educational resources and service-learning experiences designed to promote all aspects of literacy. Second, Designers for Learning provided opportunities for instructional designers to gain design experience. Our goal was to study designers who developed open education resources (OER) for adults attempting to pass a high school equivalency exam. To guide the designers, we developed an empathic design process driven by six authentic personas that represented adult learners. Designers followed an empathic design process and received feedback from adult basic education subject matter experts. Empathy is the intuitive ability to identify with other people’s thoughts and feelings (Kouprie & Visser, 2009). A persona is generally written in a narrative and describes a day in the life of a fictional individual who represents a key user group (Dotan et al., 2009). Kouprie and Visser (2009) summarize an empathic design approach as a deep understanding of the user’s circumstances and experiences which involves “relating to,” more than just “knowing about” the user (p. 441).

Because personas are qualitative instruments used in design processes and contextually describe people in specific situations, Vestergaard, Hauge, and Hansen (2016) call for rigorous published evaluations that are best achieved through case descriptions. Chapman and Milham (2006) note that rigorous published evaluations are important for the advancement of persona use. We offer a single, intrinsic case study on the design of OER and examine how designers constructed, authenticated, and used personas to relate to adult learners. We begin by providing an overview of the scholarship that connects empathy, empathic design, persona construction, and meaning-making. After presenting our case study methodology and how we constructed six authentic personas, we then describe how designers used the personas in an empathic design process to develop OER for adults preparing to pass a United States high school equivalency exam. We were guided by two questions: First, how did designers use personas to build empathy for users during the empathic design process? Second, how did designers use personas to develop instructional design skills and experience while developing OER?

Background

As alluded to previously, the term persona is derived from Latin, and its meaning is close to the idea of a mask worn during drama performances and ritual activities (Goh et al., 2017). To understand how designers build a relationship with their audience of focus, we present how empathy and empathic design, persona construction, and meaning-making are interrelated.

Empathy and Empathic Design

Kouprie and Visser (2009) describe empathy, specifically for design, as an intuitive ability to relate with other people's thoughts and feelings. Empathic design encourages a designer to get closer to the lives and experiences of learners, and ultimately increases the likelihood that the ID's service or product will meet users' needs. Empathy supports a design process as design discovery and exploration informed from rational and practical issues move to design commitment and decisions meeting users' personal experiences and private contexts (Cross, 2011; Mattelmäki & Battarbee, 2002).

In empathic design, designers must be willing to personally engage with users. Accordingly, our study employed a framework developed by Kouprie and Visser (2009) that breaks the design process down into four phases: "discovery," "immersion, "connection," and "detachment." Kouprie and Visser's framework helps IDs develop personal engagement strategies as well as empathy in their design practices. To illustrate, designers probe a users' situations and experiences in the "discovery" phrase. In the "immersion" phase, a designer maintains an open mind and remains nonjudgmental while naming their users and meandering around in the users' world. In the "connection phase," a designer identifies with the users on an emotional level by recalling their own feelings and experiences. Finally, in the "detachment" phase, a designer steps back and takes stock of the users' worlds. This allows a designer to reflect on new ideas and insights to help their users.

Reflecting on new ideas and insights to help users enables designers to bound empathy and creativity together in the design process. Coleman, Lebbon, and Myerson (2003) advocate for empathic design practices that allow designers to discover what makes users tick, thereby allowing designers to also tap into the users' feelings for sources of insight and inspiration. Thus, an empathic approach to design includes, rather than excludes, people. Coleman, Lebbon, and Myerson reflect, "[e]mpathy is the key word, and, when combined with creativity, it holds the promise of more popular and attractive design solutions" (p. 491).

A designer is active during an empathic design approach. Kouprie and Visser (2009) point to three key elements that involve the designer. First, motivation is critical for an effective empathic design process. If designers do not embrace the advantages of empathic design, they can experience unsatisfying results. Second, as designers engage in the four-phase framework of empathy, they are able to experience stepping into and out of users' lives while simultaneously reflecting on these results. Kouprie and Visser contend that the stepping in and stepping out may be a key element of empathic design. Lastly, empathic design requires a structured investment of time. Designers must be committed to the empathic design process by leading the process among others involved in the design.

Persona Construction

Again, empathic design is an attempt to get closer to the lives and experiences of users, so personas are a way to drive the design process (Cooper, 1999; Miaskiewicz & Kozar, 2011). In an authentic, engaging, and practical way, personas communicate a key user group's goals, behavior, and what the users want to accomplish. Personas are memorable representations that are conspicuous in a designer's mind throughout the design process (Pruitt & Adlin, 2010). Additionally, personas are helpful because they are constraining by determining who is and is not the audience of focus. Miaskiewicz and Kozar (2011) used a Delphi methodology to examine the benefits of incorporating personas into a design process. Design experts agreed on five design process areas that would most significantly benefit from persona use: (a) audience focus, (b) product requirement prioritization, (c) audience prioritization, (d) the challenging of assumptions, and (e) the prevention of self-referential design (i.e., a way of helping designers realize how the audience is different from the designer).

Understanding end users during the entire design process facilitates the development of empathy because the designer puts himself or herself in the shoes of the users. Persona construction should therefore be an ongoing activity throughout the empathetic design and development process (Nielsen, 2012; van Rooij, 2012). Although a persona is not a statistically significant representation of a group of learners, a persona can be authentic and an engaging tool (Vestergaard et al., 2016). Authenticity can help motivate designers and allow them to remain on a path to design for actual needs. Designers must accordingly construct personas from context and real-life people. This requires validating personas and recognizing that personas are dynamic, thus implying that they also must be revisited and redrafted at regular intervals (Grudin, 2006; Vestergaard et al., 2016). This begs the question, "do personas appear realistic to the people they are supposed to represent?" When personas are not credible and not associated with methodological rigor and data, Pruitt and Adlin (2010) suggest that personas can fail.

Nielsen (2012) suggests that personas' engaging perspective stems from the ability of narrative to foster insight and involvement. Nielsen explains, "[t]he purpose of the engaging perspective is to go from [IDs] seeing the user as a stereotype with whom they are unable to identify and whose life they cannot envision to actively involving themselves in the lives of the personas" (p. 16). In persona construction, the goal is to create empathy, engagement, and identification with users so that IDs understand the users' worlds, allowing them to create effective solutions for those worlds. Stereotyping and categorization work in opposition to that overarching goal and results in the creation of "flat characters," (p. 62). A flat character could be an elderly woman with a cane or a businessman in a navy suit.

An engaging perspective points to complex persona descriptions that draw from screenwriting, fiction writing, and narrative design (Nielsen, 2012). Flat and unrealistic characters are a risky thing in narrative design (Bell, 1997). When discussing narrative as modular design, Bell compares the assembly of a persona's narrative to the work of a mosaicist. The writer assembles fragments of social and cultural contexts to make a more lifelike narrative. This allows the writer to throw off the chronology burden, and, rather, show relationships between events, people, motifs, or themes that are not generated by sequences of cause and effect. When constructing authentic and engaging personas, a ID adopts some of these writer strategies and assembles fragments of user characteristics. A persona must tell a story. As Baxter (1997) notes, "We understand our lives, or try to, by the stories we tell," (p. xii).

Meaning-Making

Personas can often fall flat by failing to engage designers on an emotional level (Hanna & Ashby, 2016). When the story around a persona provides narrative tension and an element of surprise, designers find it easier to talk about users, remember users, and get a shared view of users (Blomquist & Arvola, 2002; Hanna & Ashby, 2016). Gotschall (2012) explains the desire for a personal story as humans evolved to crave a story and the human mind is addicted to meaning.

Bruner (1986) notes that there are two modes of thought--a story mode and an argument-logics-scientific mode. A story must simultaneously construct two landscapes, one of action and one of consciousness. A landscape of consciousness is what those involved in the action know, think, or feel, or conversely, do not know, think, or feel. Bruner (1990) later contends that a central concept of human psychology is meaning as well as the processes and transactions involved in the construction of meanings. Bruner believes that people participate in symbolic systems of culture in which meanings achieve a form that is public and communal rather than private. Bruner concludes that cultural psychology has folk psychology at its base. Folk psychology is narrative in nature rather than logical or categorical. Moreover, folk psychology's (Bruner, 1990) premises characterize human nature in the following ways:

- People believe that the world is organized in certain ways. People want certain things, and some things matter more than others.
- People hold beliefs about the past, present, and future.
- These beliefs should unite and form a whole in some way.
- Lastly, when human beliefs and desires become sufficiently coherent and well organized, they become called "ways of life" (p. 39).

Bruner (1990) contends that people have an innate predisposition to narrative organization. Through the traditions of telling and interpreting in which people come to participate in, people quickly and easily comprehend and use narrative. Bruner sums up the human desire to make meaning by claiming that "[i]n the end, even the strongest causal explanations of the human condition cannot make plausible sense without being interpreted in the light of the symbolic world that constitutes human culture" (p. 138).

Kearney (2002) talks about the double vision of narrative imagination: empathy and detachment. With similarities to Kouprie and Visser's (2009) framework for empathy, one vision enables designers to empathize with the characters in a story who act and suffer, while the other vision provides designers with a certain aesthetic distance from which to view events unfolding. With stories, designers know what it is like to be in someone else's head, shoes, or skin. The double attitude of empathy and detachment means designers are distanced, and designers are involved in the action to feel that both matter.

Nielsen (2012) connects ideas around meaning-making and narrative when discussing the engaging perspective of personas. Persona descriptions balance data and knowledge about real applications and fictitious information that is intended to create empathy. Nielsen explains that people understand their experiences, the social world that surrounds their experiences, and see their ways of life as meaningful stories organized as narratives. The power of stories allows one to peek into another person's mind and vision, as a participant rather than an observer (Baker, 2016). Therefore, a participatory peek into a day in the life of users offers an opportunity for designers to empathize with their users and design to ensure that the users' needs are met.

Methodology

In this section, we first describe how we constructed the six personas to ensure that the personas were authentic and engaging. We then present how we introduced the personas and Merrill's (2002) First Principles of Instruction to the IDs who designed OER lessons. Finally, we describe our observations of designers using personas to design and develop OER.

Constructing the Personas

We worked through multiple rounds of design to ensure that the six personas we created—named "Crystalle," "Geoff," "Jamie Ann," "Malcolm," "Mary," and "Robert"—represented adults who were planning to take a high school equivalency exam. To construct and validate six authentic personas, we reviewed personas that had been developed for a Designers for Learning project in 2015, scrutinized the results of a subject matter expert (SME) survey, researched adults preparing for a high school equivalency exam, recruited adult basic education (ABE) SMEs to review early drafts, and examined the persona and fiction literature.

In a previous Designers for Learning project, a designer who was familiar with persona construction and an ABE SME had developed four personas who represented adults who had a desire to complete their general educational development degree. These four personas (Crystalle, Geoff, Jamie Ann, and Geoff) provided a starting point in constructing the six authentic personas.

Sme Survey Results and Feedback

In preparation for the MOOC development, the second author conducted an online survey. Completed by 18 ABE SMEs, the survey data helped place us in the shoes of our study population—the adult preparing for the high school equivalency exam. For example, respondents noted that rural areas have little ABE resources and are desperately seeking resources that support instructors and learners. For some reason, underserved ABE students have been unsuccessful in traditional school, and therefore, OER designers should avoid a traditional school approach. The SME feedback illustrated that ABE contexts vary including desperately underserved groups: incarcerated students and adults from rural areas.

After reviewing the SME survey results, the first author became interested in incarcerated ABE students and students from rural areas. We changed Geoff to represent an adult learner from a rural area. Of the original four personas, there was no persona representing an incarcerated learner. The first author found a newspaper article regarding an ABE program at a Texas (USA) County Jail which inspired the construction of Robert (a fifth persona) who was a learner in the Corner Bend County Jail (Figure 1).

Figure 1

Robert Represented an Adult Learner Who Was Incarcerated in a County Jail

Meet Robert

Robert's Story

Robert just celebrated his 32nd birthday as he waits for his trial in the Corner Bend County Jail. He admits that jail is not as depressing as it used to be. He knows, as he has seen a few. The Corner Bend County Jail launched a new program this year where Robert can take classes to prepare for the General Educational Development (GED) test. In fact, the second set of students in the 4-month-long program will graduate this week.

Robert looks forward to the classes. He thinks it will help him get out of jail and put his mind into something different. It is a cool program because it is at a jail. He has heard about GED programs in prisons, but not in county jails. He is lucky that Corner Bend County has a program. Since he is waiting for trial instead of serving out a sentence, he knows it is hard to keep a GED program going in a county jail. Guys are coming and going all the time.

For Robert the toughest part of jail is that he gets depressed and worries a lot. He is not convicted on anything yet, but he worries about his family. Robert's mom is in poor health with diabetes and high blood pressure. His dad's health is not too good either. His younger sister just got out of college and lives across state. So, mom and dad are alone. He has a big problem making fast money. He has a lot of dope cases, a gun case, and an aggravated case. He did not have much of a childhood. He can remember getting his first car early in his junior year of high school. Once Robert got his car, he stopped going to school.

Robert is pretty smart. He even sometimes corrects the teacher. He has a good mind for fractions and percentages. He also started writing a book of short stories. He always liked reading and making up people who have had hard times and then succeed. His favorite part of class is going up to the white board to work out a problem. It can be tough being at the white board. When the answer comes to him, he just breathes a big sigh of relief. He just feels so proud. He doesn't want to sit back down. When the teacher tells Robert to take his seat, he just wants to stay up there and work out another problem.

Robert hopes that a GED will be the first step to something better when he finally gets out. Robert stays in his cell. He doesn't deal with people. He comes out, talks a little bit, watches TV and then goes back to his cell and starts studying or works on a short story. He tries to stay so focused.

In the classroom, Robert sits behind a computer. His computer skills are improving. He wishes he had access to the Internet, but he gets why he doesn't. Robert thinks that he is a pretty good student. He wants to learn. It is his first uninterrupted shot at high school in a real long time.

Robert doesn't want to be a statistic. The class helps keep him straight. If you steal, fight, or cause problems, you get expelled. Robert knows one of the teachers has a friend who works with Goodwill Industries. He can help him get a job across the city once he is released.

When he looks around the classroom, he sees a lot of guys who haven't had success in their life for whatever reason. A GED certificate is something that he can hold in his hand that shows he has had success. There's nothing like success.

During an online design conference, we introduced five personas to four ABE SMEs. Enthusiastic and supportive of the personas, the SMEs provided invaluable, detailed, and constructive feedback that helped us construct the final authentic personas. The SMES recommended that we create personas exhibiting the following ABE characteristics: (a) a student who has a discrepancy in abilities between reading and math; (b) a student who hated school, dropped out, and now realizes it was a mistake; (c) a student who has a high school diploma based on social promotion and not academic mastery; and (d) an 18 to 22-year-old student whose schooling was interrupted because her family migrated to the United States to find work in harvesting crops. This final student also has low levels of English language proficiency or may be illiterate. To this need, Mary (Figure 2) became the sixth and final persona. The other SME feedback was threaded into the existing five persona narratives. For example, we described that Geoff (Figure 3) was tested at a sixth grade reading level and a 10th-grade math level. This fit well with Geoff's already described challenges in needing more time to understand things that he reads.

Figure 2

Mary Has Experienced Interrupted Schooling Because Her Family Has Migrated to the United States to Find Work in Harvesting Crops

Meet Mary

Mary's Story

Mary is 19 years old. When Mary was 12, she and her family migrated to the Unites States from Mexico. Her mother, father, and older brother found work harvesting crops throughout the west and southwest in California, Arizona, New Mexico, and Colorado. Once Mary was old enough, she also began working in the fields. The family has always been mobile, moving, seasonally, to where the work is.

Although Mary regularly attended school in Mexico, in the U.S. her schooling has been interrupted at best, and non-existence at worst. Moving from place to place made attending school regularly difficult and finishing high school impossible. Finally, after 7+ years, it appears that the family will have an opportunity to settle down in one place.

Mary is a bright and talented woman. She is very artistic, often sketching the landscapes she has experienced on her many travels. Mary would like to drastically improve her English, get a driver's license, and find a job where she can use her artistic talents. Witnessing firsthand her parent's health issues, she wants healthcare. Mary sees preparing for and completing her General Educational Development (GED) certification as an opportunity to reach her immediate goals.

Mary is eager to learn, and she loves to read history and short stories and write poetry. However, as of right now, she is unable to meet high school requirements for lack of proficiency in math, technology, and English. Mary needs to develop proficiency in conversational English, as well as academic literacy in reading and writing. Mary is between illiterate to low level on the English language proficiency scale. Her poor academic skills are a direct result of her interrupted schooling.

Figure 3

Geoff Was Tested at a Sixth-Grade Reading Level and a 10th-Grade Math Level

Meet Geoff

Geoff's Story

Geoff is 51 years old. He grew up in a rural Nebraska community and was a quiet boy who was good with machinery, really good in math, but not very good in school subjects requiring a lot of reading. With five brothers and sisters, he was overlooked a bit. He sort of drifted away from school starting at about sixth grade. He vaguely remembers the teachers and principal were unhappy about this and maybe spoke to his parents a couple times. It did not matter. He hardly went to classes anyway and failed a couple grades before getting old enough that he could quit going completely. He had been happy to stop, because he found reading-based subjects very difficult and it did not seem to relate to real stuff. Geoff's parents had not minded because he moped when he had to go to school. His down moods could get bad enough to be noticed, and it worried his mom and dad. Everyone needed to pitch in and it was better for Geoff to be up and around so that he could help with things.

When Geoff was a young man, he liked spending time all over the county where everyone recognized him as a fix-it man and appreciated his ability to keep farm equipment, cars, and trucks running well. He could put up a pole barn faster and sturdier than most guys. He just generally helped anyone with anything they needed. He did a good job at it. He was not a planner or an organized record-keeper though. He got, and lost, a job at the local hardware store. Although Geoff was dependable and good natured, he was a little too quiet to be an effective salesman; more importantly, he could not keep track of inventory or handle receiving deliveries quickly and correctly. There was too much paperwork. After that, he went back to odd jobs – some of them paid pretty well because of his self-taught skills.

At 24, Geoff moved to a city nearby where he found a job as a mechanic at a truck stop. He met and moved into an apartment with Aileen, who was a waitress there. Aileen got bored with Geoff, left him, and went away with one of the independent truck drivers.

When Aileen left, Geoff sank into a depression. Without her income to help pay for the apartment, he had to move to a cheap rooming house. Soon afterward, he was injured when he was changing a tire for a friend's tow truck. The jack broke, catching his right arm and hand under the truck wheel crushing his forearm and nearly cutting off his hand. Since the accident was not on the job, Geoff was not covered by worker's compensation. To make matters worse, the injury did not heal properly, leaving him with a nearly useless hand for mechanical jobs. He had a lot of medical bills he could not pay, lost the room he was renting, and lost out on public benefits he might have received because he was too depressed to find out about them or apply for them. Geoff is ashamed of it now. He became addicted to the pain killers prescribed after his injury. He lived on the streets for a number of years picking up odd jobs for a dollar here or there and drifting from one soup kitchen to another. When he could pay for pain killers he did. A number of times, though, Geoff panhandled near the bus stops downtown for enough change to buy coffee, oxy and sometimes enough cheap wine to help him sleep through rainy or cold nights.

Recently, a social worker at one of the shelters connected with Geoff and put him into a program that provides depression counseling, drug counseling, and a place in a residential facility. As his general and mental health have improved, Geoff has reconnected with his parents and a sister and her husband. His brothers have all left the county for jobs elsewhere, but Geoff's parents want him to return home, care for them in their old age, then inherit and run the farm. They know, as he does, that farming is not the same as it used to be. Geoff will have to be able to plan a budget, keep financial records, apply for government programs, make reports to the county using a computer-based system, and keep up with important information from many sources.

As part of the year-long residential program, he has to stay off drugs and alcohol. Plus, he has to take General Educational Development (GED) test preparation courses, take the GED, and apply for jobs. Geoff sees the GED as key to his plan for a meaningful future. He hopes that at 51 he will have more patience for studying now than he did in school. He certainly has a focused goal, but he is also concerned he might not succeed. Geoff was tested at 6th grade reading and at 10th grade math. He thought of himself as a slow reader for so long. He knows he is not dumb, but it takes him time to understand things that he reads.

When he interacts with anyone, he feels that they are waiting impatiently for him to understand, to get what they are saying, and to respond. He has also missed out completely on the computer age, and he is going to have to learn how to use a computer from the beginning. He is pretty sure using a computer is nothing like fixing a tractor or truck. Geoff feels you have to be quick to use computers.

The fact that he has spent many years in depression is also a challenge for him. He does not focus well for long periods. He expects the worst from himself. In spite of this, Geoff is committed to giving the GED test preparation program his best try. The opportunity to go home, hold his head up high, help his parents and be a part of the community is strong motivation for him.

Persona and Fiction Literature

We integrated effective principles (i.e., providing direction that we interpreted, applied, and adapted situationally in context [Patton, 2011]) from the persona and fiction literature in constructing the six personas. For instance, we used third person instead of first person when we wrote our personas' narratives. First person narratives can detract from authenticity as it can be unrealistic for a person to have certain insights about him or herself (Bell, 1997). Guided by the persona literature (Nielsen, 2012; Vestergaard et al., 2016; van Rooij, 2012), we gave each persona a name and had IDs select an image to represent each persona. Neilsen (2012) maintains that images evoke empathy of real people in real situations. Therefore, we described Crystalle, Geoff, Jamie Ann, Malcolm, Mary, and Robert in contexts that said something about their everyday life. IDs then searched for images that showed personas in their situation.

We made every attempt to avoid stereotypes, which affect the authenticity of personas. In constructing personas, we had to be cognizant of inadvertently creating stereotypes as humans naturally stereotype as a way of categorizing conceptions of others (Macrae & Bodenhausen, 2001). We therefore presented the personas in a narrative style, rather than in a bullet-point style, to ensure that we were differentiating and humanizing our personas through their goals, motives, and expectations (Macrae & Bodenhausen, 2001; Turner & Turner, 2011). For example, we explained that Geoff's family expected him to manage the family farm rather than providing a general description of an ABE student in a rural community.

Introducing the Personas

As designers worked through the overview and seven modules of the Designers for Learning course, they first dissected the ABE design scenario to explore key aspects of the opportunity. Designers asked themselves the following questions: What are the needs, goals, and constraints of this situation? Who are the target learners described through six authentic personas? What is the instructional context, and how do the personas fit in that context? We introduced Merrill's First Principles of Instruction (Merrill, 2002) as an instructional design framework that the IDs could follow as they developed the lessons. Designers explained their instructional design solutions with a written design proposal. They then developed a prototype that was subject to a round of formative evaluation from other IDs and adult basic education subject matter experts. As the final deliverable, designers submitted a complete unit of instruction that conformed to the project's guidelines and incorporated all necessary content presentation, learner practice, and assessment materials. Each course module contained materials for review and activities to complete related to the instructional design project. The module activities included individual practice items, reflection, and assignments, as well as conversation prompts for a MOOC discussion forum.

In Module 1, we introduced the six personas. In modules thereafter, we used reflection prompts to ask designers which (if any) of the six personas from Module 1 continued to be their focus as they considered the audience for the OER. In some cases, designers focused on the same personas throughout the design process. In other instances, designers changed personas, added another persona, developed their own persona, and/or did not focus on any persona as they had not thought about the personas since Module 1.

Designers began practicing how to identify with learners' thoughts and feelings in Module 1. Designers used the four-phase empathy framework (Kouprie and Visser, 2009) to discover, immerse, connect, and then detach from Crystalle, Geoff, Jamie Ann, Malcolm, Mary, and Robert. Then, we used a reflection activity to prompt designers to choose a persona that resonated most with them. To that end, it is worth noting that our intention always was to have the designers focus on adult learners and take an empathic design approach. However, we fully understood that the time constraint of Module 1 would not allow designers to construct their own personas. Our solution was to introduce Crystalle, Geoff, Jamie Ann, Malcolm, Mary, and Robert without images and then have the OER designers participate in the persona construction by finding an appropriate image to represent the persona(s) chosen.

Guided by the reflection activity, designers moved onto the "discovery" phase of the four-phase empathy framework. They spent one to two minutes on each of the four separate prompts in order to enter into the persona's world and discover the persona's situation and experiences. Next, designers entered the "immerse" phase by responding to a prompt that required them to explore the persona's world. This phase required designers to withhold judgement so that they could appropriately expand their knowledge about the persona as an adult learner. The prompt in the "connect" phase asked designers to recall their own memories and experiences so that they could create an emotional tie with their one chosen persona. Finally, designers ended the reflection by responding to a prompt that encouraged them to take a step back and make sense of the persona's world. Known as the "detachment" phase, designers reflected on new insights they gained from the reflective experience and used them to generate ideas to help the persona.

Module 1 concluded with a discussion activity where designers shared their perception of the learners with one another. Using discussion instruction prompts, designers were able to read other's discussion posts and comment on those posts. The discussion prompts asked designers to share their reflections on the following question: How can you provide opportunities for this learner to engage in learning experiences and activities that can prepare this learner for his or her goals? To move along the design process, we then directed designers to start thinking about possible learning activities that they could design.

Introducing Merrill's First Principles of Instruction

After a Module 2 explanation of how high school equivalency exams align with high school math and English standards, wWe did not assume that all designers were instructional designers (IDs) or were proficient in or even aware of instructional design processes. In Module 3, designers explored Merrill's First Principles of Instruction (i.e., "activation," "demonstration," "application," and "integration") (Merrill, 2002), which helped them design the instructional experience. Merrill's principles include activating prior knowledge, using specific portrayals to demonstrate component skills, applying newly acquired knowledge and skills, and integrating the new knowledge and skills into the learner's world . The goal of Module 3 was to assist designers in creating and developing instructional activities that guide adult learners to process, apply, and integrate new incoming information into their life. For the reflection activity, designers refined their decisions about the instructional experience that they were developing for their target learners. More specifically, designers began by identifying which (if any) of the six personas from Module 1 continued to be the focus as they considered the audience. From there, designers followed Merrill's principles and completed the following actions:

- They drafted two to four learning objectives.
- They described the problem or task that would frame their lesson.
- They specified the activation, demonstration, application, and integration strategies they used in their design processes.

Observing Designers Using Personas

The goal of the MOOC was to design and develop OER to help adults prepare to to take a high school equivalency exam. In return for volunteering in service-level projects, participating designers gain real-world experience and receive support from SMEs in the field of education. Our case study, the free instructional design service MOOC on *Canvas Network, was* a 12-week course that was extended an additional six weeks (total of 18 weeks) in spring 2016. The MOOC was designed and facilitated by five ABE SMEs and eight experiences instructional designers. A total of 1,866 participants were enrolled, and 37 designers completed instructional materials that were made available for free in the "Adult Learning Zone" on oercommons.com. This case study focuses on the 37 designers who completed instructional materials.

An exciting part of taking a MOOC is the ability to connect, share, and compare experiences with others. In this course, some designers worked or volunteered in ABE programs. Others had academic or work backgrounds as IDs or as educators familiar with the subject matter, possibly in a K-12 or higher education setting.

To get conversations started, we asked designers to reply to a post to provide a brief introduction. This required them to share their backgrounds and to reflect on why they were taking the course. Of the 37 designers who completed instructional materials, 24 (65%) were women. Twelve designers (33%) noted that they are working on or have a graduate instructional design-related degree while two designers shared that they are earning a certificate in instructional design.

Why designers were taking the course resulted in a number of responses which are summarized in Table 1. Craig (all designer names have been changed), an art and design instructor who is transitioning to an ID role, wrote, “I’m taking this class to pick up pointers, get some practice, meet some great people, and possibly generate some more portfolio materials.” Carin, a recent instructional design masters graduate, shared, “…as a recent graduate in the instructional design community, I am a novice and am looking forward to the opportunity to gain additional instructional design experience and network with other professionals…” Echoing these sentiments, a veteran educational consultant named Adam posted:

> *I created two years’ worth of curricula without formal training except for what I’d learned from backwards design and lesson planning as a teacher. The company loved my products. I thought, ‘Wow! I can get paid for this!’ I then completed my second Masters, this time in ID.*

Table 1

Reasons Designers Enrolled in Course

Number of Designers	Why Designers were Taking the Course
16	Want to sharpen or improve instructional design skills
13	Want to gain real-life instructional design experience
8	Want to be part of a service project
8	Want to gain practical knowledge in instructional design and/or adult education
7	Want to work and network with other instructional designers (IDs)
3	Have a desire to move into an instructional design role
2	Want to generate portfolio material
1	Have an interest in instructional design

Note. Designers may have chosen more than one reason why they were taking the course

We followed a single, intrinsic case study approach where context is crucial. Designing OER for ABE was a complex endeavor. Our method was to place ourselves in the thick of the design process. According to Stake (2005), an intrinsic case study’s purpose is not to understand some abstract construct or generic phenomenon. Its purpose is not theory building. An intrinsic case study is conducted because one desires a better understanding of the particular case. The study is initiated because of an intrinsic interest. Our method was to detail the case in descriptive narrative so readers can experience what happened and draw their own conclusions.

Data were collected using multiple techniques that directly used human sources (i.e., designers’ responses to electronic reflection prompts and discussion board prompts) and nonhuman sources (i.e., project artifacts that included design proposals, design prototypes, and final lessons). During the entire open ABE MOOC implementation on *Canvas Network*, we collected data in the form of designers’ reflections and project artifacts as they moved through the design proposal, design prototypes, and final lesson phases.

Reflection prompts and discussion board prompts were included within specific MOOC modules (see Table 2). As designers moved through various prompts, they were asked to reflect on which persona they were using in the development of their OER. Following a thematic analysis (Braun & Clarke, 2016), we used constant comparison (Braun & Clarke, 2016) to analyze and triangulate reflection and discussion board data. We focused on reflection and discussion board responses that clearly referenced at least one persona. Our focus was to investigate how these personas helped build empathy and develop instructional design skills and experience. As we continuously collected data, we simultaneously processed coded reflection information units to understand how designers used personas to build empathy for users during the empathic design process as well as how designers used personas to develop instructional design skills and experience while developing open education resources.

Table 2

Reflection and Discussion Prompts Within Specific Modules

Module	Reflection Prompt	Discussion Board Prompt
1	Yes	Yes
2	Yes	Yes
3	Yes	Yes
4	Yes	Yes
5	Yes	Yes
6	No	Yes
7	Yes	No

To inform our guiding research questions and strengthen our case study's chain of evidence, we dealt with a variety of evidence. Additionally, both authors analyzed data to ensure the triangulation of results (Yin, 1994). We reviewed designers' responses to both individual reflection prompts within modules as well as to conversation prompts within the whole MOOC discussion forum. We additionally referenced the designers' three deliverables--design proposals, design prototypes, and final lessons--to provide context and to gain a sense of what actually was being designed. Along with a thematic analysis, we also followed Yin's elements of high-quality analysis for a case study. Our analysis relied on all the relevant evidence appearing in all seven course modules. As both of us analyzed the evidence, we included both of our interpretations and addressed the most significant aspects of the case study that related to our research questions. Finally, as designers and developers of the course, we brought our own prior, expert knowledge to the case study.

Results

We observed 37 designers who used six authentic personas as well as an empathic design approach to complete ABE OER. We used the following research questions to guide our participation in the study and our observations:

1. How did designers use personas to build empathy for users during the empathic design process?
2. How did designers use personas to develop instructional design skills and experience while developing open education resources?

We now present the themes that emerged as a result of each research question.

Using Personas to Build Empathy

As 37 designers drew upon Crystalle (Figure 4), Geoff, Jamie Ann (Figure 5), Malcolm (Figure 6), Mary, and Robert to guide the development of instructional materials, designers responded to specific reflection prompts and had an opportunity to discuss the progress of their designs with other designers. Table 3 presents how many designers focused on each persona during each module of the design process. In Module 4 and Module 5, designers continued to reflect and receive feedback on the lessons. Since Module 6 did not have a reflection activity, designers did not note which persona was their foci. Four themes emerged from the reflections and discussions that we analyzed: (a) Designers made a connection with a persona; (b) designers put themselves in the shoes of the persona, therefore empathizing with the adult learners preparing for a high school equivalency exam; (c) designers engaged with facilitators, other designers, and SMEs about the designers' own personas and other designers' personas; and (d) designers stepped out of personas' shoes and reflected on their own ideas to help the adult learners.

Figure 4

Crystalle Made It Through High School Based on Social Promotion and Not Academic Mastery

Meet Crystalle

Crystalle's Story

Crystalle is 20 years old and was a below-average student in high school. She received her high school diploma, but barely. Her neighborhood public school pushed her through. Throughout high school, she lived with her mom who made sure Crystalle got to school every day, and that she did not hang out on the street afternoons or weekends. Right after graduation, her mom lost her job at a local factory. With no steady income coming in, plans for the local community college were put on hold.

Crystalle soon left home to live with her boyfriend in a cheap apartment. Crystalle worked a year at a convenience store, and supported her boyfriend. Truthfully, she was feeling pretty good about her "adult" life getting started. Then, she got pregnant and gave birth to a daughter named Treasure. Her boyfriend was not happy with a baby in the apartment, or the loss of her income when she had to stay home to care for the baby, so he threw her out. Crystalle's mother found another job, and welcomed her and Treasure back. With the help of her mom, a steady job at the grocery store, and support from friends who help babysit, Crystalle now has plans for community college.

Crystalle recently took the community college placement exam. She scored so low that she was referred to a General Educational Development (GED) test prep program. It is her only option. If she doesn't attend the program, she will be forced to pay for remedial math and English classes to prepare for the math and English 101 classes. She and her mom can barely pay for the introductory classes. Financially, remedial classes are out of the question.

Crystalle sees community college as her ticket to getting a decent job, which is key to a good life for her and Treasure. She is trying to stay focused on this goal and, for the most part, she cooperates with the tutoring and study schedules involved in preparation. She reads and writes at about a 7th grade level, and she shows real improvement when she applies herself. Crystalle is somewhat comfortable with technology, having used a cell phone for calls, Facebook, and Web searches. She does not have much computer experience with applications like Word or Excel, and she does not type well, either. She admits she gets frustrated and bored quickly when she doesn't understand new things, and she hates being judged or looked down on. Crystalle likes tutors and instructors who demonstrate patience and concern for her, but also challenge her. She does better understanding stuff on her own at her own pace, and taking breaks when she get frustrated. She loves to show off what she learns.

Figure 5

Jamie Ann Hated School and Dropped Out of High School in Her Senior Year

Meet Jamie Ann

Jamie Ann's Story

Jamie Ann is 21 and lives with her parents. She was raised in a well-educated, financially stable family. While she was definitely the under-achiever in her family of two sisters and a brother, Jamie Ann has always been too unfocused to settle down at anything – including school. Her family has always stepped in and helped her when she needed it.

Jamie Ann's unique approach to life showed early. She was an energetic little girl, very smart, eager to learn, and bounced from one activity to another. Teachers talked to her often for too much talking and for getting out of her seat. They also praised her for learning quickly. In junior high school, this energy began working against her. Jamie Ann had trouble concentrating long enough in class to learn the more complex material like science and advanced math. In high school, she could read two or three books a week, but she hated school. She hated sitting in school all day bored out of her mind. She hated dealing with, what she called, idiot kids and teachers. By the first semester of her senior year, even though her grades were not bad, she was so miserable that she dropped out of school. She soon got a job as the receptionist at a local commercial plumbing contractor and supplier. Her parents had arranged for her application to this job, and they did their best to find new jobs for Jamie Ann every few months when boredom or a bad error due to inattention caused her to lose job after job.

Jamie Ann has been jobless for two months. It has been two and half years since she dropped out of high school, and she realizes it was a mistake. She wants to move out. She wants to find a job that she will like, and now sees that she first needs her General Educational Development (GED) certification so she can get on a path to start making more money. She is getting ready to prepare for and tackle the GED.

As a learner, Jamie Ann is still as eager as she ever was. It excites her to absorb new information, and she has plenty of technology skills to call on for navigating lessons on the computer. The problem is she assumes she understands everything once she has learned a little, so she often races on to another topic before she has fully grasped the current one.

She hates when people criticize her work. Although her reading level is 12^{th} grade, she is missing some of the background knowledge that a high school graduate should have. She admits that she focuses on herself. While Jamie Ann likes to learn new things, they do not mean much to her unless she can relate them directly to her own interests or needs.

Her goals now are to pass the GED. She concludes that she is almost done with high school anyway, so it won't be hard. Then, she wants to get into college, and find a well-paying job that she likes. She is motivated to succeed and achieve her goals. Some people say she has too much confidence. She thinks it is better than having too little.

Figure 6

Malcolm Looks Forward to Passing His General Educational Development Test and Eventually Becoming a Counselor for At-Risk Children

Meet Malcolm

Malcolm's Story

Malcolm is 24 years old and has been on his own since he was 16. He dropped out of school at the beginning of his junior year, and ran away from his foster home. He was placed in a foster home when he was 12 because his mother died of cancer and his father was in prison. He left his foster home because of abuse he experienced over two years at the hands of his foster mother's brother who had moved into the apartment next door. He did not to tell his foster parents because he thought that no one would believe him. Plus, he felt ashamed and afraid. This abuse made him feel worthless.

He moved in with a school buddy whose mom, Helen, was using and selling drugs to help pay for her habit. She told Malcolm he could stay, but he needed to pay his own way giving her $200 a week. He got a part-time job at a party store making about $160 a week before taxes. But, he needed more money than that to stay with his friend. Helen introduced him to her dealer who allowed him to sell drugs at places where the high school kids hung out.

Malcolm became a successful dealer, and began to use drugs himself. After about six months, the dealer Malcolm was working for was sent to prison for five years, so Malcolm took over the entire area. He made a lot of money and moved into his own apartment when he was 18. To get more buyers, he began hosting parties at a warehouse just three blocks from the high school. By the time he was 20, he had begun to feel he could do anything, so he began smoking crack cocaine. He threw himself a big 21st birthday party, which hundreds of young kids from neighboring schools attended. The police broke up the party and arrested Malcolm, charging him with several felonies. He was convicted and sent to prison for two years.

He continued to use any drugs he could get while in prison. When he was released at age 24, he tried to go back to his old neighborhood to deal drugs again. However, his territory had been taken over by a gang. Malcolm had no way to make a living and had no place to live. He stole scrap metal and sold it to get money for drugs. One night a community-based homeless shelter worker and drug counselor found Malcolm asleep in a doorway of a vacant store. The worker took him to the shelter for the night. The next day, the worker convinced him to stay for another night. Although Malcolm was anxious to leave, he liked being warm and talking with the worker, who seemed to understand him. The worker convinced Malcolm to enter the one-year residential program sponsored by the shelter. He is a little afraid of living in a dorm setting with other men due to his past experience with his uncle. He doesn't want anyone to know about his past. He has a hard time trusting people and believing they really want to help him.

Because Malcolm did not finish high school, the residential recovery program requires him to take General Educational Development (GED) test preparation courses and take the GED test before the year is over. He was an average student in high school where he participated in some extra-curricular activities, including chess and computer club. He really liked working with computers, but it has been eight years since he was in high school. Except for using a cell phone, Malcolm has fallen behind in computer technology, knowing very little about the Internet or Web tools.

He tests at 10th grade reading skills. However, he is really behind in science and math knowledge. Plus, he has a hard time seeing the relevance of subjects like algebra, calculus, and science. He does better when instruction is connected to the real world. He is a little afraid that he is too far behind to succeed. He is willing to try, but he doesn't want to have anyone know about his past failures. His self-esteem is low due to his family's background, the abuse he experienced, his drug dealing and use, and his time in prison. He wants to finish the program, obtain his GED, get a job, and work his way through college to become a counselor at a community center that focuses on at-risk kids.

Table 3

How Many Designers Focused on Each Persona During Each Module

Persona	Module 1	Module 2	Module 3	Module 4	Module 5	Module 7
Crystalle	4	4	1	1	1	2
Geoff	8	9	6	7	7	5
Jamie Ann	8	11	9	4	5	5
Malcolm	5	7	6	6	6	4
Mary	10	11	11	11	10	10
Robert	4	3	5	3	3	3
Own Persona	0	3	6	7	7	8
No Persona	1	1	2	3	5	2
Total	40	49	46	42	44	39

Note. Designers may have picked more than one persona within a module and/or switched personas from a previous module.

Made a Personal Connection with a Persona

In Module 1's "connection" phase, designers connect with one or more personas by recalling their own feelings and experiences. Across the first three modules, 28 different designers personally reflected and/discussed with one another how they were able to make an emotional connection with their chosen persona(s). The designers' reflections on these connections were often prefaced with similar statements. The sentiments of these statements generally demonstrated that designers connected with personas who reminded them of people that they knew. Similarly, designers were attracted to personas who had stories that paralleled the designers' own backgrounds (e.g., "I was like this persona;" "I could have been this persona;" or "I have a similar story to this persona."). For example, one designer named Jasmine used her reflection to explain how she connected with Geoff in Module 1, stating that "I was homeless at one point too. I was alone and hungry. During that time, I was so overwhelmed and frightened." Similarly, another designer named Darlene wrote, "[a]s a person over fifty, learning to use computers and embrace technology created anxiety. I had to overcome my own fears of using computers and learning various applications."

The "I-have-a-similar-story" reflections were particularly notable as designers spent time sharing stories that connected to personas' stories. A designer named Carol wrote an 84-word reflection on how, like Mary, she was sensitive and artistic in high school. Carol also noted that she had a hard time connecting with most people. Yet another designer, Marcel, shared a 117-word story to illustrate his similarities to Crystalle. Marcel explained that he was indifferent in high school and that none of his teachers or courses "really [stuck] out as life changing." Writing about a specific memory that resonated with the persona "Mary," Leslie included a 485-word reflection on how, as an American student studying Spanish abroad, she found herself out of place and alone in Portugal with no way to communicate with people. Leslie ended her story explaining that "I can imagine that Mary, like any other immigrant to the U.S. without English skills, feels homesick and out of place frequently while living here."

Beyond Preparing for a High School Equivalency Exam

As we mentioned previously, designers were tasked with developing OER on specific topics meeting the College and Career Readiness Standards (CCRS). Several designers developed these resources through a lens of teaching skills in the context of future use. They began to develop the instructional experiences in Module 1 and Module 3, and ultimately, 17 different designers shared ideas on how to teach skills that would benefit adult learners by transferring to future contexts. Additionally, to recall, in the "detachment" phase of the empathetic design model, a designer steps back and takes stock in the users' worlds. This practice allows a designer to reflect on new ideas and insights to help the users. For all six personas, we observed designers reflecting and discussing on how to help the personas beyond just preparing high school equivalency exams. For example, designers noted that: Malcolm wants to work with at-risk kids; Robert is looking for a fresh start after jail; Jamie needs to discover what she wants to do with her life; Mary confidently communicates in English at the supermarket or bank; Crystalle earns a college degree for herself and her daughter; and Geoff successfully runs the family farm.

Engaged with Others

Throughout the course, designers engaged with course facilitators, other designers, and course SMEs to discuss their own personas as well as other designers' personas. Designers' empathic connections with personas made discussions engaging and seamless. Everyone involved with the course (designers, facilitators, and course SMEs) knew the six personas so when one discussed a specific persona the others understood. In discussions across the first five modules, we witnessed 14 different designers, collaboratively, using personas to drive their empathic design process and help drive other designers' empathic design process.

We observed designers discussing how they agreed with another's assessments of personas, confirming their perspective of walking in the learners' shoes. In other instances, designers looked to one another for more insight into a persona. A designer named Linda responded to another designer to confirm her view of Malcolm and then commented, "This is an interesting concept – usually in higher or adult Ed classes I feel students have more control over which teachers they take classes from[.]" Linda then followed up by asking, "…[D]o you think Malcolm is aware enough about this issue to gravitate towards choosing female teachers for himself?"

Sometimes, a post like Linda's led to more discussion around what instructional strategies are appropriate for a persona and how a particular insight may add to or change an instructional idea. When discussing the details of a lesson with a course facilitator or SME, the designer communicated the lesson by putting the persona in the middle of the lesson. For instance, Wayne, a designer participating in our study, responded to an ABE SME's questions regarding his activity:

Thanks. I appreciate your comments. I am still thinking of tightening this. The idea of using graph paper is to allow Malcolm to see concretely how the area of a regular polygon is calculated. For example, if the length is 6 inches and the width is 4 inches, he can actually see 24 boxes (squares) on the graph. Thus, he is engaging in something practical. Then, we can move to the more abstract area of a rectangle with length 16 and width 12. The answer will be in square units. We will go on to examine more complex polygons.

Reflected on Ideas to Help

In the final phase ("detach") of the empathetic design framework, designers stepped back to take stock in the users' worlds, allowing them to both reflect on new ideas and gain insights to help the users. We observed two different ways in which 19 different designers discussed and reflected on how they could help learners across the first five modules. First, some designers demonstrated a desire to linger in the connection phase and not completely detach. These thus designers shared instructional approaches that connected with personas but varied in focus. Some approaches aimed to ensure positive reinforcement; some presented achievable learning tasks, while others provided motivation driven by real-life scenarios. Lastly, some approaches encouraged interpretation and meaning-making through fiction and nonfiction passages. To this end, Penny reflected on a specific novel:

My thought is to build up to an excerpt from *The House on Mango Street* by Sandra Cisneros. My recollection is that this novel is required reading during the high school years. Also, I think that the cultural context portrayed in the novel would be one Mary could relate to.

The second way, conversely, saw designers "detaching" from the personas. This detachment allowed designers to describe a specific CCRS that would benefit the learner. Focusing on identifying and choosing a CCRS, Module 2 was lengthy, complex, and, at times, difficult to navigate through. Some designers slowly walked through the CCRS in the shoes of a persona. For example, one designer named Charles wrote the following discussion post in Module 2: "I plan to make a lesson to suit the learning preference of the persona 'Jamie Ann'. Reading like a Historian, Unit 12: Cold War Culture/Civil Rights explores recent history through text. It is a CCSS.ELA-Literacy.W. 11-12.9b unit." He continued, "I chose this because it uses secondary sources and images which will give the unit a blended delivery style of which I am a strong advocate and will aid Jamie Ann's concentration and engagement levels." Charles stepped out of Jamie Ann's shoes and reflected on ideas to help her learn as she cannot concentrate in a traditional classroom setting. Charles coming up with instructional ideas transitions to our second research question: How did designers use personas to develop instructional design skills and experience while designing open education resources.

Using Personas to Develop Instructional Design Skills and Experience

As presented in Table 1, the top two designers' responses as to why they were participating in the course were that designers wanted to sharpen or improve instructional design skills and that designers wanted to gain real-life instructional design experience. As a result, we asked designers to provide feedback on the following statement in the Module 7 reflection,: "I gained relevant design experience during this service-learning project." Of the 28 designers who responded to the statement, 26 (93%) designers answered agreed or strongly agreed.

Designers view empathic design methods as tools for developing instructional design knowledge and abilities (Hanington, 2003; Mattelmäki, 2008; Mattelmäki et al., 2014). We were interested in learning how designers used personas as a tool to cultivate instructional design skills and experience while developing OER. A purpose of the course was therefore to guide designers through the instructional design process using an empathic framework.

We observed our study participants' instructional design processes through a lens informed by Richey, Klein, and Tracey's (2011) domains of the instructional design knowledge base. Richey, Klein, and Tracey break the instructional design knowledge base down into six content domains: (a) learners and learning processes, (b) learning and performance contexts, (c) content structure and sequence, (d) instructional and non-instructional strategies, (d) media and delivery systems, and (e) designers and design processes. We analyzed reflection and discussion board responses using the Richey, Klein, and Tracey framework to investigate how personas helped build empathy and develop instructional design skills and experience. Our investigation of the reflections and discussions yielded: First, designers put themselves in personas' shoes when structuring content and sequence. Second, designers put themselves in personas shoes when developing instructional strategies. Third, designers put themselves in personas' shoes when choosing media and delivery systems. Lastly, designers put themselves in the personas' shoes when engaged in Merrill's First Principles of Instruction (year). Based on these themes, personas clearly provided a context that designers could return to as they worked through the instructional design process.

Structure Content and Sequence

Across Modules 1-4, 15 different designers shared how they structured OER content and sequencing around one or more persona(s). In Module 4, designer Nicole described a five-part lesson series with each lesson lasting 30 minutes. Putting herself in Mary's shoes, Nicole's content centered on social stratification and the American dream. Nicole's sequence of five lessons ended with students presenting their experience learning about social stratification and whether the American dream is achievable or not.

Marcel also focused designing for Mary's situation and aligned his content directly to CCRS standards. In the Module 2 discussion, he offered two instructional content options for Mary's persona: a speaking lesson focused on grammar in use or a social studies lesson focusing on Hispanic history and immigration. In both cases, Marcel was designing to Mary's Hispanic background and her desire to learn English.

Develop Instructional Strategies

In Modules 1-3, 21 different designers described their instructional activities and/or experiences centered one or more specific persona(s). The ABE SMEs who helped facilitate the course consistently led designers to create real-world, practical activities and experiences. Therefore, when reflecting on and discussing instructional strategies, designers stressed activities and experiences that:

- engaged adult learners
- chunked information that was simple and practical
- provided constant feedback
- focused on critical thinking skills
- presented problem-solving and scenario-based situations

To illustrate, a designer named Cedric connected the empathic design approach with the development of instructional strategies for Jamie Ann when he noted, "[t]he empathy framework provided a good way of thinking about the challenges facing Jamie Ann and her possible motivations." He continued, "[i]n designing the ideal learning experience for Jamie Ann[,] I think it is important to keep in mind she is a motivated learner and has the supports and skills to succeed." Cedric noted that his learning experiences for Jamie Ann would emphasize "practicality and variety." He also concluded:

If the learning opportunities are varied enough to have a practical element[,] I

believe Jamie Ann can be made to succeed in her own learning and realize the value of being able to take in, use, and create things all as part of a larger learning process in developing her skills and attitudes for the job market.

Choose Media and Delivery Systems

Most designers came to the service-learning experience wanting and expecting to develop e-learning lessons. Designers who put themselves in the shoes of the adult learners appreciated the realities of choosing media and delivery systems. Low digital literacy skills and lack of internet access among adult learners influence the feasibility of e-learning as a viable media and delivery system. Designer Arlene captured this reality when observing the following about Robert, a persona who is incarcerated in a county jail:

Robert will not have access to the internet, so many learning modules will need to be stand-alone. He would benefit from a blended environment where an instructor is present for a limited amount of time to introduce concepts and topics, and then Robert will be encouraged to work independently on his own. He is a quick thinker but needs to use repetition to ‘cement’ his learning.

As demonstrated by Arlene’s analysis of Robert, the 16 different designers who discussed the media and delivery systems as it related to the adult learners grasped that, for whatever reason, many adult learners working toward high school equivalency exam success did not fit in a traditional classroom. Designers focused on alternate media and delivery systems like asynchronous, blended, computer based training, and traditional face-to-face.

Engage in Merrill’s First Principles of Instruction

Merrill’s First Principles of Instruction (year) aligned very well with the ABE SMEs’ insistence that lessons needed to be problem or task focused rather than a lesson that merely teaches a topic associated with a subject. Most designers had little experience using Merrill’s principles. However, Module 3 broke down the four phases (i.e., “activation,” “demonstration,” “application,” and “integration”) and had designers work through each phase as they began to relate the empathic design approach learned in Module 1 with the CCRS learned in Module 2. We observed five designers center a specific persona in each phase of Merrill’s First Principles. For example, Wayne designed a self-paced lesson for adult learners like Malcolm who tended to have challenges in distinguishing between area and perimeter. For the integration phase, Wayne designed specific situations (e.g., painting a wall and tiling a floor) where Malcolm could practice calculating the area to determine how much paint and tile is required.

Discussion

In this section, we discuss the strengths, weaknesses, and limitations of using personas to build empathy for adult learners and to develop instructional design skills and experience while developing OER. Personas ultimately helped designers put themselves in the shoes of the adult learners and so that they could understand who adult learners really are. Adult learners are not graduate students. Adult learners are adults who have not completed high school and/or have low basic literacy and/or math skills. This characteristic of adult learners thus required ABE SMEs to put stereotypes when they constructed personas, especially with regard to the well-known high school dropout stereotype. For multiple reasons, underserved ABE students have been unsuccessful in traditional school, so we found that OER designers should avoid a traditional school approach. Avoiding traditional school approaches approved to be a constraint that our study participants had to face. Designers embraced this constraint and explored all possibilities for real-world, practical OER.

Using personas to build empathy for adult learners helped surface important design elements that may have been ignored. As mentioned before, Robert, a persona who represented a desperately underserved group, is incarcerated in a county jail. Robert has no access to the internet. When focused on Robert, designers had to work within this constraint. Similarly, many designers picked up on the personas’ low digital literacy skills. Some designers developed digital literacy skills OER, while others were careful when including technology with the OER. Designers ultimately created simple digital interactions and/or have a brief section of the OER that helped to improve digital literacy skills.

Module 2 (College and Career Readiness Standard) and Module 3 (Merrill’s First Principles of Instruction) were difficult modules to navigate. Focusing on a persona(s) helped designers connect and keep the persona centered in their work throughout the course, no matter the module’s focus. Designers stepped back and took stock in the adult learners’ world. Detaching as part of the four-phase framework of empathy allowed designers to reflect on CCRS ideas and insights to help the adult learners.

As designers engaged in the four-phase framework of empathy, they practiced stepping into and stepping out of the adult learner’s life. Kouprie and Visser (2009) contend that stepping in and stepping out of another individual’s life may be a key element of training designers at designing with empathy. Kouprie and Visser also note that empathic design requires a structured investment of time. When designing the course, we created an environment where designers would continuously step into and step out of personas’ worlds. Lasting four and half months, 37 designers participated in a structured empathic design process that resulted in instructional materials that were made available for free in the "Adult Learning Zone" on oercommons.org.

Designers had limited involvement in constructing personas. In Module 1, we directed designers to choose one of the six personas that resonated with them, work through the four-phase framework with the persona, and then select an image for the persona. We intentionally did not involve designers in persona construction. Knowing the 12-week course would demand a commitment from designers, we could not envision how a designer could engage with the four-phase framework of empathy and at the same time construct a persona. For all reflection prompts, when asking which persona the designers were focused on, we allowed designers to choose that they had created their own persona. For the Module 7 reflection (Table 3), eight designers marked that they had constructed their own persona. We had no way of viewing a persona that was constructed by a designer.

Kourpie and Visser (2009) state that motivation is critical for empathic design. If designers do not embrace the advantages of the empathic framework, then designers can experience unsatisfying results. Our intent was to have designers participate in an empathic design process driven by authentic and engaging personas. We consistently engaged designers with the six personas, the four-phase framework, and an empathic approach. However this does present the following question: Although we observed designers embracing an empathic design process, without the constant prompting, would designers have stayed engaged with personas and the empathic design process throughout all seven modules? Our case study provides no answers to this question and is one avenue for future scholarly inquiry.

Another limitation of our case study was selection bias. We observed 37 designers who completed the course and submitted instructional materials. Of the 1,829 people who registered for the course but did not complete OER, we do not know why they did not finish the course. Yet another limitation of our case study is that we participated as designers of the course and facilitators to the course. Yin (1994) noted that as a source for collecting evidence, there is a tradeoff to observing as a participant. The opportunities are two-fold: gain access to events that are inaccessible and perceive reality from the viewpoint of an insider. The problems of observing as a participant are becoming a supporter of the group (37 designers in our case) and assuming advocacy roles (i.e., designers and facilitators of the course). Knowing this, we triangulated data to increase the trustworthiness of the study.

Conclusion

Designing OER for adults who have a desire to pass a high school equivalency exam was a complex process. The strengths of using personas to help designers gain empathy for adult learners outweighed the weaknesses. Personas helped designers gain an understanding and empathy for adult learners, facilitate the empathic design process, and ensure that adult learners' needs were met. We observed why a friend collects butterflies and what games he loves best does matter when we put ourselves in his shoes and reflect on ideas and insights to help him.

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Conducting a Learner Analysis

José Fulgencio & Tutaleni I. Asino

As mentioned at the outset: designing a course that best fits the needs of learners requires both an understanding of who the learners are, as well as actual efforts to evaluate and understand their needs. The chapter reviewed both conceptual issues that concern learner analysis as well as practical approaches you can use to analyze actual learner needs.

Because of this, learner analysis is an important aspect of the instructional design process. It is important to remember that learners are not empty containers in which knowledge can simply be poured. They have experiences through which they understand the world and through which they will understand or evaluate the instruction. In this way, learning is a process that involves change in knowledge; it is not something that is done to learners but instead something that learners do themselves (Ambrose et al., 2010). Hence, "consideration of the learners' prior knowledge, abilities, points of view, and perceived needs are an important part of a learner analysis process" (Brown & Green, 2015, p.73).

Although various scholars may use different verbiage, broadly, a learner analysis can be understood as the process of identifying critical aspects of the learner, including demographics, prior knowledge, and social needs (Adams Becker et al., 2014), and "is characterized as an iterative process that informs vital instructional design decisions from front-end analysis to evaluation" (Saxena, 2011, p. 94) by customizing the instruction to the previous knowledge of each individual learner so that the learner controls their own learning and has a deeper understanding of the classroom material (Reigeluth & Carr-Chellman, 2009). For example, an instructor teaching a biology master's program can expect learners to have a solid foundational knowledge of biology. At an undergraduate level however, the instructor may expect students to have a somewhat limited understanding of biology. The instructor will also have to take into consideration the learner group characteristics such as first-generation students, international students, adult learners, and learners with accessibility needs (e.g. requiring note-taking accommodations and extra time on exams), all of which may influence teaching of content, distribution of content, and pace of content distribution in the classroom. Another characteristic is the learning preferences within the group of learners, such as whether they prefer and respond better to small group learning, hands-on experiences, or case studies.

Much has been written about learner analysis, in terms of definition and the process by which it can be accomplished. However, regardless of the definition advanced, what is important to discern is that through a learner analysis, the learner contributes to the instructional design of the course and miscommunications between the learner, instructor, and course goals are identified (Adams Becker, 2014; Dick et al., 2009; Jonassen et al., 1999; Fink, 2013). A learner analysis ensures that the learner benefits from a productive learning environment that can leave a lasting impact on their lifelong learning (Adams Becker et al., 2014; Dick et al., 2009; Jonassen et al., 1999; Fink, 2013).

The focus of this chapter is on how to conduct a learner analysis. This process often includes identifying learners' characteristics, their prior knowledge, and their demographics, all of which are key factors to consider when designing a learning environment (Adams Becker et al., 2014; Dick et al., 2009; Jonassen et al., 1999; Fink, 2013). Demographics include the environment in which the learner lives and works, ethnicity, accessibility to technology, and educational background. Other factors—such as motivation, personal learning style, and access to content—also play a role in how individuals learn (Adams Becker et al., 2014; Dick et al., 2009; Jonassen et al., 1999; Fink, 2013).

The chapter begins with explaining the components of a learner analysis, describing reasons for a learner analysis, and providing a learner analysis worksheet. The next section of the chapter explains an area that the authors believe is often not discussed when writing about learner analysis: the ethics of working with learners, developing personas, and experience mapping. The last section of the chapter includes a learner analysis design project to enable the reader to put into practice some of what is covered in the chapter.

Components of a Learner Analysis

When designing learning environments, there needs to be a birds-eye view of the entire process from who the learner is, the environment, background of the learner, and the goal of the learning environment. An educator cannot make assumptions about learners based on the educator's experience. The following are key factors of the learner analysis to consider.

1. Learner Characteristics

Understanding the characteristics of learners can help shape the design of the course. For example, if your class is an executive-level course for Fortune 500 high-level officers, you may expect learners with professional experience, and who have different goals for learning and their careers, which is different from a class of undergraduate students who have little to no work experience.

In examining factors of learner characteristics, these are key questions to think about (Adams Becker et al., 2014; Dick et al., 2009; Jonassen et al., 1999; Fink, 2013):

- Who are the learners?
- What personal characteristics do these learners possess?
- What are the dimensions of the learner?
- What contributes to the reason for learning about the topic?
- What is the reason for enrolling in the course?
- What are the student's learning styles?
- What is it about the topic that motivates the learner?

2. Prior Knowledge

Time is a finite resource for most people, so instructional time should not be wasted covering material that learners already know, but instead building on their prior knowledge. Students' prior knowledge influences how they interpret and filter new information given in the classroom (Ambrose et al., 2010; Cordova et al., 2014; Dochy et al., 2002; Umanath & Marsh, 2014).

In examining factors of prior knowledge, there are key questions to think about:

- What do learners already know?
- How might this information contribute to the content and order of what you teach?

3. Demographics

Understanding who the learners are and their demographics can directly impact the instructional material. It is important, for example, not to include instructional material that may be culturally insensitive or that has no connection to students. This is particularly important when using media such as film that could be considered historic to one group and offensive to another. Culture is integral to learning and plays a central role in "determining the learning preferences, styles, approaches and experiences of learners" (Young 2014, p. 350). It is worth noting that culture can also relate to organisational cultures. For example, using learning materials or illustrations that promote collaboration amongst employees in an organization that does not have or prioritize such a practice, may run contrary to the typically established culture.

In examining factors of demographics, key questions to think about are:

- Where are the learners coming from in terms of their education level, ethnicity, demographic, hobbies, area of study, grade level?
- Why are these demographics important for the material you will be teaching?

4. Access to Technology

In education, it is important to make sure that all learners have access to the educational material. As technology becomes a necessity to participate in learning opportunities, it is also important to gauge whether or not students have access to technology. Material should be flexible, but you can imagine if you are assigning work through an app that is only available for Apple devices, how this can affect learners who own Android phones. Thus, make sure that throughout the course, educational material is universally accessible.

Sometimes issues of access can be tricky or surprising. For example, if there is only one computer, or limited internet bandwidth, but two parents and two children all need to access it for their job or homework, then there is not sufficient access. Similarly, the computer or internet access may be too old to play the instructional multimedia in a module. Thus, it is important to look beyond the statistics to truly understand the level of access.

In examining factors of access, key questions to think about are:

- How accessible is technology to every learner in my class?
- Are learning materials universally accessible for individuals with disabilities?
- If access is not universal, how can I adapt my course curriculum to include all learners?

Put Your Skills to Use: The Learner Analysis Worksheet

When conducting a learner analysis, a collection of learner information will help develop a positive learning environment. The Learner Analysis Worksheet below is one way to collect and record key factors and general information about the learners, using information available from student enrollment data. This worksheet can be adapted for designing instruction for various learning environments. Student information is often provided when a student enrolls, and academic advisors or student enrollment professionals may also be able to share this information with you. Another way to gather demographic information is to speak with the colleagues in your department. Who are the students who usually register for this course?

For example, a community college will have higher enrollment of non-traditional and first-generation students who are older than 25 and who are full-time workers compared to the conventional student body of 18 to 22-year-olds at a traditional institution who are part-time workers. The more information you can gather for the Learner Analysis Worksheet in Table 1, the more equipped you will be in designing the best learning environment for your learners.

Table 1

Learner Analysis Worksheet

Demographic Characteristics	Learner Details
Size of target audience	
Are there any subgroups that may participate?	
Age ranges	

Educational/grade level, or academic program year. How long have they been out of an educational setting?
Gender breakdown
Cultural backgrounds
Primary language
Employment status
Socioeconomic status
Traditional/non-traditional/first generation learners?
Geographic location(s)
Internet connectivity?
Access to technology?

Note. Adapted from https://en.wikiversity.org/wiki/Instructional_design/Learner_analysis/what_when_why

Ethics of Working With Learners

There is now an ever-increasing amount of information on students available on the internet broadly, and specifically through learning management systems and social media that institutions and designers can access. Data on learners includes but is not limited to: personal information, enrollment information, academic information, and other data collected by educational institutions. What was once kept private between the learner and institution on paper can no longer be assumed as safe. Records which are now held in digital format are vulnerable to hackers and are enticing to outside agencies that are seeking to monetize the data. How, then, do institutions assure ethical use of learners' data that may be needed or used for learner analysis? How much data is reasonable to share? If institutions are asking learners to be ethical in their academic assignments, shouldn't institutions do the same when it comes to working with learners? This section covers professional expectations regarding ethical conduct towards learners.

Professional Expectations

In the context of conducting a learner analysis, a professional is expected to be "committed to the needs and best interests of their clients who are basically their learners" (Wainaina et al., 2015, p. 68). There are various code of conducts from which one can draw guidance for ethical practice as most professional organizations have codes of conduct or ethics. An example is the Association of Educational and Communication Technology (AECT), which is available at (https://edtechbooks.org/-RXIX) and aims to aid all members of AECT both individually and collectively in maintaining a high level of professional conduct. However, it is critical to know that just because one adheres to a code of ethics, it does not mean there will never be conflict. What is unfortunately inherent in all human relationships is a level of conflict, even when one has good intentions. So the question then is what happens when conflicts or perceived ethical violation occurs especially when a designer is engaged in collecting data needed for learner analysis? There are various approaches, but here we suggest the following ethical framework developed by Mathur and Corley (2014) which suggests considerations and questions to ask:

- Fact-finding – Most conflicts are related to communication or lack thereof. Hence one of the first steps is to engage in fact-finding exercises. What are the facts? What is known and what is not known?
- Who is involved – who are the people that care about this case or incident? What has been (mis)communicated? Who are the individuals involved?
- What is the conflict? – Is the conflict about the frameworks being used? If so, what are those frameworks and what is conflicting? If the conflicts concern the values, morals, or policies, establish what those are and what needs to be adhered to.
- Potential consequences to actions — What are some of the possible consequences for any actions taken to solve the dilemma? How would the people involved like to be treated? What is the role of the designer in solving the conflict (whether or not the designer is involved in causing this conflict)?
- Reflection – Lastly, reflect on the actions taken. What are the repercussions, if any, to the actions taken from the difficulty?

Educators have a responsibility entrusted upon them when educating learners. The duties include but are not limited to, creating a safe environment and being professional not just in virtual space but also in digital space. When educators neglect their responsibility to be professional and ethical (an expectation that we often have for students), this can be detrimental to learners.

Developing Personas in Learner Analysis

It is often stated that if you want to know a person, you must walk in their shoes. This idiom captures the goal of a learner analysis by helping us figuratively walk in someone's shoes and come to understand them more deeply. One way to do this is through personas. Personas are fictional characters that embrace the needs and goals of a real user or group of learners (Faily & Flechais, 2011). Personas help generate an understanding of learners and what their key attributes are that learning designers need to know for their designs (Dam & Siang, 2019). Personas may be fictional characters, but they are built based on real learner analysis data and thus embrace the needs and goals of real learners.

Effective personas do five things (from the following website: https://edtechbooks.org/-bXV):

1. Represent the majority of learners
2. Focus on the major needs of the learner
3. Provide clear understanding of the learners' expectations
4. Provide an aid to uncovering universal features
5. Describe real individuals

To develop your own persona, the following chart in Table 2 can be helpful.

Table 2

Questions to Ask During Persona Development

Objective	Questions
Define the purpose/vision of the course	What is the purpose of the course? What are the goals of the course?
Describe the user	Personal What is the age of the learner? What is the gender of the learner?

	What is the highest level of education this learner has received? Professional How much work experience does your learner have? What is your learner's professional background? Why will the learner take the course? Technical What technological devices does the learner use on a regular basis? What software and/or applications does the learner use on a regular basis? Through what technological device does your user primarily access the web for information?
User motivation	What is the learner motivated by? What are the learner's needs?

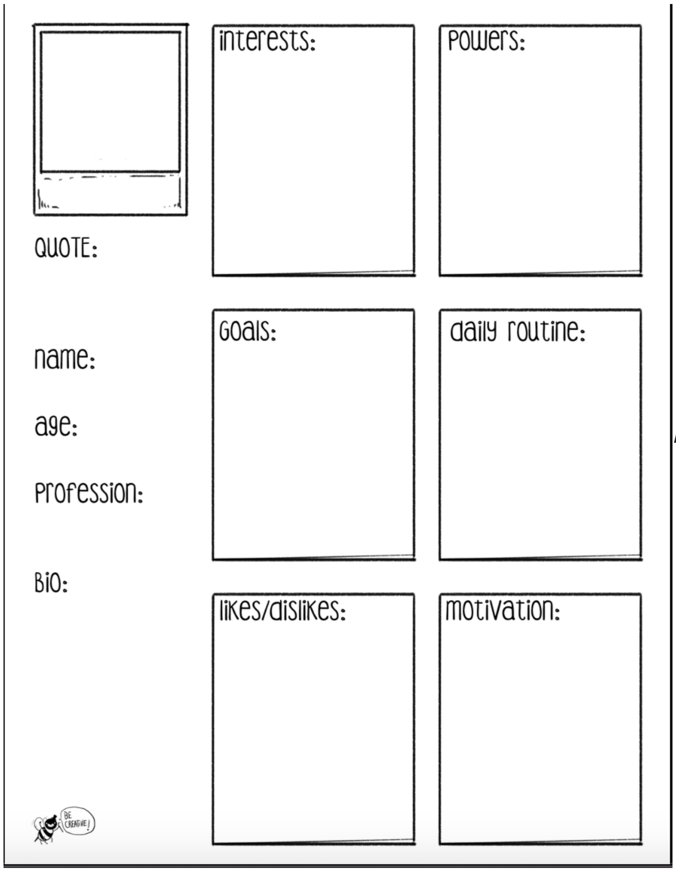
Note. From the U.S. Government usability website (U.S. Department of Health & Human Services, 2020) "questions to ask during persona development" chart.

When developing your persona, remember to organize the information in an easy-to-read logical format, and make it as visual as possible to convey the greatest sense of the "humanness" of the learners. Key pieces of information to include are the persona group (i.e. learner), fictional name, personal demographics, goals and tasks for the course, physical/social/technical environment, and a casual picture representing their learning environment.

Following in Figures 1–4 are some examples that provide an illustration of worksheets and examples for creating personas.

Figure 1

Persona Worksheet 1



Note. Persona worksheet from Open Design Kit

https://edtechbooks.org/-oyBd

Figure 2

Persona Worksheet 2

Note. Persona example from https://edtechbooks.org/-SCmQ

Figure 3

Persona Example 1

Richard Sanchez

UNDERGRADUATE STUDENT

Personal Profile

- Age: 31
- Pronouns: he, him
- Lives less than 50 miles from campus

Quote

"I worry about revealing my veteran status to other students. I often feel judged for my past work and feel the need to defend myself or explain things."

Work History & Workload

- Works full time
- Retired Army Veteran

Education

- AA degree - communication
- Returning to finish bachelor's degree

Goals

- Earn a bachelor's degree
- Form a running group in community

Personal Details

- Training for a marathon

Financial Information

- GI Bill covers much of education costs

Family Background

- First-generation college student

Attitudes & Beliefs

- Does not like to do group projects because he feels like he always does more than his group members
- Believes he is a lifelong learner

Social Support Structure

- Lives off campus with non-students
- Looking forward to expanding his social circle and finding a community to settle in after retiring from the army

Note. Persona example from https://edtechbooks.org/-GLf

Figure 4

Persona Example 2

Note. Persona example from https://edtechbooks.org/-GLf

Personas are a helpful way for designers to create a more engaging, more productive, and more effective educational experience for learners. Follow the guidelines provided in Table 2 when creating personas and be flexible and open to new information, as the personas may not be the same from start to finish.

Understanding Learners Through Experience Mapping

The popular adage of "the customer is always right," is often used to emphasize the importance of providing excellent customer service (Samson et al., 2017). While educational institutions are different from traditional service industries, they can still benefit from paying attention to learners' experiences. An experience map is a strategic tool that captures the journey of customers from point A to point B and generalizes critical insights into learner interactions that occur across such experiences. The journey captured in experience mapping, which is adapted from Schauer (2013), is split into four characteristics that generalize the experience of a learner:

1. uncover the truth
2. chart the course
3. tell the story
4. use the map

The first step, uncover the truth, includes studying the learner's behavior and interactions across channels and touchpoints. Channels are the interactions a person has with a product or service. Touchpoints are the interactions of a person with an agent or artifact of an organization. In the first part of the experience mapping, a designer finds various data and insights relevant to the experiences in the mapping process, including actually talking to the learners. Previous learner surveys and evaluations of the course or program are a good data source to begin. In order for the map to be believable, it needs to tell an authentic story and provide strong insights.

The second step, chart the course, collects the takeaways from learners to create actionable results. After you have collected data, obtained key aspects of the learner's journey, and obtained quotes from learners, it is time for the third characteristic: tell the story visually in a way that creates empathy and understanding. The goal of this characteristic is for the experience map to stand on its own, inspire new ideas, and foster strategy decisions.

The last step is to show the map to stakeholders that have insights and interactions with learners. Telling the story to stakeholders provides insights into the learner's experiences. The experience must go beyond the physical location and create an experience of usability such as identity, familiarization, memorability, and satisfaction (Ghani et al., 2016). Failure to meet the learner's needs can result in loss of interest, bad reviews, and challenges to getting the learners to accomplish the task.

As with personas, there are a number of examples of what format an experience map might take. Most are considered copyrighted and proprietary to the organizations developing them and so cannot be included here, but you can find examples of experience maps at the following sites (each also provides some practical tips for developing your own experience maps):

- What is a Customer Experience Map? How to Create an Effective Customer Experience Map?
- The Ultimate Guide to Creating a Customer Experience Map

Conclusion

As we said at the outset: designing a course that best fits the needs of learners requires both an understanding of who the learners are, as well as actual efforts to evaluate and understand their needs. We reviewed both conceptual issues that concern learner analysis as well as practical approaches you can use to analyze actual learner needs.

At this point, the best the authors can offer is to wish you luck! Your learner analysis activities will lay a strong foundation for the rest of your project, and it is worth the time it will take to set your project off right.

Practice: Learner Analysis Design Project

This learner analysis design exercise provides an opportunity to apply knowledge gained from this chapter. Imagine, you have been hired by a company based in New York City to design a Security Awareness course that teaches newly hired and senior employees to identify and prevent security breaches. The course focuses on teaching the company's staff the different types of security awareness, email and phishing attacks, malware, ransomware, social media awareness, and password security.

For your project you must do the following:

1. Complete a full learner analysis worksheet.
2. Complete a learner-centered design process based on the description of the course.
3. Develop two learner personas for the course.

Upon completing the project, share and discuss with others how you completed the learner analysis worksheet, how you developed the user-centered design and what resources were used to create the personas.

This exercise is meant to help you consider learner analysis from a practical perspective. However, realize that every company has their own style of course design for their employees, and their own methods for conducting learner analysis. While the principles discussed in this chapter should remain the same, the ways they are applied within any instructional design organization may vary. Despite this variety of approaches, our goals remain the same: all instructional designers agree on the important need to understand and empathize with learners in order to create instruction that best meets their needs.

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Activity Theory as a Lens for Developing and Applying Personas and Scenarios in Learning Experience Design

Matthew Schmidt & Andrew A. Tawfik

Introduction

The field of instructional design has experienced a number of shifts that have influenced its focus, methods, and identity, ultimately reshaping and redirecting the field. Gagné's concept of instructional systems design gave way to the now-common moniker of instructional design, which in turn has been supplanted by the term learning design. These changes in terminology historically have been predicated by broader shifts in the philosophical underpinnings of the field. The roots of instructional systems design can be found in behaviorist theories of knowledge acquisition (Gagné & Briggs, 1974), which eventually led to more cognitivist perspectives (Schuh & Barab, 2008), which in turn gave way in the early 1990s to more constructivist approaches (Honebein, 1996; Jonassen, 1991). This consequently signaled a shift from more objective epistemological views to an understanding of knowledge as more subjective and individualistic (Ertmer & Newby, 2013). With this came a recognition of the centrality of the learner to the learning process, and a move away from traditionally more instructor-centric approaches (e.g., Soloway et al., 1994). Key to learner-centric approaches is a recognition of the learner as central to the design process.

Theorists have increasingly begun to extend beyond cognitive and behavioral approaches to education and towards elements of human-computer interaction (HCI; Gray et al., 2020). More recently, theorists have begun to embrace elements of user experience (UX), which is used to design technologies in human-centered ways that are engaging, functional, and user-friendly (McLellan, 2000; Schmidt et al., 2020). Borrowing practices from user experience design (UXD) and applying them to learning design practice has led to productive application of associated methods and processes, with clear, practical value for the design of digital environments for learning (Dimitrijević & Devedžić, 2021; Haldane et al., 2019; Matthews et al., 2017; Shernoff et al., 2020). When UX methods are applied in the field of LIDT, the focus on the user of a technology system necessarily shifts to a focus on the learner-as-user of a given learning technology, e.g., learning management system, serious game, virtual learning environment, etc. (Jahnke et al., 2020). The learner experience (LX), therefore, can be characterized as an emergent quality influenced by many aspects of the learner's interaction with the given learning technology (Hassenzahl & Tractinsky, 2006; Schmidt & Huang, 2021). These include ease-of-use, appeal, context of application, learner's goal orientation, etc.

There is little argument that digital environments for learning should be designed in a way that effectively embodies learning theory and facilitates meaningful learning. However, designs of many existing digital environments for learning are conceived primarily from the perspective of a siloed learning theory. All too often, designers of such systems fail to consider the broader notion of LX (Gray, 2016). This is not to suggest a lack of expertise, but rather that considerations of LX from this more holistic lens has not been a central focus. This could be due to a myriad of challenges, including limited budgets, protracted timelines, a lack of buy-in with stakeholders, and so-on. Applying a siloed, narrow view of learning design introduces the risk of developing a digital environment for learning based on sound theory (e.g., cognitive load, cognitive flexibility) that lacks sufficient consideration of issues that are traditionally seen as more relevant to the field of HCI, for example, fluid navigation or minimalist design. This could lead to the design of a digital environment for learning that conveys the technical aspects of a content area, but is not necessarily enjoyable, pleasing, or easy to use. A purely theoretical orientation to design in itself might not take into account the myriad of variables that can influence a learner's individual experience while engaged in technology-mediated learning. For example, an interface, online course, or learning module that is difficult to use could impact learners' acceptance and perceived utility of the technology (Venkatesh et al., 2003) and ultimately could impede learning.

Learning designers are confronted by challenges on a range of fronts when attempting to apply UXD methods to learning design. One of the issues has to do with the lack of clarity around the concept of learning experience design (LXD). In the field of HCI, the term UX has become common parlance, although it is not well understood (Law et al., 2009). This is perhaps because UX consists of multiple variables that are not agreed-upon or consistently considered and because it lacks a coherent unit of analysis. In this sense, a parallel can be drawn between UX and LXD, in that terms and concepts related to LXD abound in practice, despite the lack of clear definitions and methodological frameworks (Schmidt & Huang, 2021).

Another challenge in LXD is how to contextualize individuals as they employ learning technologies. However, studies show that designers struggle regarding how to design the context that embodies the experience of users. In the realm of UX design, practitioners will often develop personas and scenarios to provide design context. These methods are equally valuable in learning design, as it is often difficult for designers to remain cognizant of the emergent needs of learners as they navigate the learning space, work with peers, and perform other learning tasks. Personas, in general, are archetypes of users who might employ the technology within their specific usage context (Miaskiewicz & Kozar, 2011). In learning design, specifically, personas are archetypes of learners who might engage in a learning activity using a learning technology (e.g., LMS, mobile app, serious game). Scenarios are narratives that describe user activity in a story format (Carroll, 2000). Both scenarios and personas can be incredibly valuable when employed for learning design.

We argue that personas and scenarios are a useful tool for situating learning designs within the lived experiences of individual learners. Traditionally, learner analysis and context analysis are recognized as critical aspects of instructional design . Articulating learner and contextual characteristics and deriving learner needs is most often performed within the context of front-end analysis. However, approaches to learner and contextual analysis can be quite general. Learner analysis methods tend to characterize learners based on measures relevant to a given content area (e.g., reading level, attendance, quiz results, performance metrics) and often are garnered through indirect means, for example from grade rosters or from interactions with subject matter experts (SMEs). Contextual analysis tends to take a narrow view, focusing primarily on the immediate context of learning (e.g., school, training program, etc.) as opposed to a broader conceptualization that might consider social, physical, and political factors. However, context plays a critical role in understanding the broader ecosystem that encompasses learning (Tessmer & Richey, 1997). Contextual factors are fundamentally and inextricably interconnected with learner considerations, such as prior knowledge, common experiences, shared social mores, etc. (Smith & Ragan, 2005). Socio-cultural factors shape cognition (Järvenoja et al., 2015), influence recall of prior knowledge and enhance meaning (Shepherd, 2011), and can promote transfer of knowledge and skills to novel situations (Tessmer & Richey, 1997). Our field has accepted that learners' operate and engage in meaning-making as negotiative practice within socio-cultural contexts (Brown et al., 1989). Indeed, "acts take their meaning in relation to the social worlds (or communities of practice or activity systems) in which individual actors participate and to the actors' positions or identities in those contexts" (Nolen, 2020, p. 1). Design methods that lead to deeper considerations of individual learners and take into account the broader socio-cultural ecology in which meaning-making is situated therefore could provide useful tools for instructional designers seeking to advance more learner-centered methods. To this end, personas and scenarios are promising; however, how they are situated more broadly within a design ecology must be articulated, which we discuss later in this paper.

The purpose of the current article is to highlight how one theoretical perspective that finds resonance in LIDT—activity theory—can be applied synergistically with specific methods of UXD—personas and scenarios—to inform the design of digital environments for learning. We argue this synergy allows for embodiment of theory while concurrently promoting positive learner experiences. Activity theory provides parameters for contextualizing technology usage within a framework that not only considers the interaction of the learner with the technology tool, but also the broader context within which that interaction takes place. In the following sections, we briefly describe activity theory and how it informs iterative design of digital environments for learning in a UCD process. Real-world case examples from our own learning design practice are provided. We conclude with a discussion of implications, and consider how similar approaches might be adopted by others in the field.

Activity Theory

Understanding learners' experiences when engaged in technology-mediated learning could benefit from a more holistic perspective of HCI (Barab et al., 2004; Nardi, 1996). One theory that finds resonance in both HCI and LIDT is activity theory. Activity theory argues that activity and consciousness are dynamically and inextricably interrelated. The theory considers the broader context and culture from which learning emerges, and thus has important implications for describing how learners think and reason within the world around them, how they engage in meaning-making, and how they develop understanding within their social context. In the field of LIDT, Jonnasen and Rohrer-Murphy (1999) explained it thusly: "conscious learning emerges from activity (performance), not as a precursor to it. So activity theory provides us with an alternative way of viewing human thinking and activity" (p. 62). From an activity theory perspective, actions are purposeful, social, mediated, multilevel, and developed through interaction between subjects and the objective world (i.e., objects). In doing so, activity theory explicates a variety of constructs to detail how an individual uses tools within an activity system and social context to engage in goal directed behavior (see Figure 1). From an end-user perspective, activity theory describes the individual and his/her role as it relates to the intersection of tasks (activity) and group-level work (action). As s/he completes a given task with available tools, s/he engages in goal-directed behaviors through established rules, such as norms and processes. Alternatively, the community can connect to the object through division of labor (Yamagata-Lynch, 2010). The theory is thus descriptive in that it takes into consideration how individuals (a) manage the contextual constructs of division of labor, rules, and community and (b) employ technology for achieving specific outcomes.

Activity theory includes multiple LXD implications for designers of learning environments. First, activity theory as applied to LXD details explicit constructs important to the learning context, in juxtaposition to approaches that might focus more on a content-driven approach to learning design (e.g., flipped classroom). Rather than viewing content as a body of knowledge to be transmitted to the learner and subsequently attained, the cultural constructs of activity theory describe the broader context in which knowledge construction takes place. It follows that understanding this phenomenon requires one to critically consider the artifacts and technology that mediate that learning process (Kaptelinin & Nardi, 2018; Yamagata-Lynch, 2007) and how those constructs are situated and interoperate within elements of the activity system. Technology, therefore, is not only an instrument available to a learner for completing an action, but also plays a role in allowing meaning-making to emerge within a community (Barab et al., 2004). Therefore, meaning-making is not only an individual endeavor, but is also an emergent property of the entire activity system.

Figure 1

Activity system diagram

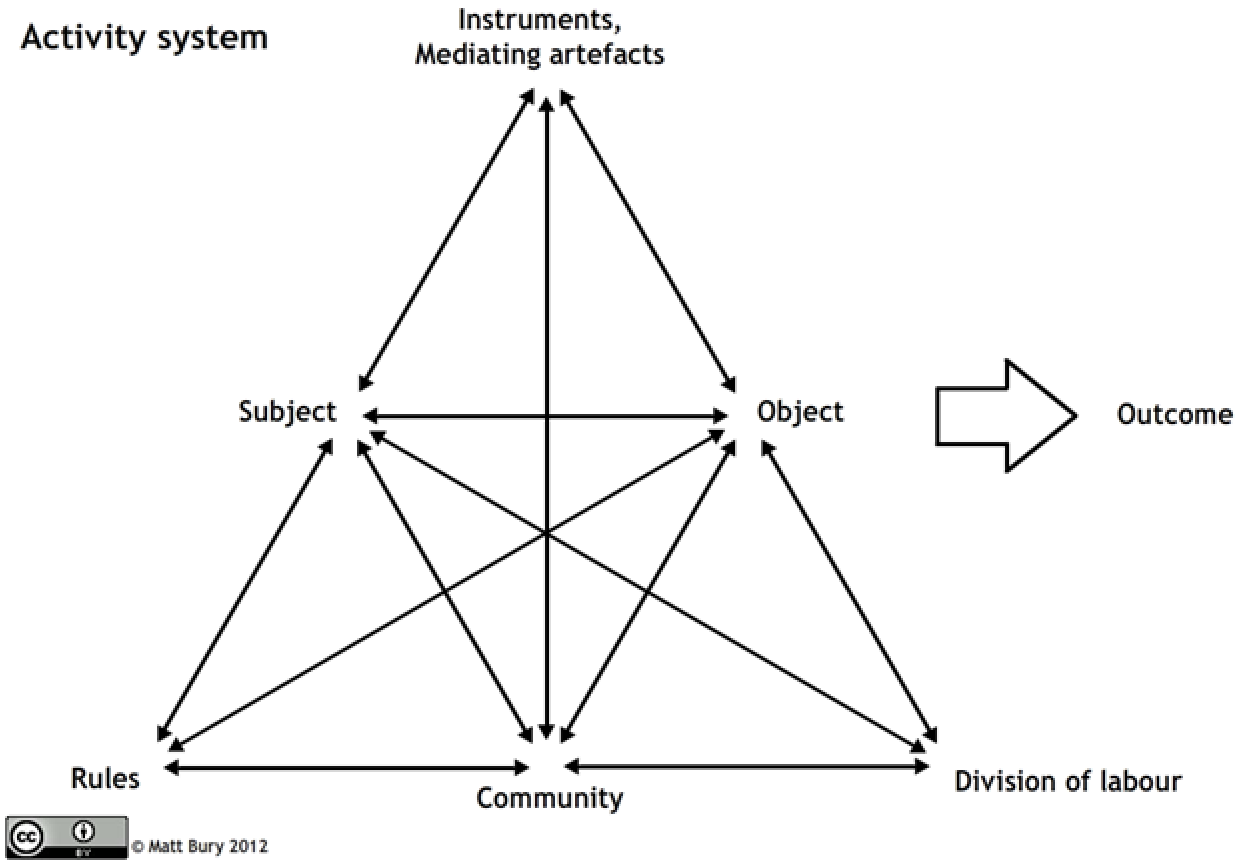


Diagram of an activity system as conceptualized by Engeström, illustrating connections between subject, instruments, object, and outcome, as well as rules, community, and division of labor.

(Engeström, 2000). CC BY 2.0.

Although most learning designers consider learners from the perspective of needs assessment, consideration is largely absent in learning design of how learning activities connect with the broader bounds of the learning community (Gray et al., 2020; York & Ertmer, 2011). Given activity theory's emphasis on activity as a multifaceted and mediated phenomenon between the subject, tool and object, it "prompts the designer to look beyond the immediate operation or action level and to understand the use of the designed tool in terms of the more comprehensive, distributed, and contextualized activity. This shift places emphasis on understanding not simply the subject but the entire context" (Barab et al., 2004, p. 203). As opposed to a narrow view of embodying a specific theory or model within a technology interface (e.g., cognitive load theory; ARCS model), an activity theory lens considers requisite technology features for affording specific actions towards learning goals, including how to interact with peers and share responsibility for tasks. Moreover, it allows designers to consider how implementing and/or changing technology tools might impact social dynamics and the learning process. Adoption of an activity theory lens by learning designers, therefore, has the potential to promote a more holistic and comprehensive view of learning as goal-oriented meaning-making activity, mediated by technological tools, and circumscribed by the broader context of the learning community, its rules, and its division of labor.

Development and application of personas and scenarios using activity theory

Designers of learning environments often approach development from a learning theory perspective to engender self-directed learning, motivation, and other learning outcomes. However, socio-cultural approaches suggest that designers of these environments should not only consider theories that circumscribe our understanding of learning, but also the broader contexts in which learning occurs (Jonassen et al., 1994). Activity theory explicates how learners might operate and navigate activity during a social learning process, thus aligning with theories rooted in Vygotskian social constructivism (Vygotsky, 1978) such as distributed cognition or situated learning theory. Therefore, activity theory could prove to be a useful tool for learning designers when applied in conjunction with established design practices (such as in the development and application of personas and scenarios) to elaborate the broader ecology of learning with technology. As it relates to LX and personas, activity theory can provide a more comprehensive understanding of how learning technology is used, by whom, under what conditions, with what kinds of supports, and for what kinds of outcomes. This provides a lens for designers to consider a broad range of issues towards the development of a learning environment that considers not only effectiveness, but also efficiency and appeal (Honebein & Honebein, 2015). In the following sections we provide case examples detailing this.

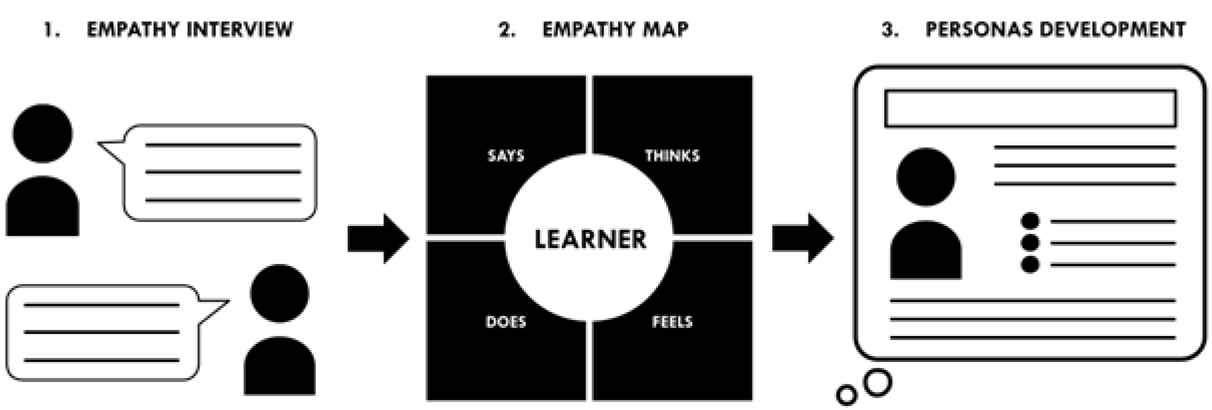
Case 1: Supporting Mobile Health Design Using Personas

Designing learning experiences within health contexts presents unique challenges. Learners are often patients with health conditions that impact their quality of life and general well-being. Stakes can be high, for example, for someone recently diagnosed with diabetes learning to take medications regularly to control debilitating symptoms, or for someone after sustaining a concussion learning how to gradually return to activities to improve recovery. However, learning designers seldom have direct experience with the myriad of health-related issues they may encounter in practice. Similarly, the SMEs with whom learning designers might collaborate (e.g., physicians, nurses) may have deep domain knowledge and practice-based experience but be professionally distant from the lived experiences their patients might face. In this case study, we describe how we used personas within our own design practice to promote empathy with patients and to better understand how we could design more holistically so as to meet their learning needs within their socio-cultural contexts.

Mobile health (mHealth) is defined as “the use of mobile computing and communication technologies in health care and public health” (Free et al., 2010, p. 1). mHealth applications have been shown to improve healthcare by reducing costs, promoting accessibility, and improving individualized treatment (Steinhubl et al., 2013). Increasingly, human-centered design approaches are being adopted to develop mHealth interventions, commonly referred to as patient-centered design (Chiauzzi et al., 2020; Hernandez-Ramos et al., 2021). Within this context, personas are often developed to guide design (Ayubi et al., 2014; Haldane et al., 2019). In our own mHealth design practice, we apply human-centered design methods within the frame of LXD. Our LXD process utilizes personas to guide mHealth design. Developing personas begins by performing empathy interviews with representative patients. Interviews are then transcribed, and salient quotes and topics are categorized using affinity mapping techniques (Lepley, 1999). These affinity maps are then used as inputs for developing patient personas (Figure 2), a process that bears some similarity to that described in Siricharoen (2021).

Figure 2

Process of creating personas through distillation of empathy interview data using empathy mapping techniques



Process model diagram illustrating how personas can be created using empathy interviews and empathy maps

Our process of developing personas follows design thinking processes (Chokshi & Mann, 2018; Ector et al., 2020) that begin with empathy interviews and are followed by empathy mapping (Klamerus et al., 2019; Weijers et al., 2021). Although techniques such as empathy interviews, empathy mapping, and development of personas are widely used methods in UXD and design thinking circles, application of empathy methods in the field of learning design is less prevalent, but has garnered some attention both in research (e.g., Mehta & Gleason, 2021; Morel, 2021; Tracey & Hutchinson, 2019) and in practice (e.g., C. Gray et al., 2015; Matthews et al., 2017). Empathy interviews and empathy mapping are methodological tools that provide a means to learn what is important to learners, to reveal emotional and perhaps tacit insights, to explore behaviors, needs, and challenges, and ultimately to develop a deep understanding for the daily lived experiences of target learners. Empathy interviews take the form of a series of open-ended questions tailored to the situation and target users. In general, empathy interviews are one-on-one conversations that elicit stories about specific experiences of interviewees. Although interview questions are personalized, following a protocol helps interviewers advance "the principles of being intentional, human-centered, and equity-focused" (Nelsestuen & Smith, 2020, p. 2). Different from other types of interviews, empathy interviews aim to promote empathy, which requires interviewers to immerse, observe, and engage during the interviews (Doorley et al., 2018).

To distill key information from empathy interviews into discrete categories, we employ empathy mapping techniques. Empathy mapping was originally developed as a tool for gamestorming (D. Gray et al., 2010). To create an empathy map, learning designers categorize interview notes based on what the interviewee was saying, doing, thinking, and feeling. The newly organized information helps designers focus on the interviewee's emotions and experiences—central elements of human-centered design. Figure 3 presents an example empathy map developed in the context of blood glucose management for type 1 diabetes.

Figure 3

Empathy map developed in the context of type 1 diabetes management

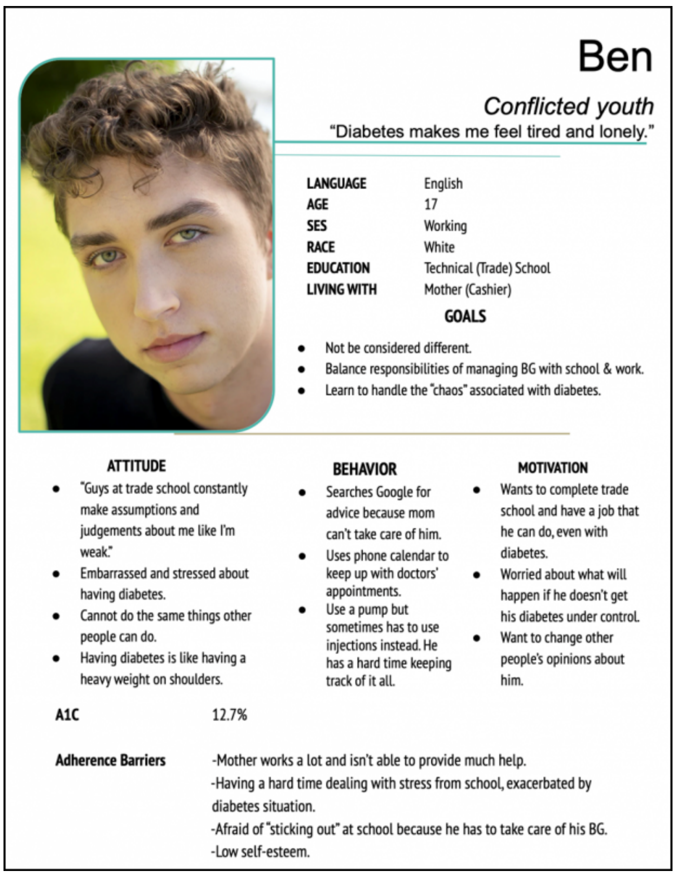
11.27.19 **Say**	**Do**	**Pain**
"Don't know where I belong" "I often react and deal with things as they come up." "When I 'Get the job done' I feel accomplished." "Thankful" "2 years after my diagnosis, I went very low and was in and out of it. It was very scary."	Maintains a low-carb diet Uses Dexcom Continuous Glucose Monitoring System Tries to avoid lows and treats BG when in the 80s. Gets T1D information by searching Google or from providers Counts carbs using apps (e.g., Dexcom app) and Google	Random highs and lows Frequent BG checks
Think	**Feel**	**Gain**
Having T1D is chaotic Finding privacy (for checking BG) is hard People are judgmental and assume I don't eat healthy or take care of my health. Thinking about the possible negative outcomes motivates to care for diabetes	Different, anxious, stress When having a **good** day (checking BG and using less insulin), feels proud, accomplished, rewarded, and excited. Feeling motivated and accomplished helps with managing T1D. When having a **bad** day (not checking BG enough and being high), feels stress, panic, unorganized.	Mother's support

Example empathy map showing four quadrants, labeled "say," "think," "do," and "feel"

Following empathy interviews and empathy mapping, personas are developed. Within our three-stage process, personas are essentially artefacts of empathetic understanding that can be continually referenced across design phases. The multi-stage process of developing personas serves multiple purposes from a learning design perspective. First, the process brings the designer directly into contact with representative members of the target population and requires the designer to engage in deep, personal questioning so as to elicit aspects of everyday life and lived experiences of the people for whom the intervention is being developed. Next, because patients often relay intensely personal and challenging vignettes from their lives and how their quality of life has been impacted by health-related challenges, the experience can be visceral, emotional, and sometimes painful—descriptors that are not often associated with learning design. By eliciting participant narratives of lived experiences, learning designers are provided a lens through which empathy can develop, that is, they can develop shared understanding and experience with target learners by intentionally seeking to uncover details about other people's situations, feelings, and lived experiences. Finally, empathy interviews can serve as a conduit that can promote the emotional disposition of empathetic concern (Warren, 2018) and the cognitive dimension of perspective-taking (Gasparini, 2015) for LX designers. An example persona is provided in Figure 4.

Figure 4

Example persona of "Ben," an adolescent with type 1 diabetes who is struggling to manage his blood glucose levels

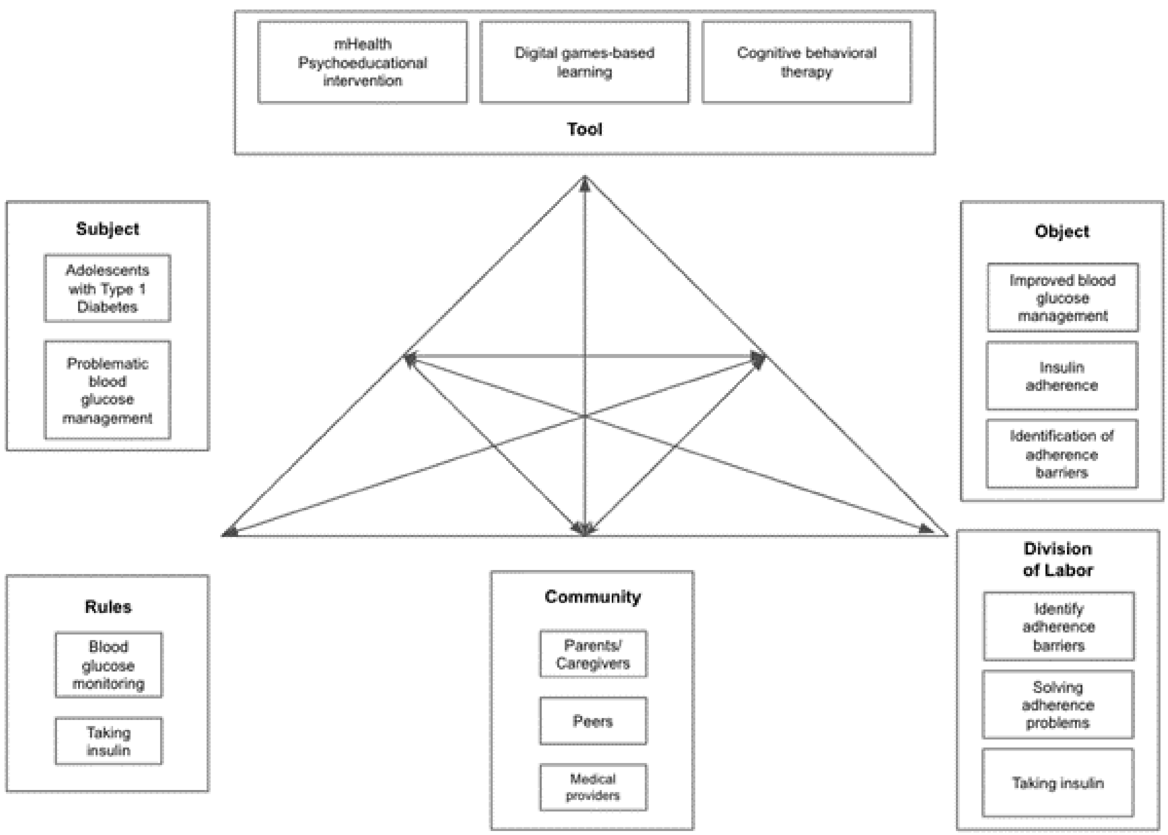


Example persona of a fictional user named Ben, an adolescent with diabetes. Persona includes information on demographics, attitude, behavior, motivation, and adherence barriers

Having established our process of persona development within the context of mHealth design, we now turn to theoretical considerations. Specifically, we consider how personas help to frame learning design from an activity theory lens. Different aspects of activity theory provided inputs for development of empathy interviews, so as to uncover aspects of lived experience that may be more tacit. For example, in type 1 diabetes blood glucose management, identification of subjects, tools, and objects is rather straightforward. However, consideration of rules, community, and distribution of labor unveils challenges that interrelatedly complicate blood glucose management. For example, we learned from empathy interviews that supporting insulin adherence is a community endeavor with multiple subjects involved, including parents/caregivers, healthcare providers, and peers, and that division of labor requires effective communication, often supported by a range of technologies. How this manifests is highly individualized and often develops unintentionally based on reaction to emergent challenges. This, in turn, results in localized rules that often are tacit and sometimes ineffective. Drawing an example from the persona in Figure 4, Ben's mother is supposed to remind Ben before school to check his blood sugar and take insulin, but she sometimes is at work and is unable to remind Ben. Not only does this result in undesirable outcomes related to taking insulin, this simple deviation resonates across the entire activity system in unpredictable ways, which potentially can amplify these undesirable outcomes. This has ramifications for learning design, and provides an opportunity for learning designers to consider not only how interventions can be designed to ameliorate these issues, but also how the intervention influences not only the outcome of potentially improved medication adherence, but also communication between subjects (community), making rules explicit and applying them with fidelity (rules), and understanding who is responsible for what (division of labor).

Figure 5

LXD of Diabetes Journey learning environment through lens of activity theory



Activity theory diagram that has been annotated with specific details from the Diabetes Journey case example

Case 2: Supporting Case Library Design Using Scenarios

The case of Nick's Dilemma illustrates how a learning environment can be designed based on sound theoretical foundations, but nevertheless fail to be used effectively due to insufficient consideration of how learners would interact with the technology within their specific learning contexts. The authors of this chapter were involved in a multi-phase, design-based research project to develop an online case library that would support learners in problem-based learning (Schmidt & Tawfik, 2018; Tawfik & Jonassen, 2013). In this problem-based learning (PBL) environment, the student reads about how the protagonist, Nick, must hire a new individual for his sales team with his boss, Sheila. The ill-structured problem outlines how Nick and Sheila are under intense pressure as they increasingly lose customers to market competition. The learner is confronted with three potential solutions to mitigate turnover within their medical device sales team. The learner can either (1) hire an internal candidate, (2) hire an external candidate, or (3) advertise the position again in a local newspaper. Each option has a range of benefits and drawbacks that the learner must identify and consider in making a decision.

The design team used the theoretical lens of case-based reasoning (CBR) to support novices as they used the PBL environment, a theory that rests on the notion that individuals use prior experiences stored in long-term memory to solve new problems. When an individual lacks any relevant prior experience to reference, they can be provided curated stories from a database (called a 'case library') to serve as 'vicarious memory' (Kolodner & Guzdial, 2000). According to CBR theory, learners read these digital cases and then apply the lessons learned towards the main problem to solve (Riesbeck & Schank, 2013). A CBR approach to PBL therefore mitigates a novice's experiential gap and uses similar cases as scaffolds from which learners can draw lessons learned (Tawfik & Kolodner, 2016).

The design team did not explicitly develop personas during their design, but instead inferred what a typical user would be like from needs assessment. Findings from needs assessment suggested that learners were upper-level juniors and seniors enrolled in a postsecondary Sales Management course at a large midwestern university. Conversations with the SME unveiled a concern that learners were too focused on finding the "right" answer while meeting the minimum requirements of a given assignment, which led the SME to believe the students lacked the critical thinking skills needed for entering the workforce. From this, the designers inferred that the "typical learner" would be a college student enrolled in the marketing class. This learner would use the learning environment as intended to access a set of hyperlinked cases to solve the problem faced by Nick and Sheila. By providing learners with cases, they would be able to encounter "vicarious memories" that would provide a stand-in for the real-world experience that the SME felt was lacking.

While the learning environment was designed to align with many aspects of case-based reasoning, the assumed student persona lacked sufficient detail to consider how the learning environment would be used in context. Specifically, we failed to consider the process of learning with PBL, group dynamics, classroom culture, and other factors. Again, activity theory allows us to construct a scenario for the persona. To re-imagine this persona and scenario through activity theory, the learner (subject) attempts to resolve the problem faced by Nick and Sheila (objective). Given that the students had little or no experience, the database of related stories (case library) serves as the tool needed to help accomplish the task. Upon reflection, the top half of the activity pyramid (subject, object, tool) is well articulated and described by the lense of activity theory.

While the interface technically aligned with the tenets of CBR, activity theory articulates ways to situate the persona within the scenario as it relates to the rules, division of labor, and community within the activity system (Figure 5). For example, an important aspect of engaging in PBL includes the importance of learning from peers. However, our design failed to include any features that would support division of labor. If we evaluated our student persona and scenario through the lens of activity theory, we might have included features that supported collaborative learning and division of labor, including assigned tasks (e.g., information gathering), shared tasks, and artifact sharing. As it stood, students had to leverage other resources outside the learning environment to manage the division of labor, which could have presented challenges from a learning experience design perspective.

Consideration of our student persona through activity theory constructs identify other opportunities to improve the design. In this activity system, the community includes existing peer groups and classroom culture. The class was structured such that learners were assigned to groups near the beginning of class as they worked with their peers, which helped develop a smaller community among two to three peers. There was also the broader learning community of the business school, which emphasized portfolios and preparation for the business setting. If we had considered this as part of our persona and design, the learning technology could have included options to publish to their portfolio or possibly microcredentials/badges that reinforced the culture of the business school

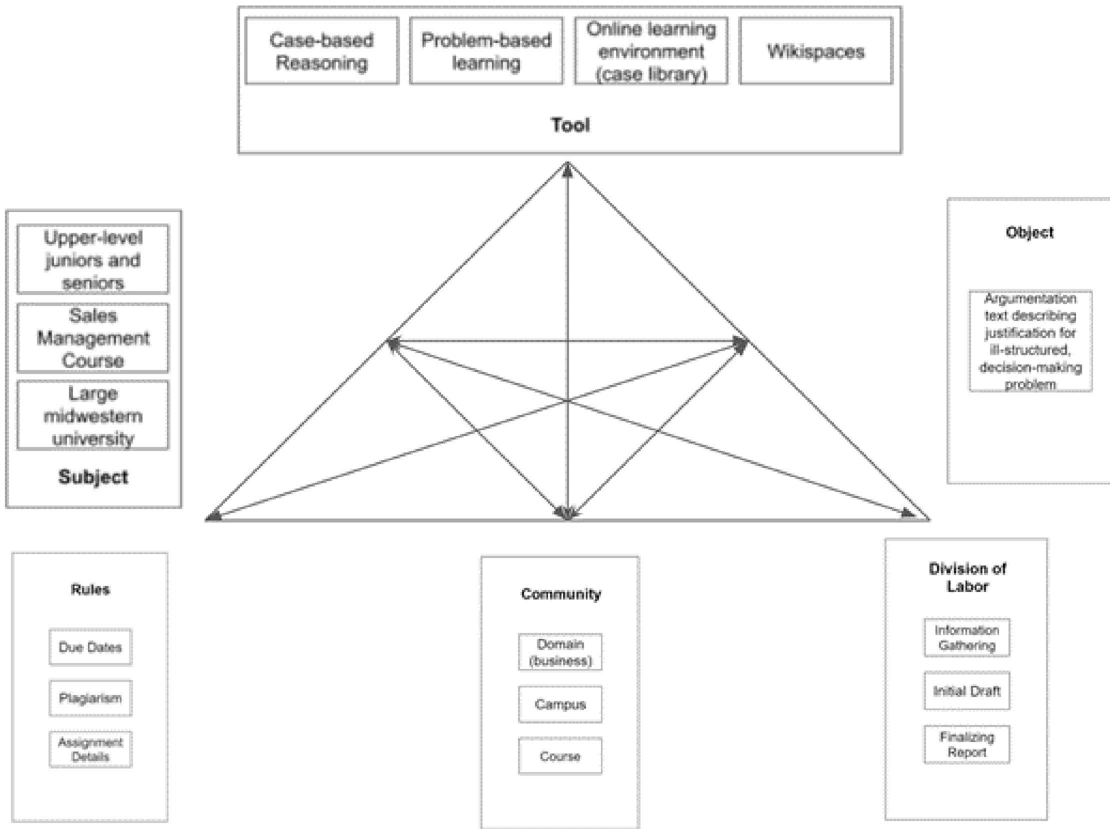
Finally, activity theory also highlights the importance of rules. There are rules about university-wide initiatives (course conduct), but also rules on the course level rules related to due dates. We found that learners were especially mindful of the due dates for the final assignment, but this was not always easy to access and created unnecessary clicks to find this information within our initial design. There were additional rules about the assignment, such as the length and format, which required students to access. Other tangential rules applied, such as plagiarism, were not explicitly described within our learning environment.

In this instance, a scenario using activity theory could be as follows:

> *"On Monday, Javy opens up his assignment tab in his LMS and noticed a newly assigned task from his instructor. As he reads the description, he notices that he needs to work with his assigned classmates and submit a two-page argumentative essay. It seems as though there are more details when clicking on the link, which he does.*
>
> *The main page has narrative at the top and directions on the bottom, such as how long the essay is and when to turn things in. The narrative says two weeks, although he's trying to line that up with the due date listed in the LMS. At the same time, he's not quite clear about whether or not he has to cite sources like he did with his prior assignments and classes in the business school.*
>
> *As he opens the screen, he reads the main problem to solve as it details Sheila and Nick must make a decision about how to build their sales management team. Throughout the narrative he also notices hyperlinks at what seems to be important decision points such as considering prior experience, hiring from within, or considering alternate individuals from outside the company. It's not totally clear, but it seems like the related cases are connected around these big ideas. By the time he's read the fourth case, he's frustrated because he's constantly hopping back and forth across the different tabs.*
>
> *After he reads the problem to solve and related cases, he meets with his other group members (Taylor and Jaren). Taylor offers to read the cases and make a bullet point summary for each one, while Jaren offers to look for some additional sources such as his textbook. It's a little unclear how they will share the resources at first, but eventually they decide to each upload a document to cloud storage and they will try to reconcile what has been learned across the various sources. Because this is an online course, they'll mostly share their ideas via the class discussion board. Once that is done, Javy offers to draft an initial version of the argumentation essay and then share it for his peers to view. Once they review, he double checks the assignment again as to whether one person needs to submit it or if each individually has to submit. Finally, he uploads an additional copy for the business portfolio that he needs to submit to the College of Business prior to graduation.*

Figure 6

LXD of Nick's Dilemma learning environment through lens of activity theory



Activity theory diagram that has been annotated with specific details from the Nick's Dilemma case example

Whereas our initial design was focused on a learner (subject) employing the case library (tool) to submit an argumentative essay (objective), an activity theory-driven persona and scenario could have caused us to consider easy access of the assignment description to minimize unnecessary navigation. The interface could have also linked to additional rules, such as plagiarism and due dates, that were already established. In doing so, this would have allowed us to expand beyond a siloed understanding of the persona and thus allow the design team to better consider the overall learner experience.

Conclusion

As educators increasingly employ technology to support learning, there is a need to design and develop tools that effectively support the knowledge construction process. In many cases, theories that guide LX are rarely prescriptive and only recently emerging, therefore specific guidance for how they might be applied to design is lacking. While previous approaches may be content-driven (e.g., flipped classroom) or informed by theory (e.g., cognitive load), they may not consider the full extent of the learning experience design. Determining how to balance educational theory inspiration with the broader learner experience is ultimately left to the discretion of the learning designer. This is an area in which learning designers potentially can benefit from UXD methods and processes. Indeed, some learning designers have begun to adopt these methods. However, research suggests that learning designers tend to incorporate UXD methods and processes in ways that are incomplete and rudimentary. For example, learner personas might be developed, but then never referenced or used to inform design. UXD processes like wireframing or rapid prototyping might be employed, but without evaluating the designs with actual learners. Learning designs might be evaluated, but in simplistic ways such as quasi-expert review or other ad-hoc approaches. More robust processes are available, but are not often used.

One way to enhance the socio-technical design of learning environment is by espousing a human-computer interaction perspective, which allows us to not only consider what the s/he is learning, but the unique interactions that impact their learning process. HCI perspectives explicate methodologies and issues related to usability, but they also detail broader socio-cultural context of the user. To date, activity theory has been used to describe how individuals work together in many collaborative learning contexts. This theory further posits that individuals (subjects) seek out context-specific tools to achieve targeted tasks (object). However, the subject does not complete this task in isolation; rather, they different tools to complete the activity within their settings. Activity theory further outlines how s/he is connected to a social group as they complete said activity, which are often then used to divide responsibilities among the group members (division of labor) (Engeström, 2017; Sannino & Engeström, 2017). Finally, rules are the informal and formal regulations that govern the task and group dynamics (Yamagata-Lynch, 2010), which are used to describe the importance of social learning and peers scaffolding (MacLeod & van der Veen, 2020).

We argue that the constructs detailed in activity theory can address some of the challenges that designers face, especially as it relates to creating personas and the scenarios where learning takes place. Indeed, Gray (2016) cautioned that "even when designers believed in the value of personas, they did not use this perspective in their visible design processes. What this might suggest is some disjuncture between reported use of methods and the actual design activity" (p. 4045). The literature suggests problems arise because personas are often ill-defined (Chang et al., 2008), lack clarity (Holden et al., 2017), and used in ways not directly tied to design (T. Matthews et al., 2012). Using activity theory to construct scenarios for personas can help elucidate some of the contextual considerations of how a user engages in the learning process with technology. Activity theory applied to personas can develop scenarios that highlight the role of technology, but also the user's community, rules, and division of labor where the learning takes place. By detailing a more holistic context of the learner, design approaches that utilize activity theory can thus be used as a mechanism to identify limitations and improvements for digital learning environments. In doing so, designers can develop environments that better consider learner's dynamic interactions within their socio-cultural context.

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(Supplement) Personas for Course Design

Elisabeth McBrien & Heather Garcia

This resource is available at the following link:

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Module 4: Design Thinking and Rapid Prototyping

Module 3 readings are provided in this section.

Design Thinking

Vanessa Svihla

Editor's Note

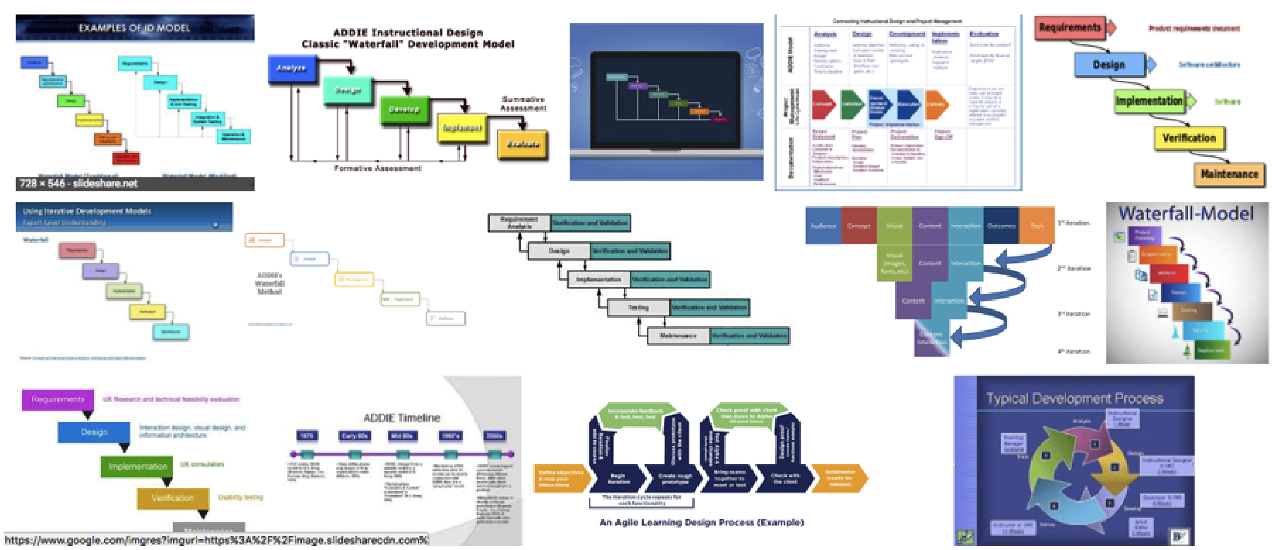
This is a condensed version of a chapter originally published in the open textbook Foundations of Learning and Instructional Design Technology. It is printed here under the same license as the original.

Introduction

Many depictions of design process, and a majority of early design learning experiences, depict design as rather linear—a "waterfall" view of design (Figure 1). This depiction was put forward as a *flawed* model (Royce, 1970), yet it is relatively common. It also contrasts with what researchers have documented as expert design practice.

Figure 1

Google Image Search Results of Design as a Waterfall Model



Fortunately, as instructional designers, we have many models and methods of design practice to guide us. While ADDIE is ubiquitous, it is not a singular, prescriptive approach, though it is sometimes depicted—and even practiced—as such. When we look at what experienced designers do, we find they tend to use iterative methods that sometimes appear a bit messy or magical, leveraging their past experiences as precedent. Perhaps the most inspiring approaches that reflect this are human-centered design and design thinking. However, most of us harbor more than a few doubts and questions about these approaches, such as the following:

- Design thinking seems both useful and *cool*, but I have to practice a more traditional approach like ADDIE or waterfall. Can I integrate design thinking into my practice?
- Design thinking—particularly the work by IDEO—is inspiring. As an instructional designer, can design thinking guide me to create instructional designs that really help people?
- Given that design thinking seems to hold such potential for instructional designers, I want to do a research study on design thinking. Because it is still so novel, what literature should I review?
- As a designer, I sometimes get to the end of the project, and then have a huge insight about improvements. Is there a way to shift such insights to earlier in the process so that I can take advantage of them?
- If design thinking methods are so effective, why aren't we taught to do them from beginning?

To answer these questions, I explore how research on design thinking sheds light on different design methods, considering how these methods originated and focusing on lessons for instructional designers. I then share a case to illustrate how different design methods might incorporate design thinking. I close by raising concerns and suggesting ways forward.

What is Design Thinking?

There is no single, agreed-upon definition of design thinking, nor even of what being adept at it might result in, beyond *good design* (Rodgers, 2013), which is, itself, subjective. If we look at definitions over time and across fields (Table 1), we see most researchers reference design thinking as methods, practices or processes, and a few others reference cognition or mindset. This reflects the desire to understand both what it is that designers do and how and when they know to do it (Adams, Daly, Mann, & Dall'Alba, 2011). Some definitions emphasize identity (Adams et al., 2011), as well as values (e.g., practicality, empathy) (Cross, 1982). In later definitions, design thinking is more clearly connected to creativity and innovation (Wylant, 2008); we note that while mentioned in early design research publications (e.g., Buchanan, 1992), innovation was treated as relatively implicit.

Table 1

Characterizations of Design Thinking (DT) Across Fields, Authors, and Over Time

Design research field characterizes DT (1992)	*IDEO president introduces DT to the business world, 2008*	*Stanford d.school (2012) & IDEO (2011) introduce DT resources for educators*	*Education researchers characterize DT for education research & practice, 2012*	*Design researchers continue to develop nuanced characterizations of DT in practice, 2013*
"how designers formulate problems, how they generate solutions, and the cognitive strategies they employ." These include framing the problem, oscillating between possible solutions and reframing the problem,	"uses the designer's sensibility and methods [empathy, integrative thinking, optimism, experimentalism, collaboration] to match people's needs with what is technologically feasible and what a viable business strategy can convert into customer	"a mindset." It is human-centered, collaborative, optimistic, and experimental. The "structured" process of design includes discovery, interpretation, ideation, experimentation, and	"analytic and creative process that engages a person in opportunities to experiment, create and prototype models, gather feedback, and redesign"	"a methodology to generate innovative ideas." These include switching between design tasks and working iteratively. (Rodgers, 2013, p. 434)

imposing constraints to generate ideas, and reasoning abductively. (Cross, Dorst, & Roozenburg, 1992, p. 4)	value and market opportunity." (Brown, 2008, p. 2)	evolution (d.school, 2012; IDEO, 2011)	(Razzouk & Shute, 2012, p. 330)

Additional Reading

For another great summary of various approaches to design thinking, see this article by the Interaction Design Foundation. This foundation has many other interesting articles on design that would be good reading for an instructional design student.

https://edtechbooks.org/-nh

Where Did Design Thinking Come From? What Does It Mean for Instructional Designers?

Design thinking emerged from the *design research* field[1]—an interdisciplinary field that studies how designers do their work. Initially, design thinking was proposed out of a desire to differentiate the work of designers from that of scientists. As Nigel Cross explained, "We do not have to turn design into an imitation of science, nor do we have to treat design as a mysterious, ineffable art" (Cross, 1999, p. 7). By documenting what accomplished designers do and how they explain their process, design researchers argued that while scientific thinking can be characterized as reasoning inductively and deductively, designers reason *constructively* or *abductively* (Kolko, 2010). When designers think abductively, they fill in gaps in knowledge about the problem space and the solution space, drawing inferences based on their past design work and on what they understand the problem to be

Lesson #1 for ID

Research on design thinking should inspire us to critically consider how we use precedent to fill in gaps as we design. Precedent includes our experiences as learners, which may be saturated with uninspired and ineffective instructional design.

A critical difference between scientific thinking and design thinking is the treatment of the problem. Whereas in scientific thinking the problem is treated as solvable through empirical reasoning, in design thinking problems are tentative, sometimes irrational conjectures to be dealt with (Diethelm, 2016). This type of thinking has an *argumentative grammar,* meaning the designer considers suppositional if-then and what-if scenarios to iteratively frame the problem and design something that is valuable for others (Dorst, 2011). As designers do this kind of work, they are jointly framing the problem and posing possible solutions, checking to see if their solutions satisfy the identified requirements (Cross et al., 1992; Kimbell, 2012). From this point of view, we don't really know what the design problem is until it is solved! And when doing design iteratively, this means we are changing the design problem multiple times.

Other design methods that engage stakeholders early in the design process, such as participatory design (Muller & Kuhn, 1993; Schuler & Namioka, 1993) and human-centered design (Rouse, 1991) have also influenced research on design thinking. While these approaches differed in original intent, these differences have been blurred as they have come into practice. Instead of defining each, let's consider design characteristics made salient by comparing them with more traditional, linear methods. These methods tend to be iterative, and tend to bring stakeholders into the process more deeply to better understand their experiences, extending the approach taken in ADDIE, or even to invite stakeholders to generate possible design ideas and help frame the design problem.

When designing *with* end-users, we get their perspective and give them more ownership over the design, but it can be difficult to help them be visionary. As an example, consider early smartphone design. Early versions had keyboards and very small screens and each new version was incrementally different from the prior version. If we had asked users what they wanted, most would have suggested minor changes in line with the kinds of changes they were seeing with each slightly different version. Likewise, traditional approaches to instruction should help inspire stakeholder expectations of what is possible in a learning design.

Lesson #2 for ID

Inviting stakeholders into instructional design process early can lead to more successful designs, but we should be ready to support them to be visionary, while considering how research on how people learn might inform the design.

Designers who engage with end-users must also attend to power dynamics (Kim, Tan, & Kim, 2012). As instructional designers, when we choose to include learners in the design process, they may be uncertain about how honest they can be with us. This is especially true when working with children or adults from marginalized communities or cultures unfamiliar to us. For instance, an instructional designer who develops a basic computer literacy training for women fleeing abuse may well want to understand more about learner needs, but should consider carefully the situations in which learners will feel empowered to share.

Lesson #3 for ID

With a focus on understanding human need, design thinking should also draw our attention to inclusivity, diversity, and participant safety.

We next turn to an example, considering what design thinking might look like across different instructional design practices.

Design Thinking in ID Practice

To understand how design thinking might play out in different instructional design methods, let's consider a case, with the following three different instructional design practices:

- Waterfall design proceeds in a linear, stepwise fashion, treating the problem as known and unchanging
- ADDIE design, in this example, often proceeds in a slow, methodical manner, spending time stepwise on each phase
- Human-centered design prioritizes understanding stakeholder experiences, sometimes co-designing with stakeholders

A client—a state agency—issued a call for proposals that addressed a design brief for instructional materials paired with new approaches to assessment that would be "worth teaching to." They provided information on the context, learners, constraints, requirements, and what they saw as the failings of current practice. They provided evaluation reports conducted by an external contractor and a list of 10 sources of inspiration from other states.

They reviewed short proposals from 10 instructional design firms. In reviewing these proposals, they noted that even though all designers had access to the same information and the same design brief, the solutions were different, yet all were *satisficing*, meaning they met the requirements without violating any constraints. They also realized that not only were there 10 different solutions, there were also 10 *different* problems being solved! Even though the client had issued a design brief, each team defined the problem differently.

The client invited three teams to submit long proposals, which needed to include a clear depiction of the designed solution, budget implications for the agency, and evidence that the solution would be viable. Members of these teams were given a small budget to be spent as they chose.

Team Waterfall, feeling confident in having completed earlier design steps during the short proposal stage, used the funds to begin designing their solution, hoping to create a strong sense of what they would deliver if chosen. They focused on details noted in the mostly positive feedback on their short proposal. They felt confident they were creating a solution that the client would be satisfied with because their design met all identified requirements, because they used their time efficiently, and because as experienced designers, they knew they were doing quality, professional design. Team Waterfall treated the problem as adequately framed and solved it without iteration. Designers often do this when there is little time or budget[2], or simply because the problem appears to be an *another-of* problem—"this is just another of something I have designed before." While this can be an efficient way to design, it seldom gets at the problem *behind* the problem, and does not account for changes in who might need to use the designed solution or what their needs are. Just because Team Waterfall used a more linear process does not mean that they did not engage in design thinking. They used design thinking to frame the problem in their initial short proposal, and then again as they used design precedent—their past experience solving similar problems—to deliver a professional, timely, and complete solution.

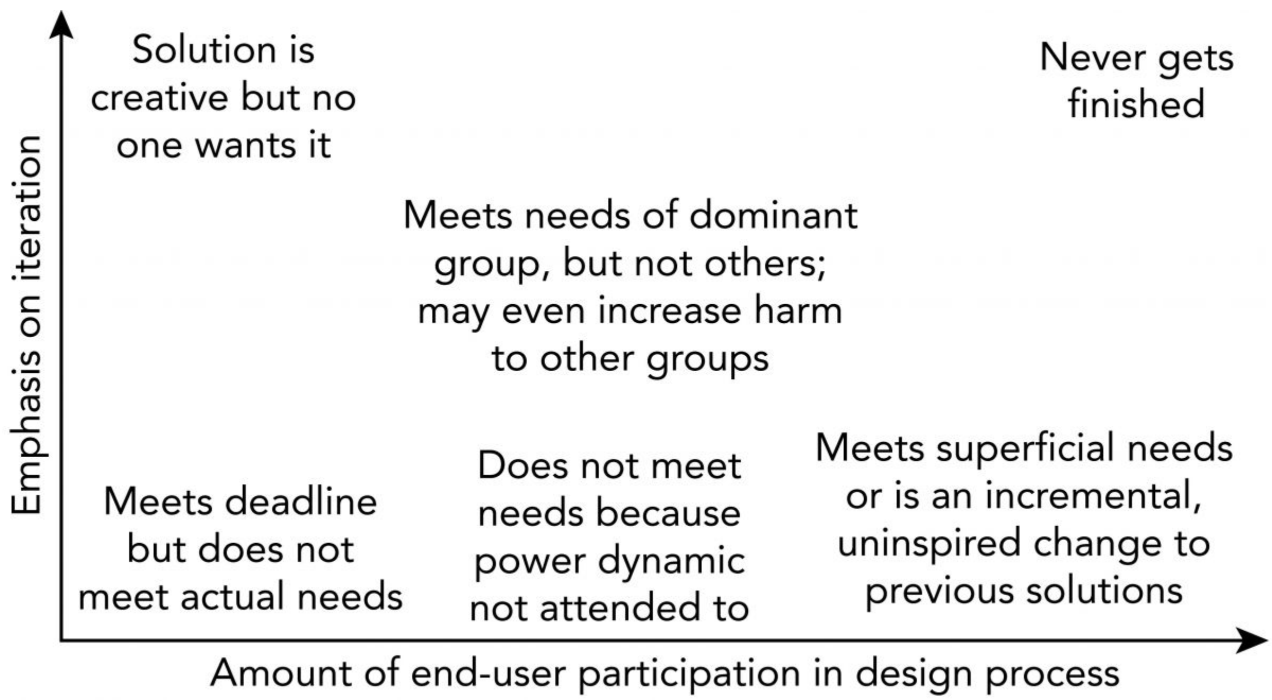
Team ADDIE used the funds to conduct a traditional needs assessment, interviewing five stakeholders to better understand the context, and then collecting data with a survey they created based on their analysis. They identified specific needs, some of which aligned to those in the design brief and some that demonstrated the complexity of the problem. They reframed the problem and created a low fidelity prototype. They did not have time to test it with stakeholders, but could explain how it met the identified needs. They felt confident the investment in understanding needs would pay off later, because it gave them insight into the problem. Team ADDIE used design thinking to fill gaps in their understanding of context, allowing them to extend their design conjectures to propose a solution based on a reframing of the design problem.

Team Human-centered used the budget to hold an intensive five-day co-design session with a major stakeholder group. Stakeholders shared their experiences and ideas for improving on their experience. Team Human crafted three personas based on this information and created a prototype, which the stakeholder group reviewed favorably. They submitted this review with their prototype. Team Human-centered valued stakeholder point of view above all else, but failed to consider that an intensive five-day workshop would limit who could attend. They used design thinking to understand differences in stakeholder point of view and reframed the problem based on this; however, they treated this as covering the territory of stakeholder perspectives. They learned a great deal about the experiences these stakeholders had, but failed to help the stakeholders think beyond their own experiences, resulting in a design that was only incrementally better than existing solutions and catered to the desires of one group over others.

The case above depicts ways of proceeding in design process and different ways of using design thinking. These characterizations are not intended to privilege one design approach over others, but rather to provoke the reader to consider them in terms of how designers fill in gaps in understanding, how they involve stakeholders, and how iteratively they work. Each approach, however, also carries potential risks and challenges (Figure 2). For instance, designers may not have easy access to stakeholders, and large projects may make more human-centered approaches unwieldy to carry out (Turk, France, & Rumpe, 2002).

Figure 2

Risks and Pitfalls Associated with Different Levels of End-User Participation and Iteration



Critiques of Design Thinking

While originally a construct introduced by design researchers to investigate how designers think and do their work, design thinking became popularized, first in the business world (Brown, 2008) and later in education. Given this popularity, design thinking was bound to draw critique in the public sphere. To understand these critiques, it is worth returning to the definitions cited earlier (Table 1). Definitions outside of the design research field tend to be based in specific techniques and strategies aimed at innovation; such accounts fail to capture the diversity of actual design practices (Kimbell, 2011). They also tend to privilege the designer as a savior, an idea at odds with the keen focus on designing ***with*** stakeholders that is visible in the design research field (Kimbell, 2011). As a result, some have raised concerns that design thinking can be a rather privileged process—e.g., upper middle class white people drinking wine in a museum while solving poverty with sticky note ideas—that fails to lead to sufficiently multidimensional understandings of complex processes (Collier, 2017). Still others argue that much of design thinking is nothing new (Merholz, 2009), to which researchers in the design research field have responded: design thinking, as represented externally might not be new, but the rich body of research from the field could inform new practices (Dorst, 2011).

These critiques should make us cautious about how we, as instructional designers, take up design thinking and new design practices. Below, I raise a few concerns for new instructional designers, for instructional designers interested in incorporating new methods, for those who teach instructional design, and for those planning research studies about new design methods.

My first concern builds directly on critiques from the popular press and my experience as a reviewer of manuscripts. Design thinking is indeed trendy, and of course people want to engage with it. But as we have seen, it is also complex and subtle. Whenever we engage with a new topic, we necessarily build on our past understandings and beliefs as we make connections. It should not be surprising, then, that when our understanding of a new concept is nascent, it might not be very differentiated from previous ideas. Compare, for example, Polya's "How to Solve it" from 1945 to Stanford's d.school representation of design thinking (Table 2). While Polya did not detail a design process, but rather a process for solving mathematics problems, the two processes are superficially very similar. These general models of complex, detailed processes are *zoomed out* to such a degree that we lose the detail. These details matter, whether you are a designer learning a new practice or a researcher studying how designers do their work. For those learning a new practice, I advise you to attend to the differences, not the similarities. For those planning studies of design thinking, keep in mind that "design thinking" is too broad to study effectively as a whole. Narrow your scope and *zoom in* to a focal length that lets you investigate the details. As you do so, however, do not lose sight of how the details function in a complex process. For instance, consider the various approaches being investigated to measure design thinking; some treat these as discrete, separable skills, and others consider them in tandem (Carmel-Gilfilen & Portillo, 2010; Dolata, Uebernickel, & Schwabe, 2017; Lande, Sonalkar, Jung, Han, & Banerjee, 2012; Razzouk & Shute, 2012).

Table 2

Similarities Between "How to Solve it" and a Representation of Design Thinking

Polya, 1945 How to solve it	***Stanford's d.school design thinking representation***
Understand the problem	Empathize, Define
Devise a plan	Ideate
Carry out the plan	Prototype
Look back	Test

My second concern is that we tend, as a field, to remain naïve about the extant and extensive research on design thinking and other design methods, in part because many of these studies were conducted in other design fields (e.g., architecture, engineering) and published in journals such as *Design Studies* (which has seldom referenced instructional design). Not attending to past and current research, and instead receiving information about alternative design methods filtered through other sources is akin to the game of telephone. By the time the message reaches us, it can be distorted. While we need to adapt alternative methods to our own ID practices and contexts, we should do more to learn from other design fields, and also contribute our findings to the design research field. As designers, we would do well to learn from fields that concern themselves with human experience and focus somewhat less on efficiency.

My third concern is about teaching alternative design methods to novice designers. The experience of learning ID is often just a single pass, with no or few opportunities to iterate. As a result, flexible methods inspired by design thinking may seem the perfect way to begin learning to design, because there is no conflicting traditional foundation to overcome. However, novice designers tend to jump to solutions too quickly, a condition no doubt brought about in part by an emphasis in schooling on getting to the right answer using the most efficient method. Design thinking methods encourage designers to come to a tentative solution right away, then get feedback by testing low fidelity prototypes. This approach could exacerbate a new designer's tendency to leap to solutions. And once a solution is found, it can be hard to give alternatives serious thought. Yet, I argue that the solution is not to ignore human-centered methods in early instruction. By focusing only on ADDIE, we may create a different problem by signaling to new designers that the ID process is linear and tidy, when this is typically not the case.

Instead, if we consider ADDIE as a scaffold for designers, we can see that its clarity makes it a useful set of supports for those new to design. Alternative methods seldom offer such clarity, and have far fewer resources available, making it challenging to find the needed supports. To resolve this, we need more and better scaffolds that support novice designers to engage in human-centered work. For instance, I developed a *Wrong Theory Design Protocol* (https://edtechbooks.org/-ub) that helps inexperienced designers get unstuck, consider the problem from different points of view, and consider new solutions. Such scaffolds could lead to a new generation of instructional designers who are better prepared to tackle complex learning designs, who value the process of framing problems ***with*** stakeholders, and who consider issues of power, inclusivity, and diversity in their designing.

Concluding Thoughts

I encourage novice instructional designers, as they ponder the various ID models, approaches, practices and methods available to them, to be suspicious of any that render design work tidy and linear. If, in the midst of designing, you feel muddy and uncertain, unsure how to proceed, you are likely exactly where you ought to be.

In such situations, we use design thinking to fill in gaps in our understanding of the problem and to consider how our solution ideas might satisfy design requirements. While experienced designers have an expansive set of precedents to work with in filling these gaps, novice designers need to look more assiduously for such inspiration. Our past educational experiences may covertly convince us that just because something is common, it is best. While a traditional instructional approach may be effective for some learners, I encourage novice designers to consider the following questions to scaffold their evaluation of instructional designs:

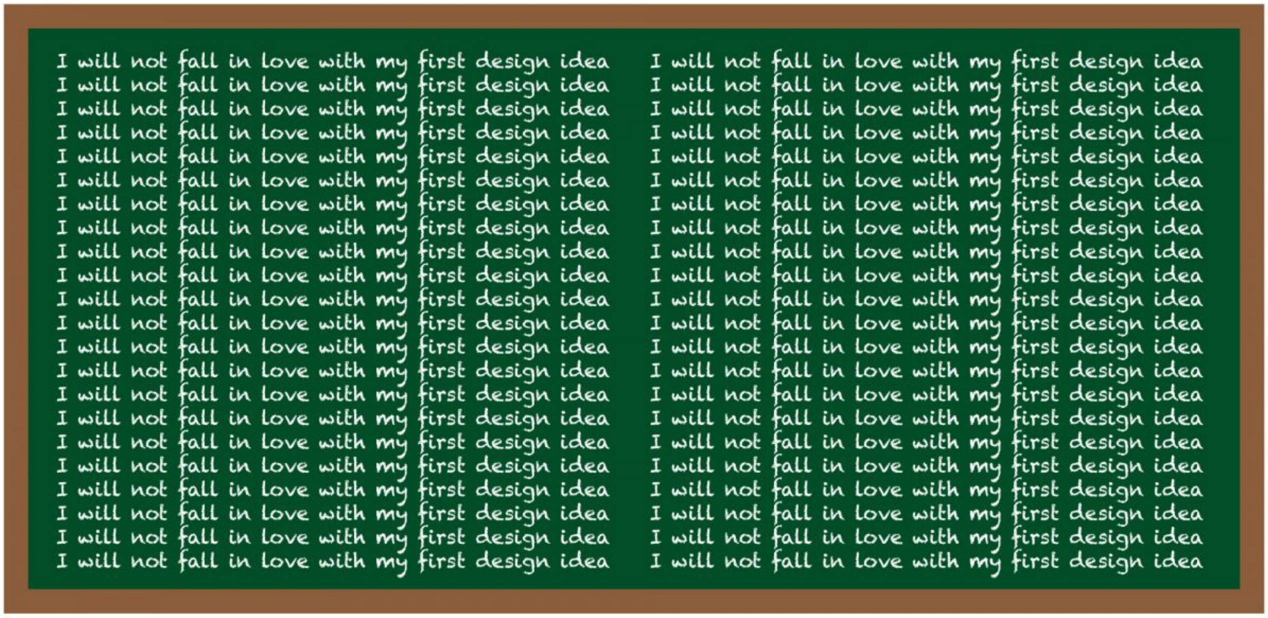
- Does its effectiveness depend significantly on having *compliant learners* who do everything asked of them without questioning why they are doing it?
- Is it a design *worth* engaging with? Would you want to be the learner? Would your mother, child, or next-door neighbor want to be? If yes on all counts, consider who *wouldn't,* and why they wouldn't.
- Is the design, as one of my favorite project-based teachers used to ask, "provocative" for the learners, meaning, will it provoke a strong response, a curiosity, and a desire to know more?
- Is the design "chocolate-covered broccoli" that tricks learners into engaging?

To be clear, the goal is not to make all learning experiences fun or easy, but to make them worthwhile. And I can think of no better way to ensure this than using iterative, human-centered methods that help designers understand and value multiple stakeholder perspectives. And if, in the midst of seeking, analyzing, and integrating such points of view, you find yourself thinking, "This is difficult," that is because it *is difficult.* Providing a low fidelity prototype for stakeholders to react to can make this process clearer and easier to manage, because it narrows the focus.

However, success of this approach depends on several factors. First, it helps to have forthright stakeholders who are at least a little hard to please. Second, if the design is visionary compared to the current state, stakeholders may need to be coaxed to envision new learning situations to react effectively. Third, designers need to resist the temptation to settle on an early design idea.

Figure 3

Designers Need to Resist the Temptation to Settle on an Early Design Idea



Finally, I encourage instructional designers—novice and expert alike—to let themselves be inspired by the design research field and human-centered approaches, and then to give back by sharing their design work as design cases (such as in the *International Journal of Designs for Learning*) and by publishing in design research journals .

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Want to Know More about the Design Research Field So You Can Contribute?

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Design Science

CoDesign: International Journal of CoCreation in Design and the Arts

International Journal of Design Creativity and Innovation

Journal of Design Research

The Design Research Society has conferences and discussion forums.

Other journals worth investigating:

Design Studies

Design Issues

Design and Culture

Sign up for monthly emails from **Design Research News** to find out about conferences, calls for special issues, and job announcements.

1. For those interested in learning more, refer to the journal, *Design Studies,* and the professional organization, *Design Research Society.* Note that this is not a reference to educational researchers who do design-based research. ↩
2. Waterfall might also be used when designing a large, expensive system that cannot be tested and iterated on as a whole and when subsystems cannot easily or effectively be prototyped. ↩

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Instructional Design Prototyping Strategies

Jacquelyn Claire Johnson & Richard E. West

One of the differences between design as practiced in our field and traditional art is that our designs must not only be interesting, engaging, and even beautiful, but they must also be useful for someone—the end users or learners. Over 2,000 years ago, Marcus Vitruvius—a Roman architect—articulated that good architecture should rise to three ideals: *firmitas* (strength), *utilitas* (functionality), and *venustas* (beauty). In other words, a building should be strong and not fall down, it should accomplish its purpose (e.g. as a home or an office), and it should be beautiful to enjoy.

> *Instructional designers seek the same three ideals in our products. For us, we desire the learning environments we create to work well, teach well, and, well, be beautiful and enjoyable to experience!*

Prototyping is an essential skill and process for instructional designers to achieve these three goals. Despite careful and rigorous front-end analysis, user research, and attention to detail during development, it is nearly impossible to produce instruction that works perfectly the first time. However, through iterations of prototypes, we can evaluate how well our instructional designs are working, teaching, and being enjoyed by a group of potential users. This will increase the likelihood that final designs will be successful. In addition, digital technologies have reduced the cost of creating prototypes, which has led to a new focus on agile, lean, and rapid prototyping design models where prototypes are not a single step in the process, but instead, each stage of design development can be tested as a new prototype—and this continual refinement of the design through continuous evaluation may never cease (see Wiley & Bodily's chapter in this book).

How can we effectively prototype and test our designs? We can learn much about prototyping from other design fields. For example, it is standard practice to use visual representations of ideas—such as pictures—during the creative process in many design fields such as architecture (Bilda et al., 2006), film and cinematography (Teng et al., 2014), and engineering (Perry & Sanderson, 1998). This skill is so meaningful, graphic design instructors insist that it is vital to "equip students with the ability to make well-informed decisions about tool choice and tool use during design ideation" (Stones & Cassidy, 2010, p. 439).

Though graphic design is an inherently visual field, the use of prototypes has application in other design fields as well. For instance, extensive research demonstrates the usefulness of visuals in product development as a means of exploring problems and generating possible solutions. Prototypes help designers understand specific design challenges and make inferences about the situation (Suwa & Tversky, 1997). They also contribute to many aspects of problem solving (Dorst & Cross, 2001; Do et al., 2000). Research in cognitive psychology has established that the cognitive load of processing ideas is reduced for designers through the use of visuals.

Furthermore, studies show it is easier for designers to process complex ideas with visual prototypes rather than relying on working memory (Cash, StankoviÄ‡, & Štorga, 2014). Vicarious experiences can be provided through visuals, which allow designers to glean and evaluate the pertinent information without investing as much time or effort into creating the experience (Menezes & Lawson, 2006). Prototypes also can guide important design conversations "if they lead the team visually into a fruitful sequence of conversation steps" (Eppler & Kernbach, 2016, p. 96).

Key Prototyping Principles

Dam and Siang (2018) argued that during prototyping you should pay attention to the following:

- People—including those whom you are testing and the observers. Because we design for humans, we are particularly interested in how humans interact with and perceive the usefulness of our designs.
- Objects—including the prototype and other objects people interact with, because what people choose to do and the objects they choose to interact with can provide clues into why they like or do not like our design.
- Location—such as places and environments, because we can learn from where people choose to use designs, and why they use them in those locations, and what affordances those locations provide for using the design.
- Interactions—including digital or physical interactions between people, the objects, and the environment. This is particularly essential because the interactions we observe provide clues into how the design could be used, and any unintended outcomes.

Similarly in our field, Andrew Gibbons (2013) has argued that every instructional design is comprised of various layers, such as the following:

- *Content*, or the actual material to be learned
- *Strategy*, or the unifying framework about how the teaching/learning is theorized to happen, or how the tasks involved in learning should take place
- *Control*, or how students interact with and provide input back into the learning material
- *Message*, or the intended meaning the instruction is meant to communicate to the learner
- *Representation*, or how the layers of the design are presented to learners (visual, audio, touch, etc.)
- *Media-logic*, or the background structures that activate each component of the instruction at the proper time and in the proper way
- *Management*, or how data about people's use of the instruction is collected and managed to improve learning and communicate about outcomes to stakeholders.

A design prototype, then, should serve to test one or all of these components from Dam and Siang and/or Gibbons. In other words, a high fidelity prototype, created close before implementation, would likely try to test all of these components. An earlier prototype may focus on one or two, perhaps testing primarily the validity of the content or messaging layers, the ability of the learner to control the interface, or the reliability of the media.

Prototyping Stages and Goals for Each Stage

In our opinion, there are three key stages for prototyping, and there are different primary goals for each stage, as described in Table 1.

Table 1

Prototyping Stages and Goals

Prototyping Stage	Prototyping Goals
Static/paper—These prototypes can be created on paper or digitally, but typically are static and do not involve interactivity, graphic design, or other expensive features. These are often “Wizard of Oz” or paper prototypes, described below.	The primary goal is to test the logic of the design with users, experts, and clients. Do they think this is likely to succeed? Which aspects or attributes of the design do they think warrant full development? Does this design seem like a good answer to the instructional problem? Are we using the best content? What insights do they have now about how to present the final product (e.g. what media format, location, or scale should we aim for?)? This is also a good time to estimate the potential

	costs in time and money to develop the design, and to ensure all parties feel the scope is accurate.
Low fidelity product/process—These prototypes have minimal interactivity and visual storyboards instead of full graphics.	Low fidelity prototypes are produced to give users and clients a better idea about how a design may look and interact, and how instructional content and strategies will be presented. Things do not work perfectly, but the focus is on testing the ideas, interaction, and potential of the design.
High fidelity product/process—These prototypes should be nearly completed designs, and ready for rigorous internal testing.	First impressions often matter a great deal, so before launching a product with actual users, ready-to-launch prototypes should be rigorously tested internally or with a sample of users. This process is usually repeated multiple times with larger groups of people until there is confidence that most of the design bugs have been identified, the product works reasonably well, and users will be able to use the product as intended.
Beta or soft launch of the design—Many designers now choose to launch a design in beta form, allowing users full range of access to the design, but without a promise that everything will work perfectly.	The goal of this stage is to fully test all aspects of the design, including user satisfaction and implementation costs. However, by keeping the design in beta, there is still flexibility to redesign an aspect not working very well, and usually users will be more forgiving.
Full launch/implementation	Even when we feel a design is "done" or ready for launch, we continue to collect confirmative or "continuous" (Wiley and Bodily, 2020) evaluation data on how well it is working and make adjustments as needed.

Prototyping Strategies

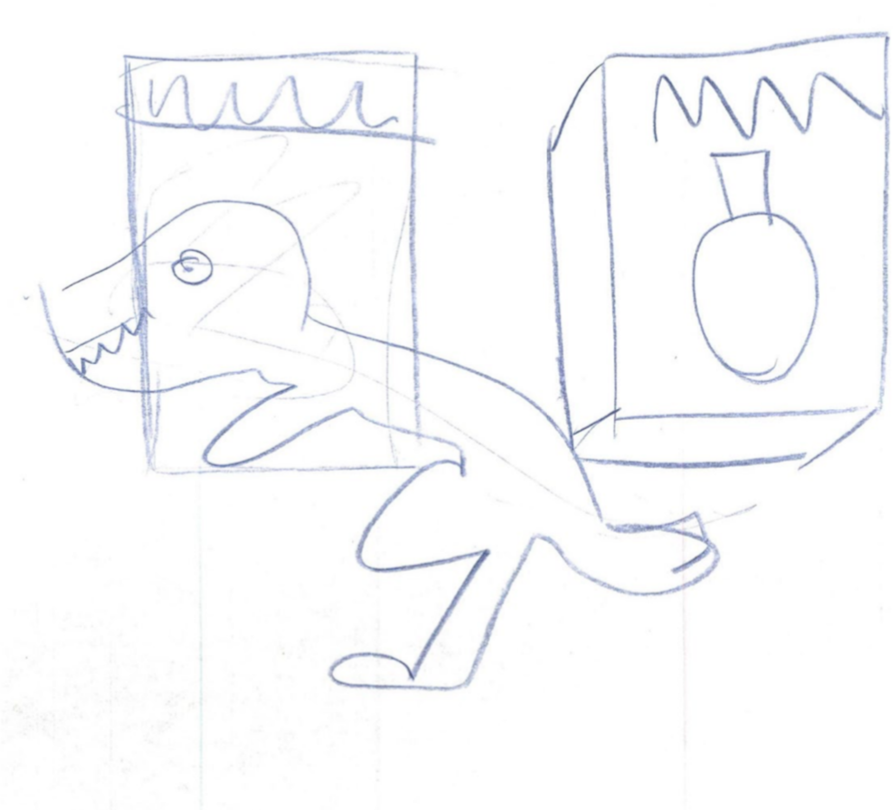
There are many strategies to prototyping ideas. Essentially, whatever you as a designer can do to test out any aspect of your design is a prototype. For example, this can be something visual, tactile, auditory, or performance-related. Following are some of the most common prototyping strategies.

Sketching

Sketches are "rough drawings representing the chief features of an object or scene and often made as a preliminary study" (Sketches, n.d.). For an example of a sketch, see Figure 1. Because sketches are simple and easily created, they are used by designers in the automotive industry to develop new design concepts. Researchers studied six designers at the Ford design studio to understand the physical and mental processes these designers go through as they sketch. They compared the process of these professional designers to student designers to ascertain the differences between the two groups. Findings indicated that, when compared to novice designers, professionals have a greater understanding of physical dimension and used an iterative design approach in which they used sketches to facilitate problem solving and creative thought (Tovey et al., 2003).

Figure 1

Sketch of Exhibit Design Layout



Note. Many of the examples provided in this chapter come from museum exhibit design, which was the background of the lead author.

As illustrated by the automotive designers, sketches elucidate aspects of the parallel development of the designer and the product. Sketches allow designers to set out ideas spontaneously (Bilda et al., 2006; Segers et al., 2005) without investing much in terms of time (Rodgers et al., 2000; Stones & Cassidy, 2010) and money (McGown et al., 1998). Expert designers are more adept at using visuals, suggesting that visuals are often a part of their professional development (Bilda et al., 2006). These visuals also contribute significantly to the design process (Dörner, 1999; Jonson, 2005; Kavakli & Gero, 2001; Suwa & Tversky, 1997; Teng et al., 2014) and are said to be essential for conceptual designing (Bilda et al., 2006). Designers use sketches to focus their non-verbal thinking (Rodgers et al., 2000), consider the idea as both its component parts and as a whole (Bilda et al., 2006), and tap into the deeper meaning and implications of their ideas (Eppler & Kernbach, 2016). Sketching enlivens previously only imagined designs (Bilda et al., 2006; Tovey et al., 2003). Through sketching, designers can embody and explore ideas that are not fully developed (Rodgers et al., 2000), communicate the physical nature of an idea (McGown et al., 1998), and subsequently clarify its characteristics to determine what will and will not work (Dörner, 1999). All of these activities are critical in the product development process.

Storyboarding

Sketch methods lead to the creation of storyboards because key ideas and images can be created and then organized in a storyboard sequence (Teng et al., 2014). Storyboards are "a panel or series of panels on which a set of sketches is arranged depicting consecutively the important changes of scene and action in a series of shots" (Storyboards, n.d.). Storyboards are an exploration, analysis, and conceptualization tool generally used later in the design process once ideas from sketches have been evaluated and selected for development.

The development of storyboards often starts with a collection of individual drawings that represent single scenes, which are part of the whole design being drawn. Each separate depiction in the storyboard represents a specific scene or perspective. Taken together, they represent the sequence in which things will flow.

Storyboards are utilized in cinematography, live television, animation, and special effects to plan the details of how a story will be portrayed (Teng et al., 2014). In architecture, they are used to visualize presentations of projects by creating analog versions of proposed buildings that will later be digitally designed (Cristiano, 2007). In other design contexts such as industrial design, storyboarding is a way of visually recording social, environmental, and technical factors that affect the context of how end users will interact with the product (Martin & Hanington, 2012).

Storyboards were used by students at Georgia Institute of Technology in their industrial design classes. When working on a product development project to redesign travel luggage, students performed research about the needs of consumers as well as market standards as a basis for beginning their design project. After completing the research, students storyboarded their designs to show how luggage is handled through the whole travel experience from storage, packing, passing security, walking through the airport, boarding the airplane, loading it into the overhead bins, and ultimately back into storage. These storyboards facilitated discussions about various design features and how to prioritize them to meet user needs (Reeder, 2005b).

As this example demonstrates, storyboards can contribute to product development because they are drawn with the target audience in mind (Martin & Hanington, 2012) and visually describe how users will interact with the product. When designers examine design challenges in depth using storyboards, they can understand the complexity of the situation and consider individual portions of the situation while not losing sight of the whole (Reeder, 2005a). They can visually document how users will interact with the product and use this documentation to develop innovative product solutions that address the needs and expectations of users (Reeder, 2005a). In general, storyboards act as a visual budget, which helps the production process run more smoothly by planning and allocating resources effectively (Cristiano, 2007). Because nothing is fixed or unchangeable, storyboarding is a flexible way of trying out ideas and incorporating changes; ideas can easily evolve as they are drawn in storyboards (Glebas, 2013), as was the case with the exhibit pictured in Figure 2.

Figure 2

Storyboard of Ostraka Layout

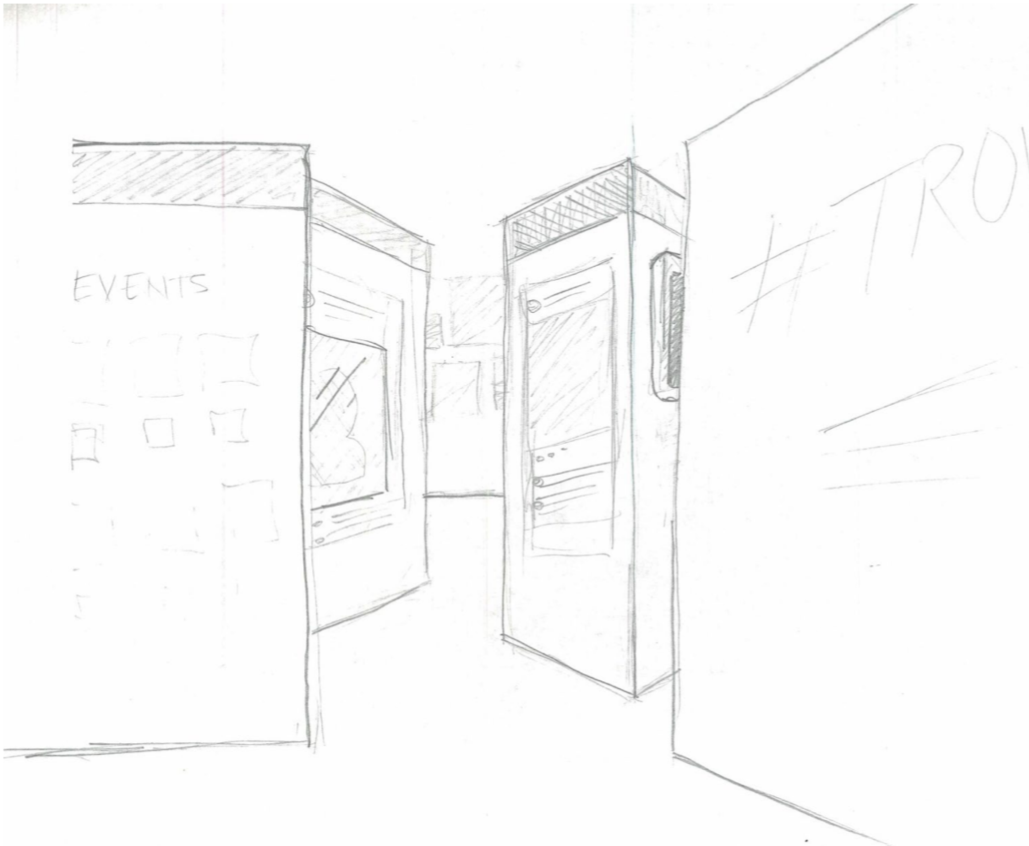
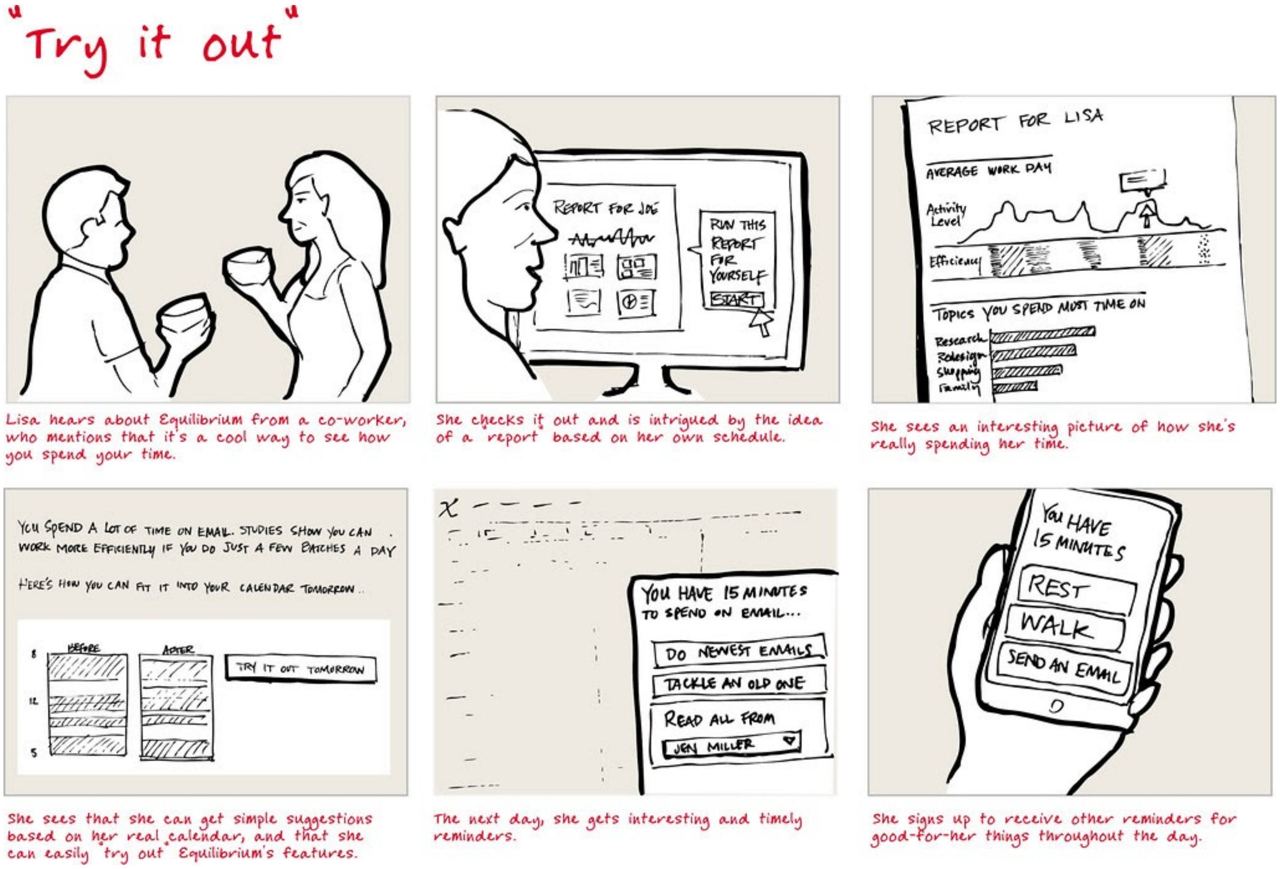


Figure 3

Storyboard Example



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Product Builds

Product builds are any three-dimensional representation of an idea that an audience and designer can manipulate and experience. They can be as complex as working versions of a tool, 3-D prints, or even Lego/fabric-based lower fidelity builds. They can also be of varying levels of fidelity, as initial product builds may include a few layers of the design (such as the physical shape and visual coloring/representation). However, later prototypes can have increasing more fidelity, including prototyping various versions of audio, music, content, and dynamic interactivity to test how effective each new design element is.

Product builds are seen as an essential design activity because it allows designers to learn by doing as they explore ideas (Camere & Bordegoni, 2015). This is a practice common to many fields, including experience design (Buchenau & Suri, 2000), education (Barab & Plucker, 2002), engineering (Alley et al., 2011), social innovation (Brown & Wyatt, 2015), and instructional design (Merrill & Wilson, 2007).

As an example, engineers at a precision pump manufacturing organization were tasked with creating a new line of pumps for a food processing chain. The pumps needed to be more efficient and have fewer parts than the originals. The core design team was co-located and created prototypes to test their new designs. The use of prototypes contributed to the direct aural and visual communication team members had with each other. The prototypes were critiqued and approved, and in this way they structured the design process for the engineers (Perry & Sanderson, 1998).

As this engineering example illustrates, product builds are a valuable communication tool. They can provide a shared, tangible view of an idea and facilitate answering questions concretely (Yang, 2005). They can also be used to persuade others to adopt a new mindset because they tangibly demonstrate the merit of an idea. Prototypes can be a source of positive peer pressure to move forward with the development of ideas (Norris & Tisdale, 2013).

Product builds also reveal information about the designs through the process of fabrication. Creating prototypes reduces design risk because designers can learn about the product-to-be without investing the time and cost required for full production (Yang, 2005). This technique helps designers determine how to fulfill the tasks and requirements that must be accomplished for a given project (Smith, 2014). Designers learn from the mistakes they make on prototypes and the feedback they receive about their prototypes, which then leads to improved designs, as was the case with the prototype pictured in Figure 4. This is an iterative process that continues until they reach a product that will accomplish the desired results.

Figure 4

Product Build of an Early Iteration of a Museum Exhibit

Bodystorming, or Role-Playing

Bodystorming is a method in which brainstorming is made physical. During bodystorming, role-playing and simulation with simple prototypes is done to create informative performances that illustrate what it might be like to use a product that is under development (Martin & Hanington, 2012). Bodystorming is a way of developing greater user empathy: designers immerse themselves in situations end users might experience and then focus on the decisions, emotional reactions, and interactive experiences users might have. This approach is based on the premise that the best way to understand an interaction is to experience it personally (Smith, 2014).

Participating in the interactions users might have can reduce the time designers spend studying documents of user observation. It allows them to tap into aspects that are unobservable because they have experienced these elements firsthand (Oulasvirta et al., 2003). This technique has the potential to help designers communicate better with their peers, clients, and end users because of the performance aspect of this type of visual (Burns et al., 1994).

Designers at the Helsinki Institute for Information Technology enlisted 10 researchers and industry representatives to use bodystorming to innovate ubiquitous computing technologies. They spent a full day bodystorming the interactions an elderly user group would have at an old age service house, subway station, the subway, the mall, and a grocery store. They identified problems related to activities performed at each of these locations and framed them as design questions. Those involved were split into two groups to perform the bodystorming. One researcher acted as a moderator, while another served as a group leader. These researchers recorded ideas that emerged and facilitated the experience. They found that bodystorming inspired researchers to become familiar with new contexts and improve their design abilities (Oulasvirta et al., 2003).

This example of bodystorming presents how this visual tool can support the product development process through facilitating communication across peers, clients, and users. Like the other forms of visual representation, it offers a shared perspective to all involved, which provides opportunities for further discussions (Burns et al., 1994). However, it contributes differently than other visuals. It allows designers to experience, discuss, and evaluate their ideas in context, and helps designers to understand how the settings in which a design is used can affect their intended use (Smith, 2014).

This approach is believed to be less error-prone than brainstorming because it allows designers to experience realistic constraints that can affect the user experience (Smith, 2014). In bodystorming, designers rapidly prototype ideas, which allows for immediate feedback on how the product works (Oulsavirta et al., 2003). Discussing the feedback brings up new issues for designers to explore (Flink & Odde, 2012).

Wizard of Oz Prototypes

In the movie/book, The Wizard of Oz, Dorothy and her companions seek the wisdom and power of the Great Oz to grant their wishes. However, what they thought was an all-powerful wizard was really a man behind the curtain, pulling levers and pushing buttons to give the effect of something magical happening. Similarly, in Wizard of Oz prototyping, the designer creates a low fidelity or paper prototype, but without the interactivity or dynamic responses from the system. Instead, when a user or prototype tester wants to do something, they indicate where they would go, or what they would click, and the designer provides the next low fidelity prototype example. In this way, they simulate the interaction that they will eventually build into the system. In essence, as Dam and Siang (2018) explained these are “prototypes with faked functions.”

Sometimes this “faking” can be more complex, with a human on one side of a screen typing responses to the user that appear to come from the computer. As another example, a popular experience at Disneyland theme parks is Turtle Talk with Crush (shown in Figure 5), where children talk to Crush, the popular turtle from Finding Nemo, through a computer screen. On the other side of the screen, the performers make Crush respond to the children in authentic ways that make Crush seem real. This perhaps also exemplifies an ethical issue with Wizard of Oz prototyping as many young children really do think Crush is real. Even with adults, some Wizard of Oz prototyping can appear realistic, and participants should be informed that they are not, in reality, interacting with a real product.

Figure 5

Turtle Talk at Disney World

Note. Photo CC-BY/SA from Josh Hallet and available at https://edtechbooks.org/-SmA.

User-Driven Prototypes

Dam and Siang (2018) described one final prototyping strategy, where instead of designers creating prototypes for users, the users create prototypes for the designers. They explained that this can be a way of understanding the users and developing empathy. “When you ask the user to design a solution, rather than provide feedback on a prototype, you can learn about the assumptions and desires that the user possesses. The purpose of a user-driven prototype is not to use the solutions that the users have generated; instead, it is to use their designs to understand their thinking.”

According to Dam and Siang (2018), a designer sets up user-driven prototyping by asking users to design specifically to answer questions designers have. They provide the example of airport designers asking users to sketch or build what they think an ideal experience would look like.

Conclusion

Prototyping is an essential strategy for testing out emerging designs and refining ideas before expensive implementation launches. In addition, prototyping is an essential part of the design process itself because prototypes help to structure the collaborations on a design team and represent the distributed cognition of design teams and how ideas are negotiated by team members (Henderson, 1998). Thus, design cultures or styles are intrinsically tied to the way in which each constructs representations of their ideas. Such prototypes—e.g. sketches, drawings, bodystorming, etc.—are the heart of design work and constitute the space in which ideas are defined, refined, and negotiated. (Henderson, 1998, p. 141). A team’s ability to create, interpret, and communicate with prototypes can facilitate or restrict how they interact as a group, making these prototypes “primary players in the social construction of the design culture or design style of the designing group” (Henderson, 1998, p. 140). Thus, it is essential that designers think deliberately about how they use prototypes as part of an effective team design culture.

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Rapid Prototyping: an Alternative Instructional Design Strategy

Steven D. Tripp & Barbara Bichelmeyer

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Rapid Prototyping EduTech Wiki Entry

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Rapid prototyping

Rapid prototyping (also rapid prototyping design, RAD) is a general design method.

See also: user-centered design and R2D2 (an other agile instructional design method).

Contents

[hide]

1 The model

According to Joe Hoffman and Jon Margerum-Leys (HTML retrieved 29 May 2006), the general rapid prototyping model can be summarized as follows:

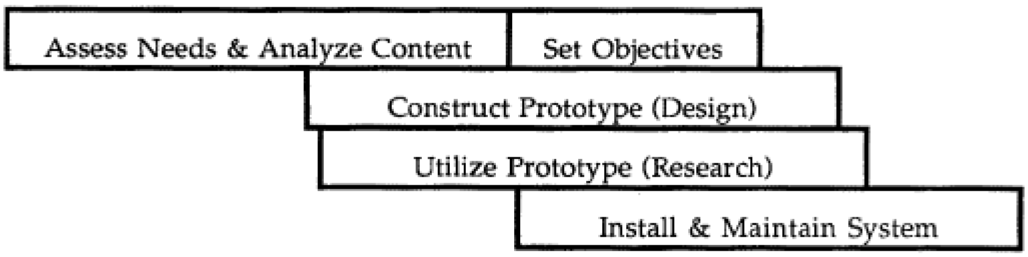
1. concept definition
2. implementation of a skeletal system
3. user evaluation and concept refinement
4. implementation of refined requirements
5. user evaluation and concept refinement
6. implementation of refined requirements

2 Rapid prototyping as instructional design method

Agile methods have been always very popular in education since this is how teachers operate in the classroom. However, until recently instructional design methods were rather dominated by heavier instructional systems design models.

2.1 Tripp and Bichelmeyer

Tripp and Bichelmeyer (1990: 36) define a model that presents “that occur in a rapid prototyping environment, when prototyping is specifically used as a method for instructional design. The overlapping boxes are meant to represent the fact that the various processes do not occur in a linear fashion. In other words, the analysis of needs and content depends in part upon the knowledge that is gained by actually building and using a prototype instructional system.”



Tripp and Bichelmeyer rapid prototyping ISD model

2.2 Lot Like Agile Methods Approach (LLAMA)

A model created and "sold" by Torrance eLearning. Unfortunately we only found videos that explain this method.

2.3 Successive Approximation Model

The Successive Approximation Model (SAM) was developed by Michael Allen and Richard Sites. There are two main versions:

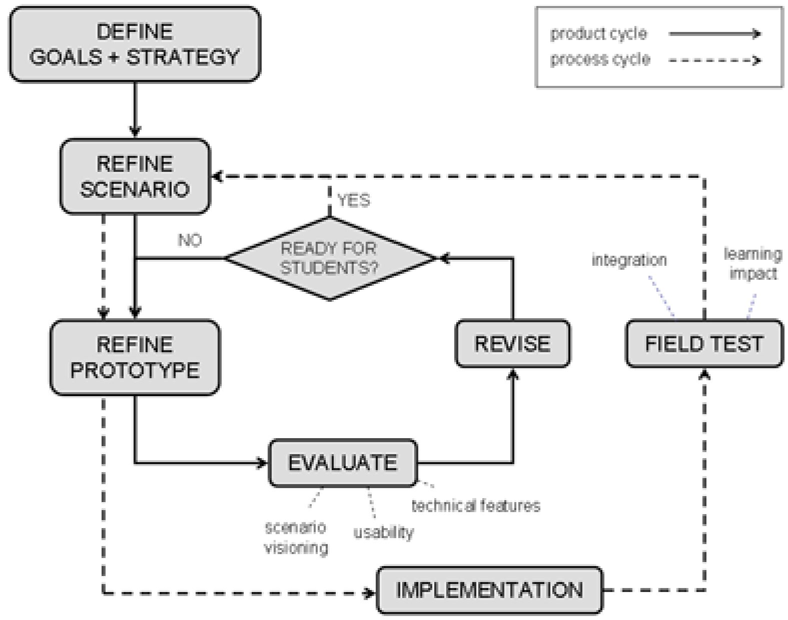
- SAM_1 for small projects: A Design - Develop - Evaluate loop
- SAM_2 for larger projects: A three stage model: Preparation - Iterative Design - Iterative Development.
    - Iterative Design includes a Design - Prototype - Evaluate Loops
    - Iterative Development includes a Evaluate - Develop - Implement Loop

2.4 eLab Model

The eLab model considers fast prototyping as a communication "catalyst" that is particular suitable in situations where change management issues exist:

- It allows to promote the discussion within the project group in a focused way, by concentrating on the facts and the results, rather than on theories and prejudices against technologies.
- It will allow to build shared understanding among the different professionals involved in the project and builds trust: two important conditions for the success of the project.

The authors summarize their model with the following diagram:



The eLab prototyping model (Botturi, Cantoni, Lepori, Tardini 2007)
This design method:

- makes the design and development process open to new emerging ideas
- makes the design open to emerging needs from test and evaluation phases
- let's teachers focus on pedagogical design (teaching) instead of course materials preparation and technology
- stimulates discussion with external partners.

2.5 Discussion

Botturi et al (2007) identify three main issues one has to deal with, plus pitfalls to avoid

1. Cost: “Fast prototyping costs. What is developed risks being rejected and 'demolished', even if in critical and fruitful demolition. In order to be cost effective, a sound ratio between prototype scale and the final product is needed; when this is not feasible, examples taken from other experiences may be used.”
2. Shared understanding: “Fast prototyping is particularly helpful in order to provide a shared understanding of what the final e-learning course is likely to be; it offers the development team a common background where many misunderstandings can be avoided.”
3. Training effect: “E-learning is a new world: it happens quite often that people working in course development do not have extensive experience. Fast prototyping provides them with a common language and an initial experience of e-learning.”

Botturi et al (2007) identify two pitfalls to avoid:

- “The first pitfall is the 'quick and dirty' effect, i.e. a very rapid, but low quality development may negatively affect further developments, hindering understanding, collaboration and commitment. The second one is just at the opposite pole in the 'speed' scale: the non-fast prototyping case. Here the prototyping phase is extended so much that it only delivers a late contribution, which often has to be accepted as time resources do not allow substantial revisions.”

3 Software

A lot, e.g. alone for the SCRUM method, Wikipedia lists over 15

Example:

- Pivotal tracker, a free for education web 2.0 tool plus Gooddata analytics.

4 Links

- The Agile Elearning Design Manual - Think Small (Iterations, Action Maps, Storyboards, and Mini-Modules), by Sumeet Moghe, June 2009.
- https://edtechbooks.org/-ZuRV
- http://www.agilealliance.com/
- Approach: the fastprototyping (eLab page).
- Agile Modeling (AM) Home Page
- Scrum (Wikipedia). Scrum is an agile software development method.
- Evidence Based Scheduling, by Joel Spolsky, 2007.
- You may kiss the bride and update the Scrum board. Agile development isn't just for software anymore. By Phil Johnson, ITworld August 09, 2012.

In project oriented learning

- Scrum in the Classroom by John Miller, 2012.
- Let's Scrum by Rebecca Pope-Ruark, PhD, Michelle Eichel, Sarah Talbott, Kasey Thornton, 2012.

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- Peter Rawsthorne, Cape Breton University & Memorial University of Newfoundland, Agile Instructional Design, PDF (from [1])

(Supplement) High Quality Resources on Design Thinking in Learning Design

Resource Title	Description	Link
IDEO's Design Thinking Website	Learn about Design Thinking from the design firm that is credited with establishing this concept. Many high quality materials, including resources for educators.	https://designthinking.ideo.com/
What is Design Thinking?	Blog post that quickly and succinctly introduces the learner to the main concepts associated with Design Thinking.	https://edtechbooks.org/-Rjm
Design thinking, explained	An overview of the basics of Design Thinking, provided by MIT's Sloan School of Management.	https://edtechbooks.org/-SLwd
Making the Link Between Design Thinking and Instructional Design	The well-regarded Association for Talent Development (ATD) provides a sneak peek at the book *Design Thinking for Training and Development: Creating Learning Journeys That Get Results* (ATD Press, June 2020), with some solid insights for new LX designers.	https://edtechbooks.org/-QdAA
How To Use Design Thinking In Learning Experience Design	Practical advice for using Design Thinking within an LXD frame.	https://edtechbooks.org/-ZkkZ
Design Thinking For Instructional Design (A four-part series)	Overview of how Design Thinking techniques can improve instructional products by means of a human-centric approach. Considers challenges related to artificial intelligence and machine learning.	**Part 1**: https://edtechbooks.org/-VvTr **Part 2**: https://edtechbooks.org/-jFpy **Part 3**: https://edtechbooks.org/-ZEJ **Part 4**: https://edtechbooks.org/-CIVS

Module 5: Project Management in Learning Experience Design

Module 4 readings are provided in this section.

Project Management Competencies of Educational Technology Professionals in Higher Education

A Qualitative Analysis of the Knowledge, Skills, and Abilities

James Kline, Swapna Kumar, & Albert D. Ritzhaupt

Introduction

What project management competencies (knowledge, skills, and abilities) must an effective educational technology professional possess to be successful in their role and responsibilities? Unfortunately, we do not have a clear and definitive answer to this important question from our current knowledge base. Project management as a field of endeavor has a rich history, a well-developed knowledge base (e.g., Project Management Body of Knowledge), a diverse set of practicing professionals across many disciplines (e.g., construction, information technology), and a strong professional credentialing system used to certify the active members of the profession (e.g., Project Management Professional certification). The field of educational technology utilizes knowledge, skills, tools, and techniques from project management to assist in the creation of our products and services. Project management has long been recognized as a vital aspect to the individuals who practice the craft of educational technology (Donaldson et al., 2007; Van Rooij, 2010; Van Rooij, 2011). Though project management is deemed essential to the field of educational technology, scant research has documented the project management practices utilized by our professionals (Brill et al., 2006; Kang & Ritzhaupt, 2015; Ritzhaupt, & Kumar, 2015). In each of the few empirical studies we do have, project management is recognized as a key competency for educational technology professionals (Brill et al., 2006; Kang & Ritzhaupt, 2015; Ritzhaupt, & Kumar, 2015; Sugar et al., 2012). Yet we are still lacking a complete explanation of who, what, how, why, where, and when these project management competencies are employed by professionals within the field of educational technology, particularly in the higher education context.

While project management has been described as a generic methodology for managing most projects across disciplines (Pollack, 2007), the studies on educational technology project management have placed particular emphasis on the formalized standards contained within the Project Management Institute's (PMI) "Project Management Body of Knowledge" (PMBOK) (Brill et al., 2006; van Rooij, 2010). This collection of commonly accepted project management principles has become the de facto framework for managing projects, including educational technology projects in higher education. The PMI is the leading professional association in the United States governing the PMBOK and the Project Management Professional (PMP) certification, one of the most widely sought-after professional certifications (Starkweather & Stevenson, 2011). The PMBOK is a standardized body of literature approved by the American National Standards Institute (ANSI) (Cabanis-Brewin, 1999; Project Management Institute, 2017, p. 539) and underlies many project management training programs in the US. This document operationalizes and explains 10 knowledge areas (e.g., project cost management), five process groups (e.g., planning), and 49 individual processes (e.g., estimate costs) that cover the broad knowledge in the profession of project management. The PMBOK defines project management as the “application of knowledge, skills, tools, and techniques to project activities to meet the project requirements” (Project Management Institute [PMI], 2017, p. 10). The knowledge, skills, tools, and techniques are the resources that educational technology professionals draw from to complete their tasks in an effective and efficient manner.

Of particular importance for the current study is that the PMBOK is a descriptive project management framework that “identifies a subset of the project management body of knowledge that is generally recognized as good practice” (PMI, 2017, p. 2). The PMBOK is not a prescriptive methodology (e.g., PRojects IN Controlled Environments, or PRINCE2) or product development method (e.g., waterfall, agile) but claims to be “a foundation upon which organizations can build methodologies, policies, procedures, rules, tools and techniques, and lifecycle phases needed to practice project management.” Likewise, the PMBOK asserts that “the knowledge and practices described are applicable to most projects most of the time, and there is consensus about their value and usefulness.” The PMBOK assumes that practitioners will “tailor” (p. 28) the appropriate aspects of their project management frameworks to the needs of their particular industry or project. Project requirements are the criteria by which projects can be deemed a success or failure. These criteria are typically established early in a project life cycle and are uniquely tied to a specific project for a specific purpose. For instance, educational technology projects might have learning outcome requirements, accessibility requirements, or usability requirements that serve as these criteria.

The field of educational technology deploys nearly an endless list of possible products and services. These can range from technology enhanced learning environments, such as an immersive, educational game or simulation used in K-12 classrooms, to interactive and personalized online learning courses used in institutions of higher education, to performance improvement processes adopted in a Fortune 500 company. While the intellectual property and creations of these products are vastly diverse, they are all characterized as “project work” (Donaldson et al., 2007). These diverse projects are implemented by a wide range of professionals in the field of educational technology. We use the term “educational technology” to be inclusive of the many roles in our discipline, including titles like “instructional designer” (ID), “e-learning specialist,” “instructional technologist,” and more.

According to the PMBOK, a project is “a temporary endeavor undertaken to create a unique product, service, or result” (PMI, 2017, p. 4). The nature of the work in educational technology is such that we create unique products and services in a specified period of time. This work typically involves a team of stakeholders (e.g., subject-matter-expert, ID, graphic designer) working towards a common goal with limited time frames, budgets, and resources (van Rooij, 2010). Projects are the basis for much of the work undertaken in the field of educational technology, which is why we draw so heavily from the field of project management.

Academic programs in the broad field of educational technology (inclusive of instructional design, instructional technology, learning design and technology, instructional systems, etc.) do not consistently offer academic courses in project management to prepare professionals entering the field (van Rooij, 2010; van Rooij, 2011). Therefore, many educational technology professionals may find themselves in the roles of managing projects or participating as a stakeholder on a project without any formal training on how project work is executed. While the nature of many projects in the field of educational technology might be considered small (e.g., designing and developing an online course) with fewer than 10 stakeholders, 6-month durations, and budgets less than $75,000 (van Rooij, 2010), some educational technology professionals might find themselves working in multi-million dollar initiatives without any preparation on how to function in these project-driven environments. A project is generally deemed successful if it is delivered on time, within budget, and meets the project requirements negotiated by the project sponsor(s) with an acceptable level of quality (PMI, 2017, p. 13).

Empirical research has documented that educational technology professionals spend a significant portion of their time on project management activities (Cox & Osguthorpe, 2003). While we know the fields of educational technology and project management work in tandem to meet the requirements of our work environments, none of the present studies explore the project management competencies of educational technology professionals using in-depth qualitative procedures to explore these phenomena. Since researchers from our field have questioned the preeminent value of the PMBOK to our profession (Brill et al., 2006), more empirical research is necessary to understand the actual aspects of project management that educational technology project managers in higher education are using in practice. We need a stronger understanding of how educational technology professionals are managing intricate projects in increasingly complex work environments with limited resources, evolving requirements, and multiple stakeholders.

Thus, the purpose of this research is to document the project management competencies (i.e., knowledge, skills, and abilities) utilized by professionals in the field of educational technology working in the higher education context using qualitative procedures to explore the deeper "who, what, how, why, where, and when" questions. Although qualitative research methods are rarely employed in project management research literature (Cicmil, 2006; Pollack, 2007), they can provide answers to exploratory research questions and assist with generating theory and hypotheses about a phenomenon. We explore the experiences of educational technology professionals that serve or have served in the role of project manager in higher education. This research sheds light on the educational technology field and provides useful knowledge to guide the practice of the professionals, professional associations, and academic programs in our field as we embrace the ideas from our sister discipline–project management. In order to do this, we explore a range of exploratory questions: How do educational technology professionals in higher education manage projects, and what competencies are necessary for them to succeed within this important role? In what ways does educational technology project management in higher education contexts reflect the standards of the PMBOK? Lastly, what other project management knowledge, skills and abilities are essential in our field?

Conceptual Framework

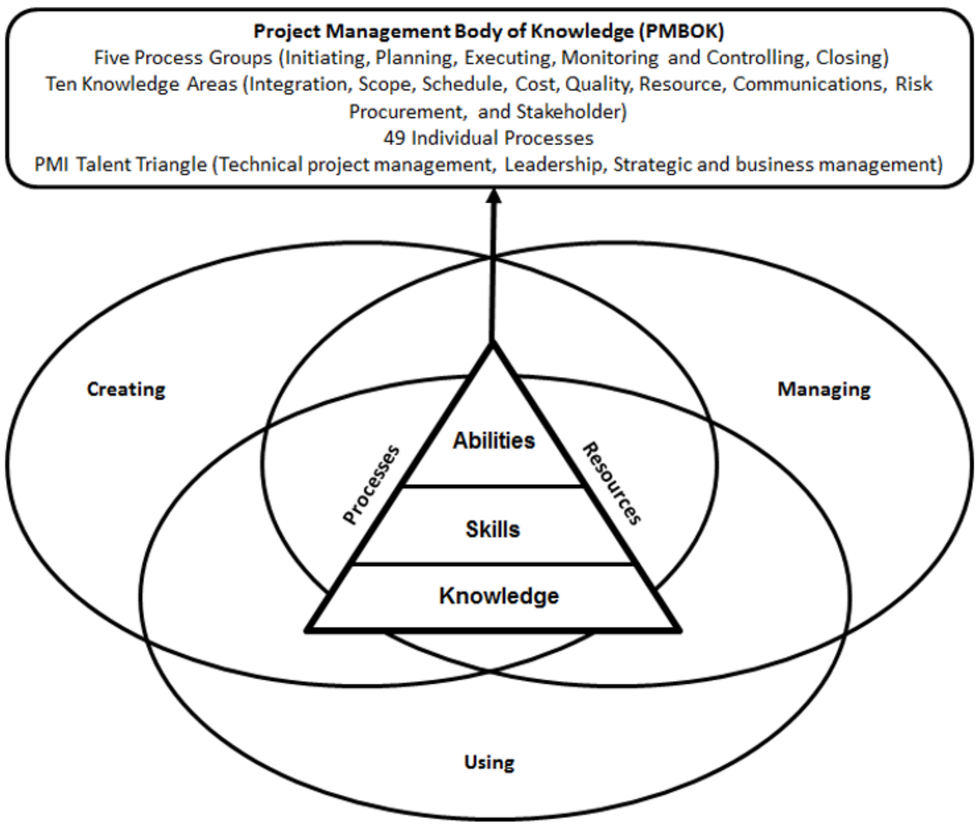
The conceptual framework proposed for this study is based upon research by Ritzhaupt, Martin, and Daniels (2010), Ritzhaupt and Martin (2014), and Kang and Ritzhaupt (2015). In these studies, the Association for Educational Communications and Technology (AECT) definition of educational technology (Januszewski & Molenda, 2007) was integrated with statements of knowledge, skill, and ability (KSA) (Ritzhaupt & Martin, 2014; Ritzhaupt et al., 2010). Specifically, the framework incorporates the AECT definition of educational technology with its three actionable concepts of "create, use, and manage" to explain the following statement: "Educational technology is the study and ethical practice of facilitating learning and improving performance by *creating*, *using*, and *managing* appropriate technological processes and resources" (Januszewski & Molenda, 2007, p. 1). The primary focus of this article is on the dimension of "managing" in the context of educational technology projects in higher education, specifically focusing on those aspects of managing that are employed in the practice of project management.

Figure 1 provides an illustration of the conceptual framework with each actionable concept as an intersecting circle creating a Venn diagram. The conceptual framework illustrates a triangle in the center to visually represent the interconnections between the actionable components of the AECT definition of educational technology as well as the processes and resources (i.e., tools and techniques used by project managers). Project management competencies are defined as KSAs mapped unto the PMBOK's five Process Groups, 10 Knowledge Areas, and 49 individual processes used in the formal project management standard (PMI, 2017). Additionally, we connected the KSAs to the "PMI Talent Triangle," which emphasizes competencies of project managers in three areas according to the newest edition of the PMBOK: "technical project management," "leadership," and "strategic and business management" (PMI, 2017, p. 56). These combined elements can be represented as KSA statements or competencies using this conceptual framework. As such, Ritzhaupt and Martin (2014) defines a knowledge statement as "an organized body of information" (p. 14) A skill statement is defined as the "manual, verbal, or mental manipulation of things" (Ritzhaupt & Martin, 2014, p. 2). Finally, an ability statement denotes "the capacity to perform an activity" (Ritzhaupt & Martin, 2014, p. 2).

As presented in Figure 1, KSAs merge and overlap within the three actionable concepts to represent the processes and resources employed by professionals in the field of educational technology with a focus on the actionable concept of "managing." These processes and resources are indicative of the 49 individual processes that account for the PMBOK, and the broader domains of competence outlined in the PMI Talent Triangle. The processes and resources are also representative of the tools employed in project management, such as common project management software packages (e.g., Microsoft Project). Ritzhaupt, Martin, and Daniels (2010) illustrated that the "knowledge, skill, and ability statements can be thought of as overlapping in which skills rest upon knowledge, and abilities rest upon skills" (p. 427). For example, the category, "[a]bility to create a risk management plan," requires related knowledge and skills to be able to fulfill the proposed ability statement. In particular, this ability might require knowledge of similar risks from previous projects of similar scope (e.g., expert judgement), stakeholder needs, and various analytical techniques for planning risk management as well as skills in decision-making, delegation, estimating, and budgeting.

Figure 1

Conceptual framework for educational technology project management in higher education. Adapted from "Development and validation of the educational technologist multimedia competency survey," by A. D. Ritzhaupt and F. Martin, 2014, Educational Technology Research and Development, 62(1), p. 13-33.



Method

Participants

The participants in this study were recruited from AECT's existing members in the spring of 2017. An e-mail request was sent which required potential participants to fill out a short pre-selection survey covering demographics, educational background, and professional experience. Given the nature of the study, participant selection for this qualitative study was intentionally purposeful with selection criteria established to identify participants who could best inform our research questions and enhance understanding (Creswell, 2009; Sargeant, 2012) of real project management competencies used in higher education. As such, the primary criteria for inclusion were that the professional worked in the field of educational technology within a higher education context, either had a job title of "project manager" or had professional experience serving in a project manager role regardless of formal title or institutional context, had worked in that capacity for at least one year, and was available for an online interview. We selected these criteria to ensure that the participants were experienced professionals in the higher education context using project management. Of 25 educational technology professionals who responded, 13 met the inclusion criteria based on their background, job title, and experience. These individuals were subsequently invited and agreed to participate in the study.

Of the 13 participants, eight were female and five were male. Their ages ranged from 27 to 65 years old, and their work experience ranged from three years to over 20 years. Ten of the participants held doctoral degrees, and the remaining three participants held master's degrees. All 13 participants worked in an educational technologically related role and either had a current title of project manager or previously held such a position. They all represented a diverse range of educational technology positions, including: two IDs, two senior IDs, two assistant professors, one associate professor, one full professor, four participants at a college director's level (Director eLearning and Instructional Technology; Director of Training; Director, Professional Development and Training; Director of Teaching and Learning Excellence), and an associate dean. Five of the participants worked at public universities, three worked at private universities, one worked at a community/state college, one worked at a for-profit online university, one worked at a private, Christian liberal arts college, and two worked for independent instructional design service firms with major stakeholders in higher education. In total, eleven American states and one Asian country were represented.

In terms of project management experience, eight (the majority) participants managed project teams of one to five people; another four participants managed teams of six to 10 people; and one participant managed a team of 11 to 20 people. Only one participant reported having earned a formal project management certification. Of the thirteen participants, only one of the participants had a year or more of formal project management education or training; six had one project management course only; and another six had no formal project management training at all.

Survey and Interview Questions

The research team developed a semi-structured interview protocol of 11 open-ended questions intended to capture the essence of the specific project management KSAs that educational technology professionals who have served as project managers needed in order to manage complex projects. All questions were designed according to Patton's (1990) Interview Guide Approach to ensure uniformity and to facilitate an open dialogue with the participants without leading them toward a particular response. Of note, the questions were deliberately designed using simple language and not the technical jargon found in the PMBOK. This decision was made to ensure the interviewees fully understood the language and intent of each interview question in the event they did not have formal project management education or training. Each interview question was reviewed by two IDs in higher education following a standard think-aloud protocol (Ericsson & Simon, 1984; van Someren et al., 1994), and minor revisions in diction and sequencing of questions were made to the original items. Appendix A features the final version of the interview protocol.

Data Collection Procedures

All 13 interviews were conducted with each participant individually using the online web-conferencing software, Adobe Connect. All questions were presented orally (i.e., the voice of the interviewer) and in written form on the screen to assist participants in the virtual environment and to keep the interviewees focused on the topic being discussed. The same member of the research team conducted all 13 interviews to ensure consistency in the data collection process. Each interview was recorded using web-conferencing software for subsequent transcription and coding. The software generated individual video files with audio, which could then be used for data transcription. Each interview lasted from 45 to 60 minutes across all participants.

Data Analysis

Data were transcribed using a professional transcription service and then analyzed using the Constant Comparative Method (CCM), described by Glaser (1967) as that which is "concerned with generating and plausibly suggesting (but not provisionally testing) many categories, properties, and hypotheses about general problems" (Glaser, 1967, p. 104). The CCM was selected because it can be used to generate theoretical explanations of the phenomenon–project management competencies used by educational technology professionals–with a large corpus of qualitative interview data. In the CCM, incidents applicable to each category are first compared (Glaser, 1965; Glaser, 1967). Then, within each category (i.e., open-ended interview question), each incident (i.e., participant response) was coded. The category was then reviewed to compare and determine the codes across participants. Codes within each category were generated, and then codes across categories were compared and integrated into a set of themes; for instance, the codes “communication skills” or “empathy” occurred across multiple categories and were combined to form a larger theme.

We maintained a detailed audit trail during both the data collection and analyses processes to establish the dependability and confirmability of the findings. To increase trustworthiness, two members of the research team independently coded two categories and discussed their codes for differences. Following comprehensive discussion, all other categories were coded by one researcher, reviewed by a second researcher, and discussed by members of the research team before codes were collapsed across categories and finalized to create an initial taxonomy of codes. The overarching themes “knowledge,” “skills,” and “abilities” were confirmed by looking within and across the taxonomy to discover relationships.

Results

As mentioned previously, three dominant themes emerged during data analysis: knowledge, skills, and abilities. Additionally, contextual information supporting these themes is provided in the following sections, including the project manager responsibilities and stakeholders, project management certifications, and project management technology resources. Additionally, we present our coding properties and categories in Appendix B

Responsibilities and Stakeholders

Common job responsibilities of the participants in higher education included managing both online and blended course design, development and improvement efforts for courses, training and professional development, faculty and user support, student support, staff support, training and technical support, or maintenance initiatives. In order to provide context and insight into their work environments, participants were asked about the primary stakeholders that they served as well as those that they viewed as most critical to their projects. Since all of these participants represented the higher education context, eight of them cited faculty members as being their critical stakeholders, and five others stated that their funding sources were the most critical stakeholders. Provosts and supervising partners were also mentioned as critical stakeholders in projects. In terms of primary stakeholders, participants mentioned the organization, learners, end-users, university administration, executive boards, program directors, and design departments.

Project Management Certification

While most of the participants recognized the extensive knowledge gained through formal project management certification, responses were largely mixed in their support for formal certification as a means of acquiring a ready skillset for managing real projects in the field. Instead, participants emphasized that the educational technology project manager should know the needs of the organization and client when opting for or against certification. One participant highlighted project management skills over project management certification, stating that “[c]ertification *might* [emphasis added] help you get clients. It's like if you're a small person consulting sort of job, but whether you have that or not, the schedule would be critical because you're not going to have that ability to bring in departments on time and on budget.” Another reflected:

So, I don’t have one, so *I can’t say that there’s an advantage to it* [emphasis added], but had I not had the two (project management) classes I took, I think I would be behind the eight ball. [For instance,] I don’t think that I ever would have understood that this is an 80-hour project, not an eight-hour project…And we know in the tech world nothing is perfect, and nothing works the first time through. So, *in the absence of taking a class, I can see why a certificate would be beneficial, in giving you that background knowledge* [emphasis added].

Still other participants were entirely against the idea of getting formal project management certification as an essential requirement for managing educational technology projects in higher education. One participant taking this position stated:

Not PMP. They're still too wedded to linear models that really end up being games between project managers and the people who do the real work. I've never met an engineer who knows what's going to happen more than two weeks or three at the most anyway. So I know PMP is popular. I know that certificate commands a pay grade. So there is a value to it. I don't necessarily think it's that helpful in managing [instructional design] or performance consulting work. I'd be very curious to start seeing what happens as you start seeing certifications wrapped around agile [certification]…You know, it's like, I would be far more interested in an agile [certification] that was actually focused on E-learning or performance support, performance improvement kind of thing.

Although there is no consensus of support for project management certification, several participants shared their experiences working on both ID projects and for higher education organizations of different sizes. They noted that the size of the project or organization may influence whether certification is necessary. Specifically, if the project or organization is large, then professional project managers may actually take the place of IDs who are focused on project management. Such professionals who focus solely on project management may actually benefit from gaining project management certification. However, for IDs working on smaller projects as part of smaller organizations, the likelihood of becoming an ID project manager increases. Therefore, whether project management certification is necessary for these project managers is more of a personal decision rather than essential. The key in this case is to acquire the essential project management KSAs, either through certification, other training, or through professional experience. One participant explains that "[f]or projects [which] are big and complex, I'd much rather have someone who specializes in project management and can run four or five difficult projects for me at the same time." The same participant then elaborated that:

If you're going to only work in big organizations, it may not be as critical for you. Then it probably limits your options later on…for me it was important. Not to have the certification, but certainly to have the skills. [For instance,] it allowed me to manage when I was independently running projects. Now, it matters less to me [in the larger organization] because I'm going to specialize and hire people who are just project managers. As you move into larger organizations, I think it's better to specialize in that, so we use project managers. And that's what they do, they're not [IDs]; they're people who are trained and learned project management.

Project Management Technology Resources

The technology resources that project managers need to use when managing educational technology projects span across KSAs. Technology resources are some of the more tangible tools and techniques that practitioners use and can include both hardware and software tools developed specifically for project management or other general productivity purposes (PMI, 2017). The technology resources mentioned by the project managers were vast, and many reflect the professional preferences of a particular respondent or the needs of their organization. For simplicity, some of the resources and their stated purposes are summarized in Table 1. The technology resources listed can be linked to project management processes (e.g., the process "develop project charter") defined in the current version of the PMBOK. Participants did not identify a single technology resource that was universal to the craft of project management. However, several general purposes and technology resources did reoccur across the participants. We noted that many of the technology resources and stated purposes listed are for communication management functions (e.g., team collaboration) among the various project stakeholders or focus on schedule management functions and include things like collaborative calendars, Gantt charts, and to-do lists. What is clear is that these project management professionals must be abreast of multiple technology resources to function in their work environments.

Table 1

Resources: Technology and purpose in project management.

Technology	Purpose
Microsoft Project	scheduling, resource allocation, Gantt charts
Microsoft Word	scope of work (memorandum of understanding), project charter,

Technology	Purpose
	issue/bug tracking, and status reports
Microsoft Excel	budgeting and project charter
Microsoft Outlook and other email	client, team, and other stakeholder communication
Google Suite, Google Smartsheet, Google Hangouts, and SharePoint	team communication, collaboration, and agile scrums
Google Docs	collaboration and archiving
Trello, Slack, and Basecamp	streamlined project management processes and scheduling
Tableau	data display
Google Sheets and Google Calendar	scheduling
Polycom and Yammer	video conferencing
JIRA, Bugzilla, and Mantis	agile project management and issue/bug tracking
Daily Scrums	agile project management
Subversion	document sharing and revision control
Toggl	time tracking and timesheets
To-do list app (and manual lists)	time management
Microsoft PowerPoint	presentations and storyboarding
Qualtrics	project research and data collection
Sharedrive and Google Drive	project archiving
Working knowledge of HTML, JavaScript, and Flash	communication with developers
Video and graphics production terminology	communication with developers
Learning management system basics	communication with team and faculty stakeholders
Paper calendars	scheduling
Traditional whiteboards and flipcharts	planning and brainstorming
Phone and text messaging	communication
Various templates and hardcopy documents	project documents, course blueprint, and archive data

Knowledge

All 13 participants had academic backgrounds in educational and instructional technologies as well as e-learning and learning technologies, both of which they highlighted as essential to their role as project managers in the field of educational technology. They perceived their academic backgrounds as providing them with essential educational technology project management knowledge in the following areas: instructional design models, practice, and theories (11 participants); learning and pedagogical theories and strategies (4 participants); learning sciences (2 participants); or research, data analysis, evaluation and assessment (3 participants). One participant stated that an “academic background in instructional design teaches you how to problem-solve. It teaches you how to keep goals, project goals, long-term organizational goals at the forefront of your planning.” Meanwhile, another participant said:

[Project managers] have to have a good command cognitively of the elements that make up the instructional design model that they're using in the project. In, you know, whether it's ADDIE [Analysis, Design, Development, Implementation, and Evaluation] or some other model that they're using rapid prototyping or whatever. As the project manager in successfully managing that project they have to know... be well versed in that particular model and the tasks associated with each phase of development within that model…So that kind of knowledge is important.

Several participants mentioned that their academic backgrounds gave them confidence to communicate with their project team and stakeholders. They acquired the vocabulary to communicate with their stakeholders, be it pedagogically, or through research or leadership. One participant stated, “I found that it helped me to have confidence speaking to some of these people who had been working with many of these things for a long time.” Another stated that he “was able to translate the vocabulary of the field into common language,” while yet another stated that it gave him credibility with his stakeholders. All participants highlighted the importance of project management skills as essential to their roles. They cited knowledge gained through prior teaching experience, professional experience as an ID, experiences with diverse projects, and other types of professional opportunities as valuable to project managers in their field.

General Business and Institutional Knowledge

The first category of “essential knowledge” relates to the higher education institution itself, that is the context in which educational technology project work is done. By being cognitively aware of the organizational context in which educational technology projects are situated, the project manager ultimately becomes more effective at aligning project-level goals with the greater strategic objectives of the institution. Regarding the institution, all 13 participants voiced the need for educational technology project managers to have various types of general business and institutional knowledge. In particular, all 13 participants stressed the importance of having professional levels of interpersonal intelligence and strategies and having broad familiarity with the commonly used technologies and tools needed for conducting office work, managing projects, or performing instructional design and development tasks. Although most of the participant responses about the category of “interpersonal intelligence” were directly centered on a variety of soft *skills* and not necessarily *knowledge*, it is evident from their responses that having an active understanding of the complexities of social interaction as well as the motives, perspectives, and needs of the people around them is essential when managing even the simplest of projects in the educational technology field. Likewise, such an understanding of complex projects also requires deep knowledge of implementation strategies for the various interpersonal skills reported. The importance of knowing *how* and *when* to use a particular skill or ability was a common theme among all 13 participants.

In support of having broad awareness of various technology resources, one participant stated:

I think it's also important for a successful [instructional design] project manager to at least have a working knowledge of various programming languages, video production terminology, [and] graphics-production terminology. I'm not saying that they need to be programmers or video producers or graphic artists, but they certainly need to know how to communicate within those specific genres associated with the development of a course, or a program, because absent that communication they're not gonna be able to handle those elements of the project.

Other types of general business and institutional knowledge that emerged throughout the interview process include: knowledge of communication strategies for working with diverse project team members and stakeholders (7 participants); being well-versed with various work prioritization tactics (4 participants); decision-making strategies (2 participants); ethics and copyright laws (2 participants); research techniques (2 participants); consulting, collaboration and general budgeting concepts (2 participants); and principles of emotional and organizational intelligence (4 participants). In emphasizing the principles of emotional and organizational intelligence, one participant stressed the importance of “knowing how the organization works so you can work that organization. So how are things done? Who’s where? Where are the big paying points? Where are the opportunities? What’s the nature of your business? What things are keeping people up at night?” Similarly, another participant added that the educational technology project manager should be “[e]motionally intelligent enough, socially intelligent enough to quickly determine what it is the stakeholders need, and then focus the communication directly to that need, and that's it. Nothing else.”

Project Management Process Knowledge

The second category of knowledge to emerge was “project management process knowledge.” Participants noted that educational technology project managers needed comprehensive project management process knowledge to help guide them through the various overlapping phases and processes involved in managing multiple and diverse projects. When asked what type of knowledge is deemed essential, one participant emphasized knowing the basics of integration:

[Project managers] need some basic project management skills, knowledge in order to keep track of all the various pieces that have to come together, and as we both know instructional design is an organic process. It's not as linear as we would like to think it is. And so, lots of details, and lots of things that could fall through the cracks with someone who is not attentive to those types of details and keeping everybody on track.

Other participants not only recognized the importance of knowing project management basics, but also stressed a core responsibility of the project manager is knowing how to allocate and manage with finite resources to achieve the project goals. One participant stated:

I think *understanding the phases of project management*, and *understanding when you have more flexibility, when you have less* [emphasis added]. You know, there’s a curve that tells you, you know, the further you get into a project, the more costly and the less effective changes become. So understanding that and managing with that knowledge is very important.

Among the core project management areas identified by participants as requiring a certain depth of knowledge include: project team management (12 participants), project management foundations and practice (7 participants), project scope and needs assessment (7 participants), project scheduling and time management (5 participants), stakeholder engagement (3 participants), budgeting and cost management (2 participants), and resource estimation and management (2 participants). Within the largest of these subcategories of project management knowledge--“project team management”--participants emphasized the need for the project manager to understand the “roles, skills, and abilities of the team members: (6 participants) in order to be successful. One participant explained this idea in this manner:

As a project manager you really have to have a solid understanding of the roles that you’re managing, right? It doesn’t mean that if you are managing a content developer, and a content designer, and a media developer…It doesn’t mean that you have to be able to build the media. It doesn’t mean that you have to have that same attention to detail that a content developer does or that you have to be able to master or have a mastery of all of the, you know, learning theories or design approaches that an [ID] does, but you do have to have an awareness of what all goes into that…in order to be able to appreciate the process and also estimate how much time it’s going to take for that process.

In terms of engaging different stakeholders, six participants mentioned the importance of understanding scope definition and the challenges associated with it. One participant explained:

You know the scope of work [that the stakeholder is] going to come up with is going to be, you know, huge. And so one of the things that we did to help on the project management side is in the early analysis stuff, we just put in a whole bunch of questions from one deliverable to the next. Are you scoping this appropriately? Is this appropriately scoped?

Still another participant emphasized the importance of knowing the scheduling and time management needs of the project and the individual team members. (Although all participants managed teams as a project management responsibility, some of the participants had sole responsibility for project and team scheduling.) However, on this participant’s team, each member was responsible for scheduling the completion of their own tasks:

[Those on the team] do typically two levels of scheduling. There’s a high-level schedule that’s major project milestones. The other level of schedule is a lot more detailed, and we’re calling those serial review schedules. And it’s how a team will take a particular deliverable and the process that they use to get that deliverable out and through everybody for review.

Instructional Design Knowledge

In addition to having broad business and institutional knowledge as well as project management process knowledge, the third category of knowledge to emerge was “instructional design knowledge.”

All 13 participants felt that educational technology project managers need a solid understanding of instructional design in order to effectively manage projects, team members, and stakeholders in the higher education environment. Project managers need to have a wide range of foundational knowledge in their field to recognize and coordinate the many interconnected parts of their projects. For instance, one participant stated:

I don’t have to be a content expert in the area; that’s the faculty member’s job, or the subject matter expert. My job is to have knowledge of instructional design theories, pedagogy, best practices, and then take their [faculty or subject matter expert] content and their goals, and put it in, put it to work. So to me, the knowledge of the instructional design theories, pedagogical theories, brain research, you know, understanding how students learn.

All responses related to the category of “instructional design knowledge” fell within the areas of instructional design best practices (6 participants), instructional design models and theories (5 participants), and learning and pedagogical theories (4 participants). The importance of project managers getting real-world knowledge through professional experience working on instructional design projects – with real people and a variety of modalities – was a common theme of the participants. One participant summarized this perspective by stating the following:

[As project manager,] you do have to be up on best practices, in terms of course design, in terms of working with the subject matter experts. Some of those interpersonal skills are really important, and if you don't have that ability to work with people, you're not even gonna get off the ground with a project management project or course design or other.

All 13 participants stated the importance of being knowledgeable of the basic ADDIE model or other design-based approaches to managing projects, and eight participants highlighted the importance of backward design to their job roles. One participant explained this in the following way:

My project management probably looks a lot like an instructional design model. So the instructional design model is gonna be[,] what would the outcome be? And what are the assessments? We really have moved in the last several years to using the backward design model. And so we look at, what are the outcomes. Then, how are we gonna assess whether we got to those or not? And then what are the steps in getting there in terms of project management?

Another participant described her approach to project management through a design-based lens:

We really use these days more of a design approach [in which]we have a spiral model, and the integrative approach where we try to turn out a prototype, test the prototype, modify the prototype in a continuous cycle like that. So, we've gone over time from the more waterfall approach to much more of this cyclical design thinking type of approach.

Yet another approach mentioned was a focus on performance improvement, or the human performance technology perspective. A participant with this perspective stated:

We look at all this stuff through a performance improvement lens... We frame it within the context of, you know, we either have a problem where people aren’t doing what they need to, or we’ve got a future opportunity where we need people to do something different than they are. And when you frame things that way, you need to start looking at, you know, what is the gap in performance? What is the difference between expected and actuals? And given that difference, is the gap worth closing? And given a gap that’s worth closing, what are its causes?

Participants preferred specific approaches, such as iterative or performance improvement approaches, and provided examples of different models they used in their jobs. However, they all stressed knowledge of different models as an essential part of the project manager’s repertoire. While all 13 participants identified instructional design models that they used in their own practice to manage projects, some also mentioned the importance of having knowledge of proprietary models, of agile project management approaches, of rapid-prototyping, of active learning, and of program review processes as useful for project managers. One of the participants even acknowledged that intuitive and *informal* systems to managing projects have their place as well, instead of just a focus on “Gantt charts and rigorous documentation.”

Skills

Just as gaining knowledge of instructional design through experience was a common theme, acquiring project management skills through hands-on experience was also a commonly discussed topic across participants. The nature of such experience occurred within both formal training and professional contexts in the workplace. To illustrate the importance of hands-on experience, one participant commented on the importance of a project manager being able to differentiate between the roles of ID and project manager yet interconnect them again when needed.

Another participant noted the value of having real experience in actual course design in order to manage projects:

[As a project manager,] you still need some real background of what course design looks like, and what kinds of things are appropriate in an online or a hybrid or a face-to-face setting. You know, you have to know that certain types of learning activities are gonna work in one modality or another or be more effective or not be more effective.

In terms of essential skills needed to manage educational technology projects in higher education contexts, participant responses fall within one of four dominant skill categories: project planning and management (90 references across participants), general management and design skills (35 references), interpersonal and communication skills (33 references), and intrapersonal (i.e., self-mastery) skills (18 references). Of these four overarching categories of essential skills, 24 separate subcategories were also identified and are discussed in this section.

Project Planning and Management Skills

Within the first category, there are nine subcategories of skills that directly relate to planning and managing various project components. These subcategories reflect nine out of ten knowledge areas of the PMBOK. Particularly noteworthy is that all 13 participants considered it essential for the educational technology project manager to have skills in the areas of “determining project scheduling strategy,” “determining project scope and needs,” and “developing the project team.” In relation to the “determining project scheduling” category, one participant noted various elements needed to show these skills:

Well, you want to know what are the outcomes that you're gonna have at the end of that project. And so thinking from a management perspective, it's breaking it down to the tasks and so forth that need to be done, setting up some sort of timeline for that with milestones and so forth, and looking at what kind of resources you're gonna need for those kinds of things.

Yet another participant discussed the need for scope-management skills, while a third participant discussed various sub-skills needed to become skilled at “developing the project team”:

You will also need to be able to build and appreciate rapport with others, right? You have to be able to empathize, ‘cause I mean it’s very easy for a relationship to become adversarial, right, for whatever reason. Maybe the person’s having a bad day. It can become very adversarial and you need to be able to empathize with them and not just react when you’re having that. …But one of my early project managers, he was amazing at, first of all really appreciating his team, and appreciating our needs to work well together, right? You have to be able to recognize when your team needs some bonding moments in order to get over the finish line or whatever, and when you need to be a little bit silly.

Another essential project planning and management skill that was discussed by a large majority of participants is managing stakeholder engagement (11 participants). In one discussion, a participant referred to the project manager as a “consultant-collaborator” with the stakeholders and the project as “surfing,” in which “everything is going to move underneath your feet as you're going along.” In this discussion, the participant implied that most project management processes, including the management of stakeholder engagement, involve some type of surfing:

And so if you think about the other aspects of project work, one of those aspects is consulting and collaborating with your client in ways that don't let them do stupid things, and in ways that shape their expectations, and in ways that are collaborative because they know how their organizations work; we don't. And so we have to find this kind of balancing point between the strong suits of [ID]/performance consultant and clients.

General Management and Design Skills

In relation to general management and design, all 13 participants identified having broad technological skills as crucial for the educational technology project manager in higher education. Participants stated that project managers should be skilled at using information and communication technologies, using project management software, designing project charts, and using other scheduling and budgeting tools. Some participants also emphasized the importance of having broad skills in programming, video production, and graphics production for project managers. Participants agreed that the educational technology project manager needs to have some skills in using common productivity technologies (e.g., Microsoft Suite, Google Docs, Microsoft Outlook) for general day-to-day purposes. Still other participants highlighted skills in using project management-specific software such as Microsoft Project.

Other general management and design skills mentioned by participants fall within one of three additional subcategories: general management skills (10 participants), research skills (9 participants), and instructional design skills (3 participants). The first of these, general management skills, consists of various miscellaneous skills mentioned by two or fewer participants each. These include skills like creating project value (2 participants), determining the project management approach (2 participants), and using agile (2 participants) and linear (2 participants) project management models. One participated listed the research skills needed by project managers:

…so, the ability to conduct focus groups, the ability to write a survey and implement a survey, and then review the data, analyze the data, come up with hopefully a learning solution or a problem solution at the end of those analyses that we do.

Interpersonal and Communication Skills

All 13 participants placed great emphasis on general interpersonal skills (i.e., people skills) and communication skills. Like general management skills, the skillset identified as general interpersonal skills includes a synthesis of various interpersonal skills, each of which was mentioned by two or fewer participants. Skills in this general category include assertiveness (2 participants), collaboration (2 participants), diplomacy (2 participants), empathy (2 participants), listening (2 participants), negotiation (2 participants), confidence-building (1 participant), and teaching (1 participant). As for communication, although all 13 participants identified communication skills as essential when dealing with stakeholders, clients, and team members, there were two major areas of emphasis into which communication skills fell: clear and consistent communication (9 participants) and general project communication (8 participants). Regarding project managers maintaining clear and consistent communication, one participant talked about being able to explain a concept in multiple ways and that "[y]ou have to be a good communicator. You have to be clear. And realize that even though you think you're being clear, you have to realize how the other person needs to hear it in order for them to understand it." Another participant described clarity in communication in terms of careful articulation of project outcomes based on realistic expectations:

It's [our] role, I think, to listen, to take what [faculty] say and then be able to craft that into a very tangible measurable outcome. And be able to articulate that back to the client, so to speak, the faculty member, the academic department, whoever might be initiating or ultimately using this piece of instruction so that you're clear that you all have realistic expectations.

As for having general communication skills, the same participant explained this type of skill as "keeping everyone informed, assessing the progress, setting up milestones" and that everything needs to be "guided towards that shared vision." In relation to essential communication skills, not only did the participants emphasize effective communication for project managers, but they also stressed skills in managing expectations, input, and communications between stakeholders and the project management team.

Furthermore, according to participants, project managers who have well-developed interpersonal and communication skills are better equipped to "acquire the right team members" (3 participants), "understand team roles and assign them according to team members' skills and abilities" (8 participants), and "facilitate team collaboration" (6 participants) for successful project completion on the timeline. One participant reflected:

…the most important [element for project success] really is that collaboration and communication piece because [the team] start off as strangers, and if they're going to do well in the course, they need to work through storming and norming to become a high performing team. And they're going to do that because everybody is in on this, even people with a lot of experience. They're going to slip schedule, and they're going to have to overcome it.

Finally, in addition to the categories previously mentioned, project managers need to have background knowledge on the strategies needed to develop emotional intelligence (discussed under "Knowledge" above), three of the participants underscored that skills related to emotional and social intelligence are most vital to deal with a wide range of relational scenarios that a project manager may face when working with a diverse team or set of stakeholders.

Intrapersonal Skills

Within this category is a set of widely varying general intrapersonal skills that all participants argued were important to project managers. These include understanding oneself, particularly those desires, intentions, moods, strengths and weaknesses with which each person must live. Although all 13 participants cited skills that fall within the category of "general intrapersonal skills," only two types of "self-mastery" skills were identified as essential by three or more participants: personal time management (5 participants) and focus on details (3 participants). Other intrapersonal skills identified include an appreciation for process (1 participant), flexibility and adaptability (1 participant), taking initiative (1 participant), possessing organization (1 participant), having persistence (1 participant), self-reflecting (1 participant), maintaining self-responsibility (1 participant), and having tolerance for ambiguity (1 participant). One participant summarized her view:

I think you have to have a high tolerance for ambiguity, in the initial stages of the project, because a lot of times when you're working with clients, they may not know what they want, and they may have just a vague idea, and you kind of got to be willing and able to go with that and sort of explore the outcomes that you're trying to achieve as you move forward.

Abilities

The third and final dominant theme that emerged in the data is "essential abilities," or "the capacity to perform an activity" (Author, 2010, p. 427). As for essential abilities that project managers need to manage higher education projects, 42 distinct ability statements were identified across participant responses, and each ability statement aligns with one of 11 overarching ability categories. Of these 11 categories, nine directly relate to managing various project aspects and, interestingly, align rather closely with nine out of ten knowledge areas of the PMBOK. The nine categories of abilities that align with the PMBOK include using and managing resources (54 references across participants), managing stakeholders (17 references), managing schedules (15 references), managing communications (12 references), managing scope (9 references), managing project integration (8 references), managing cost (4 references), managing risk (3 references), and managing quality (1 reference). The two remaining categories of abilities in this study include general "project-wide" abilities (59 references)–which apply across multiple project phases–and industry-specific abilities (12 references). This section provides an overview of those abilities cited most often by participants–and thus deemed essential.

Project Management-Specific Abilities

The PMBOK (2017) standard tells us that a primary project management goal is "to meet the project's objectives and stakeholders' expectations" (p. 53), which is accomplished through balancing "the competing constraints on the project with the resources available." In alignment with the primary project management goal of managing stakeholders, the one ability statement for which all the participants in the current study agreed was the ability to proactively manage stakeholder expectations and engagement (13 references). In a discussion on engaging and managing the expectations of faculty stakeholders, one participant stated it like this: “I would say proactive. Getting back to that sort of people skills, you kind of have to manage your client, sometimes the expectations to the client, but sometimes the actual getting input from clients. Again, university faculty are typically pretty busy people. And their job description isn't necessarily centered around instructional development.”

In the area of scheduling, all participants considered it essential for project managers to be able to develop and follow a project schedule (13 references) in order to manage time contraints. To highlight the importance of being able to develop and follow a project schedule, one participant mentioned that “all of those aspects of producing, of course, successfully, and adhering to a project management plan or timeline…If the project manager is not knowledgeable about those kinds of details, those can actually be the fly in the ointment that holds up the project from being delivered on time and within budget.”

Similarly, most of the participants believed that various communication-related abilities were a vital part of the educational technology project manager’s arsenal. However, while 12 participants deemed it essential to be able to communicate clearly, openly, and constantly in order to manage project communications, the emphasis of each participant varied widely. For instance, one participant stressed the ability to communicate clearly, while another focused on the ability to communicate in a transparent manner with an “open-door” approach to communications. Yet another participant highlighted the ability to focus communications to meet the needs of the stakeholders:

And so, part of the project manager’s responsibilities might fall in the area of negotiating different timelines or different resource options that might be available. So some negotiation skills, I think, are helpful as well, but good, solid communication skills, and understanding what it is each of these stakeholder groups really needs to know in order to make a decision…and that's where the communication needs to be focused. I work with a lot of instructional design graduate learners who want to go into a lot of lengthy explanation about the process, about the value of instructional design, about how it happens, who all's in. And these stakeholders, they don't care. That's not what they wanna know, so the instructional design project manager needs to be political enough to quickly determine what it is the stakeholders need and then focus the communication directly to that need.

In relation to using and managing resources, all 13 participants deemed it essential that educational technology project managers have the ability to use common technology software and terminology for instructional design projects. Although the types of technologies mentioned varies, participants all suggest that having the broad ability to use technologies and associated terminology is essential to communicate with people managed by a project manager.

Similarly, most of the participants further delineated the ability to use common project management software (10 participants), such as Microsoft Project or Gantt charts, as essential.

Other common overarching ability statements related to overseeing resources include managing people (9 participants) and managing all (non-human) resources (8 participants). In relation to managing people, one participant noted that “[i]t comes down to the management piece of it though. Of how do you effectively manage people? I think [that is] the key to me at least.” Likewise, key statements that various participants used to describe the ability to manage all resources include “identify resource requirements,” “estimate properly,” “allocate resources to accomplish an end,” and “you have time, money and resources, and you have to balance those out.”

The final two categories of essential project management-specific abilities include: managing scope (9 participants) and managing project integration (8 participants). Of these dominant categories, the specific participant statements of essential abilities include determining the project’s scope of work (9 participants), developing and following project plans and tools (4 participants), and evaluating project outcomes and status (4 participants). To this end, a participant noted that:

Spending time to [develop and] really assess what the client wants, what’s expected, and then articulating that so that the whole team understands it, I think is where it all begins. And then once you have that, then it’s basic instructional design and project management. What are the milestones? What are the steps? Who are the people? What are the resources? What are the timelines? And then just planning the rest of it and working that plan.

Finally, while some participants noted useful abilities related to the larger project management categories of "managing cost," "managing risk," and "managing quality" (4, 3, and 1 participant[s] respectively), ability statements in these categories were not widely mentioned by the participants.

General "Project-Wide" Abilities

In the current study, all 13 participants recognized the need for project managers to have general abilities that apply across project tasks, phases, or even the life of a project. Altogether the participants identified 18 distinct "project-wide" ability statements. Within this category, only one ability statement was held in common among most participants. The ability to apply general interpersonal skills was discussed by 12 of 13 participants. One participant described the importance of this ability in the following way:

So the first and foremost is the people skills, or rather people abilities. You've gotta be able to relate; you have to be able to listen, what is their end goal, you know, what do they wanna achieve, and they're gonna tell you, they want to do 1, 2, 3 and achieve X, Y, Z, and you have to figure out how to make them understand [participant laughs] 'cause they're two different processes coming together.

Yet another participant focused instead on project managers possessing an interpersonal skill such as assertiveness, which he termed "the ability to push in a nice way." He further elaborated that "you wanna remain friendly, but you've got to, you know, with each successive message or phone call, you've got to up the pressure to perform." Only one specific interpersonal skill–the ability to work well with others (7 participants)–was a shared response by more than half the participants. While there was broad variety among participants regarding which general project-wide abilities are essential, three particular ability statements were discussed by at least five participants. These include the abilities to apply different project management lens to each project (6 participants), to apply suitable project management principles (5 participants), and to manage diverse project details (5 participants). In the words of one participant:

The last part of this project beast is the notion of the project management. How do you deliver quality work on time within budget? How do you manage changes? What kinds of project management approaches do you use given the kinds of risks that you need to mitigate in the project? How do you identify and classify "risk?" How do you work with others to mitigate those? And, you know, in order to deliver quality work on time and budget that the client's actually going to value, because at end of all this stuff, you deliver value behavior change in the workplace.

Industry-Specific Ability

Although participants in this study only identified one ability statement that applies to the level of the industry or organizational context, this ability statement represents a significant consensus among the participants. Specifically, 12 of 13 participants noted the importance of having the ability to apply instructional design principles and theories of teaching and learning. For instance, one participant this ability in the following way:

My job is to have knowledge of instructional design theories, pedagogy, best practices, and then take their content and their goals, and put it in, put it to work [i.e., to apply it]. So to me the knowledge of the instructional design theories, pedagogical theories, brain research, you know, understanding how students learn…

Discussion

Before drawing conclusions and interpreting the findings of this study, it is important to take note of the limitations of this study. This is a qualitative inquiry with an intentionally small and homogeneous sample, and as such, these data should not be generalized to the larger population of educational technology project managers. Instead, these results should be viewed as "transferable" to the reader's professional experiences and background in their contexts. Further, the participants in this study were largely representative of the United States as they were recruited from AECT, and participants practiced project management in the context of higher education settings. Readers should be cautious in transferring the findings of this study to other educational technology contexts (e.g., the military), and especially, other disciplines (e.g., construction management). Also, we only interviewed participants on one occasion, and we did not collect additional data sources (e.g., each participant's resume or curriculum vitae) to triangulate the findings from the study, which could have enhanced the validity of our results. Finally, the participants in this study served as the source of expertise (per our selection criteria) about educational technology project management in higher education. Thus, our findings are subject to the experience of the professionals in our limited sample. The results of this study may be applicable to other educational technology professionals with project management experience in higher education.

With these caveats in mind, this research has expanded our understanding of the project management competencies of educational technology professionals working in institutions of higher education. The findings from our study illustrate that educational technology professionals practicing project management must possess a wide variety of competencies to fulfill their roles and responsibilities. Consistent with previous research (Ritzhaupt & Kumar, 2015; Kumar & Ritzhaupt, 2017), our findings show that educational technology professionals in higher education identify faculty members as being their primary stakeholders. Although students are the main audience of much of the project manager's work, faculty members are often perceived as both the client and subject-matter expert in higher education settings. The participants in our study all had academic backgrounds in the broad field of educational technology with formal training in topics like learning theories, instructional theories and strategies, instructional design and development models, learning sciences, research, data analysis, evaluation, and assessment. However, six of the participants had no formal training in the craft of project management. This finding is consistent with the reality that many educational technology programs do not offer coursework in project management (van Rooij, 2010; van Rooij, 2011).

The participants in this study blend instructional design model processes with project management processes to guide their work efforts and manage their projects effectively. This is not an unusual practice in the field of educational technology with educational technology professionals using methods like rapid-prototyping (Tripp, & Bichelmeyer, 1990) or agile methods (Sweeney, & Cifuentes, 2010) to serve as the project management function. Several of the participants noted using the principles of backward design to guide their creations and project efforts (McTighe, & Thomas, 2003). Instinctively, the educational technology professionals are using project management processes, tools, and techniques without having detailed knowledge of formal project management methodology. Their knowledge of project management processes is often derived from the experiences of implementing their product development life cycles (i.e., instructional design models) with customized features. It would appear that educational technology professionals are tailoring instructional design models with custom project management processes to function within their work environments. Regardless, several of the professionals are unconsciously using formal processes mirroring the PMBOK without ever having been trained in this subject.

This is not to say that the professionals in this study did not have some background in formal project management. After all, more than half of the participants had taken at least one course in project management during their academic preparation. Several of the project managers described traditional project management processes, tools, and techniques, including things like defining and managing scope, estimating activity resources and durations, developing budgets, or developing schedules and timelines. Participants also noted that they used applications like Gantt charts, the critical path method, and project management software. The participants did not necessarily use the formal language presented here to describe the ideas, but nonetheless, the principles and ideas were still present in their narratives. Consistent with prior research (Ritzhaupt & Kumar, 2015; Kumar & Ritzhaupt, 2017; Kang & Ritzhaupt, 2015), educational technology professionals in higher education must be abreast of a wide variety of information and communication technologies, ranging from standard productivity tools like word processors and spreadsheets, to authoring packages to Learning Management Systems (LMSs) and cloud-based tools for collaboration. These tools are used for a range of purposes, to include scheduling, budgeting, conferencing, planning, communicating, storyboarding, and version control. It is therefore clear that project managers in the educational technology context must develop competencies in a wide range of processes and tools.

Also consistent with prior research , the role of communications skills and the ability to work with diverse stakeholders floated to the top of the list for many of these educational technology professionals (Ritzhaupt & Kumar, 2015; Kumar & Ritzhaupt, 2017; Kang & Ritzhaupt, 2015). Communications management and stakeholder management are two of the ten knowledge areas described in the PMBOK and are incredibly important competencies to develop as project managers. After all, Schwalbe (2015) reported that project managers spend as much as 90 percent of their time communicating with project stakeholders. Educational technology professionals serving in the project manager role also have to carefully balance client expectations with the resource constraints of the work environment and effectively lead project team members to achieve goals that are sometimes unclearly defined yet progressively elaborated as time passes. Both written and oral communication skills are essential to this role; project managers must be effective communicators and develop expertise in engaging with and managing stakeholders from diverse backgrounds. These findings are also consistent with the competencies described by the PMI Talent Triangle in the newest edition of the PMBOK, which emphasize technical competence in project management and the importance of leadership and knowledge of the business domain – in this case, higher education (PMI, 2017).

The educational technology professionals serving as project managers in this study had varying attitudes towards the value of professional certifications in project management. Most of the participants saw value in project management credentials, while others felt the PMP in particular was too linear and rigid. Prior research in our field has also questioned the importance of certifications like the PMP for educational technology professionals (Brill et al., 2006). Even project management scholars have reservations about the value of the PMP to professionals managing projects across disciplines and contexts (Starkweather & Stevenson, 2011). Nonetheless, what is clear from this research is that many of the project managers in the educational technology context that we interviewed are practicing the ideas described by the PMBOK with or without consciously realizing they are doing so. The PMP is intended to certify professionals from any industry (e.g., construction management, information technology) so that they may practice effective project management on any type and size of project. Many of the educational technology professionals interviewed in this research were managing smaller teams (less than 20 team members) and smaller projects (i.e., projects with duration of less than 6-months, with budgets less than $75,000, and with fewer than 10 stakeholders). Some of the processes prescribed by the PMBOK might seem inappropriate for smaller projects; thus, the question of value remains unanswered in the educational technology context, particularly in higher education. More empirical research is necessary to determine if these credentials are truly leading to better project management in educational technology.

The interview data we collected from these project managers touch upon most aspects of the PMBOK (e.g., knowledge areas). Again, the participants did not always use the jargon of the PMBOK to express themselves during the interview; nor were they expected to do so. What we can conclude is that educational technology professionals are practicing varying aspects of integration management, scope management, schedule management, cost management, communications management, stakeholder management, quality management, risk management, and resource management in their regular work environments. In fact, they have developed their own tailored processes and domain expertise in these areas. Also evident in our data is that project managers are involved in the full life cycles of the projects from initiation to closing.

Though many aspects of the PMBOK were evident, there were also many aspects that were not present in our interview data. For example, we did not see as much evidence aligned with the processes within procurement management, which involves acquiring goods or services from vendors. Also absent from the interview data are specific project management tools, techniques, and processes outlined in the PMBOK and other project management literature. For instance, the Earned Value Management (EVM) method is a powerful and popular tool that supports the management of scope, schedule, and cost in an integrated mathematical framework supported by common project management software packages (Anbari, 2003). Quantitative and qualitative risk analyses were also not discussed, nor was the use of a risk register to manage the risk events for a project. The concept of a Work-Breakdown Structure (WBS) was also not mentioned directly, even though project management software such as Microsoft Project and Gantt charts were noted. These missing elements are likely a function of our interview protocol. However, future research needs to examine which processes are useful and which processes are not to project managers in educational technology working in institutions of higher education.

Recommendations for Practitioners

Professionals, professional associations, and academic programs may find this research useful in planning professional development opportunities and academic curricula. Project managers in our field can assess the extent to which these findings are applicable to their work environment and employ some of the many ideas presented in their own professional practices. Aspiring project managers can use this study to assess their current competencies and plan learning events to prepare them for this important role. Professional associations such as AECT, the Association for Talent Development (ATD), or the International Society for Performance Improvement (ISPI) can work to refresh their standards and credentialing programs (e.g., ATD's Certified Professional in Learning and Performance) to target specific project management competencies relevant to the field. Professional associations, like the Online Learning Consortium (OLC), are already offering professional development experiences focusing on project management in higher education (OLC, 2018). Academic programs in the field of educational technology should start to address the gap in project management curriculum in our field by offering robust courses and authentic project experiences to prepare educational technology professionals for their increasingly complex work environments.

Recommendations for Researchers

Future research on the role of project management in educational technology is a fruitful research avenue with ample opportunities to address questions of both theoretical and practical significance. As the present study was an exploratory study using qualitative procedures, some of these findings may be useful in contributing to the development of a survey or other data collection tools for educational technology professionals working as project managers. A large cross-sectional sample of professionals across the United States, and even beyond, would provide useful information in understanding the roles and responsibilities of project managers within our discipline. This information is also useful for human resource professionals to acquire the appropriate professionals to serve in these roles. As this study focused on those individuals within a higher education context, it would also be advantageous to interview professionals in educational technology working in other contexts, like business and industry, the government, the military, or K-12 education. These data could be compared and contrasted to examine the moderating influences of the contexts in which the project manager works. At some point, we will have to examine the influence of credentialing systems like the PMP on the practices of project managers of professionals in the field of educational technology and the overall success of projects managed by those professionals.

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Appendix A: Interview Questions

General

1. Please talk a little about your academic and professional background. Do you think your academic background has helped you in your professional responsibilities? If so, how? (If not, why not?) Please explain.
2. Please explain how your role fits within the organizational structure of your institution.
3. (Who do you report to? Also, what function[s] do the team members play in your work?)

Project Management

1. In terms of project management, how many years of formal (or formalized) experience managing projects would you say you have at this point?
2. From your experience, what knowledge, skills, and/or abilities should you possess to be successful in managing projects?
3. Who do you consider to be the primary project stakeholders you work with most frequently? Which of them would you consider to be most critical?
4. Are project management models, processes, or standards useful in your job? If so, which ones?
5. What type of project management preparation or training would you recommend for your position (if any)? What advantages are there in holding a professional certification in project management (if any)?
6. What specific types of technology or tools do you use most frequently in your line of work when managing projects?
7. In your opinion, what general aspects of managing projects require the most attention and/or challenge in your role?

Wrap-up

1. What would you consider to be a successfully managed project?
2. From your professional experience, what would you consider to be your greatest lesson learned about managing projects?

Appendix B: KSA Categories and Subcategories

Table 2

KNOWLEDGE (3 Categories; 20 subcategories identified)

CATEGORY 1 – General Business and Institutional Knowledge	**49**
Interpersonal Intelligence and Strategies	13
Common Technology and Tools	13
Communication Strategies	7
Emotional & Organizational Intelligence	4
Work Prioritization Tactics	4
Decision-Making Strategies	2
Ethics and Copyright Laws	2
Research Techniques	2
Consulting and Collaborating Techniques	1
General Budgeting Concepts	1
CATEGORY 2 – Project Management Knowledge	**38**
Project Team Management	12
Project Management Foundations & Practice	7
Project Scope and Needs Assessment	7
Project Scheduling & Time Management	5
Project Stakeholder Engagement	3
Project Budgeting and Cost Management	2
Project Resource Estimation and Management	2
CATEGORY 3 – Instructional Design Knowledge	**16**
Instructional Design Best Practices	6
Instructional Design Models and Theories	6
Learning and Pedagogical Theories	4
Top Knowledge Statements (at least 7 participants)	
Interpersonal Intelligence and Strategies	13
Common Technology and Tools	13
Project Team Management	12
Communication Strategies	7
Project Management Foundations & Practice	7
Project Scope and Needs Assessment	7

Table 3

SKILLS (4 categories; 24 subcategories identified)

CATEGORY 1 – Project Planning and Management	**90**
Schedule Management Skills	
Determining Project Scheduling Strategy	13
Managing Project Schedule	7
Scope Management Skills	
Determining Project Scope & Needs	13
Managing Project Scope	3
Team Management Skills	
Developing Project Team	13
Managing Project Team	7
Hiring Project Team	3
Managing Stakeholder Engagement	11
Identifying and Managing Project Risk	7
Budgeting and Managing Costs	5
Planning and Managing Communications	5
Managing Project Change	2
Setting and Managing Quality Control	1
CATEGORY 2 – General Management and Design	**35**
Technological Skills	13
General Management Skills	10
Monitoring & Controlling Project Work	
Creating Project Value	
Determining Project Management Approach	
Skill with Agile Models	
Skill with Linear Project Management Models	
Research Skills	9
Instructional Design Skills	3
CATEGORY 3 – Interpersonal and Communication	**33**
General Interpersonal (mentioned by ≤ 2 participants)	13
Assertiveness	
Collaboration	
Diplomacy	
Empathy	
Listening	
Negotiation	

Confidence-Building	
Exploring Potential Outcomes	
Teaching	
Emotional and Social Intelligence	3
Communication	
Clear & Consistent Communication	9
General Communication	8
CATEGORY 4 – Intrapersonal	**18**
General Intrapersonal (mentioned by ≤ 2 participants)	13
Appreciation for Process	
Flexibility and Adaptability	
Initiative	
Organization	
Persistence	
Self-Reflection	
Self-Responsibility for Project Issues	
Tolerance for Ambiguity	
Personal Time Management	5
Focus on Details	3
Top Skill Statements (at least 7 participants)	
Determining Project Scheduling	13
Determining Project Scope & Needs	13
Developing Project Team	13
Technological Skills	13
General Interpersonal Skills	13
General Intrapersonal Skills	13
Managing Stakeholder Engagement	11
General Management Skills	10
Clear & Consistent Communication	9
Research Skills	9
Open Communication	8
Identifying and Managing Project Risk	7
Managing Project Schedule	7
Managing Project Team	7

Table 4

ABILITIES (11 categories; 42 abilities identified), Corresponding to PMBOK Knowledge Areas (PMI, 2017, p. 25)

CATEGORY 1 – Using and Managing Resources (23 distinct ability statements)	**54**
Use common software and terminology for ID projects	13
Use common project management software	10
Manage people	9
Manage all (non-human) resources	8
Estimate project resources accurately.	3
Use team member skills effectively	3
Meet needs of team members	2
Plan, conduct, and manage meetings	2
Advocate for project team	1
Hire the right team members	1
Motivate team members	1
Reward team	1
CATEGORY 2 – Managing Stakeholders	**17**
Proactively manage stakeholder expectations and engagement	13
Consult and collaborate with clients	4
CATEGORY 3 – Managing Schedules	**15**
Develop and follow a project schedule	13
Determine project's critical path	2
CATEGORY 4 – Managing Communications	**12**
Communicate clearly, openly and constantly	12
CATEGORY 5 – Managing Scope	**9**
Determine project scope of work.	9
CATEGORY 6 – Managing Project Integration	**8**
Develop and follow project plans and tools	4
Evaluate project outcomes and status	4
CATEGORY 7 – Managing Cost	**4**
Develop and follow a project budget	4
CATEGORY 8 – Managing Risk	**3**
Develop and follow a risk management plan	2
Apply appropriate risk responses	1
CATEGORY 9 – Managing Quality	**1**
Deliver quality work on time and on budget	1

CATEGORY 10 – Industry-Specific Abilities	**12**
Apply instructional design principles and theories of teaching and learning	12
CATEGORY 11 – Project-wide Abilities (18 distinct ability statements)	**47**
Apply general interpersonal skills (see Skills table)	12
Work well with others	7
Apply different project management lens to each project	6
Apply suitable project management principles.	5
Manage diverse project details	5
Teach, mentor, and provide feedback	4
Find solutions to problems	3
Conduct research and analysis	2
Develop and implement contingency plans and workarounds	2
Expect and manage change	2
Manage paperwork and routine tasks	2
Multitask	2
Perform negotiation tactics	2
Adhere to ethical and legal requirements	1
Deliver quality work	1
Design project charts	1
Manage multiple projects	1
Take responsibility for actions	1
Top Ability Statements (at least 7 participants)	
Develop and follow a project schedule	13
Proactively manage stakeholder expectations and engagement	13
Use common technology software and terminology for instructional design projects	13
Apply general interpersonal skills (See Skills table)	12
Apply instructional design principles and theories of teaching and learning	12
Communicate clearly, openly, and constantly	12
Use common project management software	10
Determine project scope of work	9
Manage people	9
Manage all (non-human) resources	8
Work well with others	7

Previous Citation(s)

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Understanding Project Phases and Organization

David Wiley

LEARNING OBJECTIVES

1. Identify the phases of a project.
2. Describe the types of activities in each phase of a project.

Introduction

Projects, by definition, have a beginning and an end. They also have defined phases between the project kickoff and project closeout. A phase represents a grouping of similar activities that has a very loosely defined beginning and end. Phases are typically sequential, where the prior phase is essentially complete before the beginning of the next phase; however, phases do not have clear-cut end dates and some activities in an early phase of the project will continue into the later phases. This is in contrast to project beginning and ending dates and milestone dates, which do have clearly defined dates with the expectation that these dates will be met.

The Project Management Institute (PMI) identifies four major phases of a project as characteristics of the project life cycle.[1] These four life-cycle phases are initiation, planning, execution, and project closeout. The knowledge, skills, and experience needed on the project can vary in each phase. During the early phases of a project, the project leadership needs good conceptual skills, the ability to build a team, and the experience to build a project roadmap. During project closeout, the project leadership provides a high degree of motivation and attention to details. On a large project, lasting two or more years, it is common to see the project management team change leadership to provide skills that are appropriate to the final phases of the project.

Initiation

The ***initiation phase***, which PMI labels "starting the project," includes all the activities necessary to begin planning the project. The initiation phase typically begins with the assignment of the project manager and ends when the project team has sufficient information to begin developing a detailed schedule and budget. Activities during the initiation phase include project kickoff meetings, identifying the project team, developing the resources needed to develop the project plan, and identifying and acquiring the project management infrastructure (space, computers). On projects where the scope of work for the project is not well defined, the project team will invest time and resources in developing a clearer scope of work. On projects where the major project stakeholders are not aligned, the project team will expend resources and time creating stakeholder alignment.

Unlike project milestones, some activities associated with project initiation may be delayed without delaying the end of the project. For example, it is advantageous for the project to have the major project stakeholders aligned from the beginning, but sometimes it is difficult to get the commitment from stakeholders to invest the time and resources to engage in an alignment process. Sometimes it is only after stakeholders begin observing progress on a project that the project manager can facilitate the stakeholder alignment processes.

Image by iChris

Planning

The ***planning phase***, which PMI labels "organizing and preparing," includes the development of more detailed schedules and a budget. The planning also includes developing detailed staffing, procurement, and project controls plans. The emphasis of the planning phase is to develop an understanding of how the project will be executed and a plan for acquiring the resources needed to execute it. Although much of the planning activity takes place during the planning phase, the project plan will continue to be adjusted to respond to new challenges and opportunities. Planning activities occur during the entire life of the project.

Execution

The ***execution phase***, labeled by PMI as "carrying out the work," includes the major activities needed to accomplish the work of the project. On a construction project, this would include the design and construction activities. On an information technology (IT) project, this would include the development of the software code. On a training project, this would include the development and delivery of the training.

Closeout

The ***closeout phase***—or using PMI's nomenclature, "closing of the project"—represents the final stage of a project. Project staff is transferred off the project, project documents are archived, and the final few items or punch list is completed. The project client takes control of the product of the project, and the project office is closed down.

The amount of resources and the skills needed to implement each phase of the project depends on the project profile. Typically, a project with a higher-complexity profile requires more skills and resources during the initiation phase. Projects with a profile that indicates problems with alignment among key stakeholders or political and legal issues will require specialized resources to develop plans that address these issues early in the project. A project with a lower complexity level will invest more resources in the execution phase to complete the project as effectively and efficiently as possible.

Project Phases on a Large Multinational Project

A United States instructional design company won a contract to design and build the first distance-learning-based college campus in northern Argentina. There was no existing infrastructure for either the educational or large internet-based projects in this part of South America. During the initiation phase of the project, the project manager focused on defining and finding a project leadership team with the knowledge, skills, and experience to manage a large complex project in a remote area of the globe. The project team set up three offices. One was in Chile, where large distance education project infrastructure existed. The other two were in Argentina. One was in Buenos Aries to establish relationships and Argentinean expertise, and the second was in Catamarca—the largest town close to the campus site. With offices in place, the project start-up team began developing procedures for getting work done, acquiring the appropriate permits, and developing relationships with Chilean and Argentine partners.

During the planning phase, the project team developed an integrated project schedule that coordinated the activities of the design, procurement, and design teams. The project controls team also developed a detailed budget that enabled the project team to track project expenditures against the expected expenses. The project design team built on the conceptual design and developed detailed drawings for use by the procurement team. The procurement team used the drawings to begin ordering equipment and materials for the implementation team; to develop labor projections; to refine the construction schedule; and to set up the campus site. Although planning is a never-ending process on a project, the planning phase focused on developing sufficient details to allow various parts of the project team to coordinate their work and to allow the project management team to make priority decisions.

The execution phase represents the work done to meet the requirements of the scope of work and fulfill the charter. During the execution phase, the project team accomplished the work defined in the plan and made adjustments when the project factors changed. Equipment and materials were delivered to the work site, labor was hired and trained, a learning center site was built, and all the development activities, from the arrival of the first computer to the installation of the final light switch, were accomplished.

The closeout phase included turning over the newly constructed campus to the operations team of the client. A punch list of a few remaining items was developed and those items completed. The office in Catamarca was closed, the office in Buenos Aries archived all the project documents, and the Chilean office was already working on the next project. The accounting books were reconciled and closed, final reports written and distributed, and the project manager started on a new project.

KEY TAKEAWAYS

- The phases of a project are initiation, planning, execution, and closeout.
- The initiation phase, which PMI calls "starting the project," includes activities such as holding alignment and kickoff meetings, identifying the project team, developing the resources needed to develop the project plan, and identifying and acquiring the project management infrastructure.
- The planning phase, which PMI calls "organizing and preparing," includes developing detailed staffing, procurement, and project controls plans.
- The execution phase, which PMI calls "carrying out the work," includes the major activities needed to accomplish the work of the project.
- The closeout phase, which PMI calls "closing of the project," includes transferring staff, archiving documents, closing offices, completing punch list tasks, and turning over the results of the project to the client.

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[1] Project Management Institute, Inc., A Guide to the Project Management Body of Knowledge (PMBOK Guide), 4th ed. (Newtown Square, PA: Project Management Institute, Inc., 2008), 11–16.

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Wiley, D. (2018). Project Management for Instructional Designers. EdTech Books. https://edtechbooks.org/pm4id

Agile Design Processes and Project Management

Theresa A. Cullen

Due to the changes in and flexibility of computing today, software engineering and instructional design have made major changes in their approach to development. This evolution to a knowledge economy required processes to change from approaches where planning and communication happen up front to more agile processes where projects are completed in smaller chunks with greater communication between team members and clients. Adopting these agile processes may enable instructional designers to create more flexible designs that better meet the needs of clients and allow for greater collaboration with others involved in the development process (e.g., UX designers, programmers, media production).

What is Agile Development?

Agile development has its roots in a document written by 17 people at a retreat in 2001, when a group of software developers met together to decide how projects should be approached. They were frustrated by static lists of tasks that were developed early in projects that could not easily be changed, creating a process that lacked flexibility and feedback. This kind of static list was known within the industry as "Waterfall," referring to the slow trickle of development that happens from a prescribed list of designs (Nyce, 2017). The group had championed different approaches during their extensive careers, but it was not until they came together in 2001 that they laid the groundwork that would change how many products were designed. They agreed that good programming and design had 12 key principles. As agile processes have been adopted by other fields such as business, education, health care, finance, and marketing (Oprins et al., 2019), the foundation of the approach has been based on these 12 principles, which make up the Agile Manifesto (Beck et al., 2001):

1. Our highest priority is to satisfy the customer through early and continuous delivery of valuable software.
2. Welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage.
3. Deliver working software frequently, from a couple of weeks to a couple of months, with a preference to the shorter timescale.
4. Business people and developers must work together daily throughout the project.
5. Build projects around motivated individuals. Give them the environment and support they need and trust them to get the job done.
6. The most efficient and effective method of conveying information to and within a development team is face-to-face conversation.
7. Working software is the primary measure of progress. Agile processes promote sustainable development.
8. The sponsors, developers, and users should be able to maintain a constant pace indefinitely.
9. Continuous attention to technical excellence and good design enhances agility.
10. Simplicity—the art of maximizing the amount of work not done—is essential.
11. The best architectures, requirements, and designs emerge from self-organizing teams.
12. At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly.

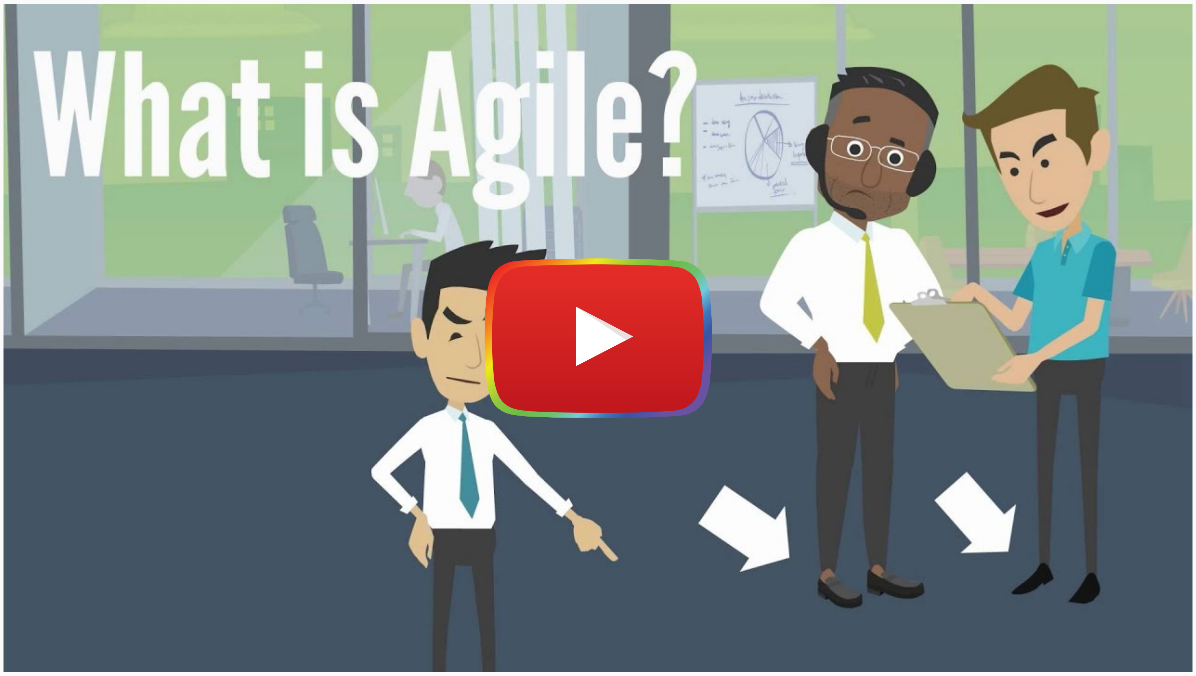
Summary of the 4 Values of the Agile Manifesto

[Watch on YouTube]

Agile has become a generic term for processes that adhere to the agile principles laid out in this Agile Manifesto, much like ADDIE is a basic process for instructional design or design thinking is a generic process for approaching design projects. For example, there are different instructional design approaches (e.g., Dick and Carey; Morrison, Ross, Kemp, and Kalman; and Smith and Regan), but they all include basic principles such as needs analysis and evaluation. The same is true of agile processes, as there are different approaches to realize the key components of the agile manifesto in practice.

One of the most prevalent agile approaches is called Scrum, which is used by businesses both in software engineering and other areas. The value of Scrum is that it has clear roles for different individuals and a variety of agile processes used in design. Even as agile processes are repackaged in a variety of products (Scrum, Adaptive Project Development [ADP], Kanban, etc.) they all adhere to these 12 principles that define agile development (Portman, 2019). Key components present in all products include constant communication with the client, support for the development team, a focus on deliverables that are fast enough to produce forward motion, and a focus on developing a reliable and robust product.

Review of Agile Principles



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To examine designing through an agile framework, let's look at some key components of Scrum. Scrum is defined as "a framework within which people can address complex adaptive problems, while productively and creatively delivering products of the highest possible value." (Schwaber & Sutherland, 2017). The Scrum processes and roles defined in Table 1 support agile processes in practice.

Table 1

Key Terms Related to Scrum Processes

Backlog	A list of tasks that need to be completed as part of the project. This list is prioritized by team members at the beginning of each sprint. The backlog allows the team to communicate priorities with a client and accurately predict the timeline of a project.
Sprint	A short interval of time (often two weeks) where the team decides on a set of backlog tasks to achieve as a team. An example sprint dashboard, representing the backlog and completed items on a project, is shown in Figure 1. An example sprint team is shown in Figure 2.
Sprint Retrospective	As in all agile processes, reflection is an important part of Scrum. At the end of each sprint, the Scrum team takes time to review how the processes went and make plans to improve processes in the future. They ask questions like, "What did we do well and what should continue?" or "What could we improve?".
Stand Up	A daily meeting that is designed to last 15 minutes or less to update the team on accomplishments, problems, and status. It is called a stand up because it is meant to be kept short by having everyone

	stand during the meeting. During the meeting, team members ask questions like, “What did I do yesterday?”, “Am I blocked by anything?”, or “What do I plan to do today?”.
Scrum Master	The person managing the Scrum team who makes sure that all team members are getting the resources they need and adhering to the team plan.
Definition of Done	This is an agreed-upon level of fidelity for product production in each sprint. The team must agree what is the expectation of each team member’s work.
Product Owner	This is the person who is responsible for the backlog. They work to develop an accurate timeline and keep the project on track. The Product Owner cannot be the Scrum Master.
Scrum Team	All of the people involved with the design of the product. This could include developers, UX designers, QA, and instructional designers, given the project. Different sprints could have different team members.

Scrum Basics and Roles

[Watch on YouTube]

Figure 1

Example Sprint Dashboard

Note. "Sprint dashboard" by Tiendq is licensed under CC BY-NC-ND 2.0

Figure 2

Example Sprint Team

Note. *"The Agile PM Game (Aug '11)" by VFS Digital Design is licensed under CC BY 2.0*

Need for Agile Processes in Instructional Design

By nature of their work, instructional designers (IDs) collaborate with diverse groups such as UX designers, programmers, media creators, and a variety of subject matter experts. It is to be expected that instructional design processes may be influenced by those other fields and IDs may even be required to use processes from other disciplines such as programming. One problem that many teams find is the need for quick results and to maintain good communication with a client throughout the design process. Adnan and Ritzhaupt (2018) summarized the criticism that traditional instructional design approaches like ADDIE are not flexible and are less able to produce dynamic projects—especially those that require flexibility and updating. The flexibility of an agile approach allows for both speed of design, but also better repurposing and tailoring for different design problems. Being knowledgeable about agile processes in both instructional design and other fields will enable better team collaboration and client communication (Oprins et al., 2019).

Fernandez and Fernandez (2006) examined agile versus traditional approaches to project management. In a traditional approach, instructional designers may meet with a client at the beginning of a process, and then create designs, only to unveil them when the project is done. They found that these traditional or waterfall approaches did not meet the needs of the fast-changing markets and the need to have products available quickly to stay competitive. They found that business practices were changing towards shared responsibility and team collaboration. Leaders were no longer in charge of projects, but instead they were in charge of teams that have different skills but were all committed to making the client's project a reality. Agile is a mindset above all else that includes shared responsibility and design, regular client communication, and embracing change throughout the process.

While an agile approach is different from traditional instructional design approaches, our field has a history of flexible design approaches too. The most notable was rapid prototyping, proposed by Tripp and Bichelmeyer in 1990. Rapid prototyping comes from software engineering's approach to design where they create prototypes, test them, and then quickly revise them based on the results. Tripp and Bichelmeyer (1990) argued that instructional problems cannot be defined fully at one time and therefore a new flexible approach would allow for more adaptability and response to deep learning issues that become apparent through the design process.

There are many similarities between rapid prototyping discussed in 1990 and agile processes now, specifically, the focus on the product and being open to change in design through regular communication with clients. That is not to say that most instructional designers do not communicate with clients regularly, but rather that choosing an agile approach places the client at the forefront while still not conflicting with key components of the instructional design process like establishing need, breaking down learning processes, and designing effective evaluation.

Now that you have some of the terminology and history, let's compare traditional instructional design approaches to agile approaches in Table 2. Using the ADDIE acronym to compare how each method approaches important tasks in designing effective instruction allows us to see that both approaches deal with the same information and issues and both can produce effective instruction.

Table 2

Comparison of Traditional Instructional Design to Agile Processes

Task	Traditional Instructional Design	Agile Processes
Client Involvement	Utilizes a single or a few major delivery points and feedback points with the client.	Relies on delivery points to the client in short time intervals (often 2 weeks). Focuses on constant iterations.
Analysis	Perform needs and task analysis at the beginning of the design process. Emphasizes depth.	Generates user stories throughout the process to illustrate needs which are revisited at the beginning of each sprint. Emphasizes speed.
Design	Communicates overall design by producing design documentation at the beginning of the process that is used throughout the entire process.	Communicates overall design by creating a backlog of tasks that the development team chooses from to set goals for each sprint. Design is revisited at the end of each sprint.
Development	Produces large parts of a project at once based on learning objectives or content topics. Emphasizes producing a complete learning unit.	Produces small components of content throughout the process focused on delivery to address items in the backlog. Emphasizes forward movement on content development.
Implementation	Implements a complete project or complete module with all parts of instruction and assessment complete.	Releases completed components at the end of each sprint. In a web or app-based design, the team can "push out" parts of the project regularly. The release may not produce a complete product at every update, but instead focuses on continual improvement of released content.
Evaluation	Evaluated as a complete unit with feedback from users and clients.	Engaged in constant evaluation due to the retrospective process at the end of each sprint. Project is constantly

going through feedback loops and adjusting based on client and updated user stories at each sprint.

An Example of Scrum in Practice

At a university where I worked, our Information Technology department used Scrum processes to manage large projects. The department set out to redesign the student and faculty portal. They started by having focus groups of faculty and students about how they used the existing tools and what they thought was missing. This would be very similar to learner and needs analysis processes in instructional design. The team used these focus groups to create user stories. Each user story highlighted a different stakeholder and what they needed from the product they were designing. Then, the Product Owner took that feedback and created a backlog of tasks with different priorities that had to be completed (see Figure 3 for an example backlog). They created these with input from all members of the team with a goal of forward movement and the ability to release improved functionality at regular intervals.

For example, in this project, the first sprints focused on interface design. Members of the sprint team included people from marketing and web design to make sure that the overall look matched the brand and other components used by faculty and students. After several sprints to design the look, the product owner moved people down the list of priorities to begin to design the functionality. Not all tools were redesigned at once. In fact, the Scrum team decided to focus on student tools first like enrollment and financial services. About halfway through the year-long project, members of the Scrum team visited faculty and student meetings to ask for input on what they had designed so far. They announced that it would be several months until faculty functions would be the priority in the backlog and continued to refine student functions based on feedback.

Throughout the process, the Scrum team published new tools and functions in the portal and had students and faculty start using them. They gained feedback, reflected on what they had already designed and changed their priorities and the product moving forward. Redesigning an entire university records and communication portal is a major undertaking, but by using Scrum processes the team was able to show results and continue to tailor their product to their stakeholders. They were also able to push out different usable products throughout the year without waiting for the entire project to be finished.

Figure 3

Example Backlog for the Portal Project

Backlog for Portal Project

In Progess	Soon	Future	Completed
Faculty: Advising	Student: Billing	Parent: Billing	Overal Interface Design
Faculty: Course Listing	Faculty: Book requests	Adminisitrator: Reports	Log in and authentication
	Faculty and Student: LMS launch	Student: Jobs	Student Feature: enroll
		Student: Organizations	Student Feature: advising
January 2 - 15	January 20- February 4th	February 7th - 21st	Oct 1 - present
Retrospective: January 16	Retrospective: February 5th	Retrospective: February 22nd	
Product Owner communicates with client and reviews backlog for next sprint.	Product Owner communicates with client and reviews backlog for next sprint.	Product Owner communicates with client and reviews backlog for next sprint.	

Conclusion

Following more agile processes can be a choice by an instructional designer, or it can be part of a company's culture. Agile processes are not at conflict with good practices in instructional design. In fact, steps like creating a backlog that prioritize features, gaining customer feedback on designs during the process, and being reflective is good practice. Taking an agile approach to instructional design can benefit the team dynamic and instructional product. The team dynamic is improved through improved client communication, flexibility, and creating components that could be better reused in other projects with similar user stories. Tripp and colleagues (2016) found that a workplace that embraces agile processes could increase job satisfaction among its employees. Fernandez and Fernandez (2006) found that agile made projects more adaptable and able to produce products faster. Oprins and colleagues (2019) point out having an agile approach emphasizes the importance of people in an organization, builds empathy, and guards against automation. Agile processes, when followed, can improve team communication and keep team members from pursuing dead ends or wasting important time because all of the team were not "on the same page."

There are also downsides to following agile processes. Regular communication with team members and clients takes time and can slow down some aspects of design. Since agile processes are designed to always be flexible, it can be frustrating to live in constant change, even if it produces a better product. For many, following agile processes requires a change in approach and communication style which can be difficult. Finally, agile is a buzzword: There are many companies that say that they use agile processes but do not have trained individuals, necessary resources for team members, and do not embrace the agile mindset. This kind of workplace can be incredibly frustrating because it can produce unpredictable results. Agile processes take commitment from all stakeholders and the leaders of an organization or company.

Next Steps

Instructional designers have many opportunities to become more knowledgeable of agile processes.

First, there are many resources available about agile processes and thought processes available online. In addition to the Agile Manifesto itself, many Scrum professionals start with the Scrum guide (https://edtechbooks.org/-rZPW) to learn about agile processes in practice.

Second, talk to people working in the industry. Reach out to alumni from your instructional design program and ask them about the project management processes that they use.

Third, for those interested in pursuing an agile philosophy further, consider pursuing a professional certification as a Scrum Master (https://edtechbooks.org/-jNf). The certification can be earned after taking a short workshop about agile processes and then passing an exam. The workshops can range from $1000 to $5000, but the training produces a certification that can be included on a resume or LinkedIn profile.

Takeaways

As an instructional designer, you will work with a variety of teams within a company (instructional designers, content experts, trainers, HR, etc.). Understanding different ways that projects are managed within a company not only makes you more valuable within the organization, a better team member, but also helps you to be more flexible to your approach to instructional problems. Many companies that have adopted this approach would value instructional designers who are both aware of and have practiced agile approaches to be able meet the changing needs of the organization and its clients. If this is the way that you enjoy working, then become more knowledgeable on agile processes and look for a company that clearly integrates it into their culture.

Links and Resources

- Scrum Guide (A good place to start) https://edtechbooks.org/-rZPW)
- Scrum Alliance (https://edtechbooks.org/-jNf).
- Agile Instructional Design Course on LinkedIn Learning https://edtechbooks.org/-XDT

Agile Activities

Following are six activities designed to help you think critically about agile processes:

1. (A collaborative slides version of this activity is available view only at https://bit.ly/agileactivity. To be able to edit, choose *make a copy* from the file menu, then save it to your own Google Drive.)

An instructional design project on training about workplace bullying was handed to a team that had been designed in a traditional way. The new team uses agile processes. How could they break down this project into smaller chunks (aka create a backlog) to allow for prioritizing parts of the task and providing logical places to stop and receive feedback from the client throughout the process?

- The tasks developed by the traditional team included:
- Explain terminology: bullying, bystander, and victim.
- Outline the roles that each individual takes in a bullying incident.
- Outline what employees should do if they witness bullying.
- Outline what employees should do if they experience bullying.
- Create a design for the look of the materials to create consistency between a face to face and online learning module.
- Create a list of resources available for additional information and training.
- Outline the company policies on bullying.
- Outline the processes for reporting bullying.
- Create example stories or cases with different perspectives (bully, bystander, and victim).
- Develop face-to-face workshop that will last 90 minutes.
- Develop an online tutorial that can be used to document compliance.
- Develop discussion questions for in person training.
- Develop quiz questions for an online module which can be recorded for compliance.
- Create a video with a bullying scenario from the workplace for in person training.
- Create a video with a bullying scenario for the online training.
- Develop a script and support materials for a face-to-face facilitator.

After breaking up the task into smaller groups, then plan the backlog. Many companies use a table design to show the progression of a project. Assign priorities to the groups you created above and explain why you arranged them that way.

In Progress	Soon	Future	Completed

Did the original team forget any task they might need? What were the tasks? How does this agile process help to refine the project and identify gaps?

2. You are designing a remote learning activity to be used by a teacher for a middle school classroom. Create a user story for the stakeholders involved. Think about parent, student, teacher, and curriculum coach. Explain what their needs may be and think about how your design may need to incorporate those needs.

3. Agile teams have been shown to be more effective than traditional teams. Why do you think this is the case?

4. Explain how agile processes value the relationship with the client.

5. At the end of a sprint, an agile team takes time to do a retrospective before starting the next group of tasks. How does scheduling time to reflect on a project in process increase efficiency when designing?

6. Read over the agile manifesto. Give examples of how it honors collaboration and the value of stakeholders.

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Advanced Instructional Design for Successive E-Learning: Based on the Successive Approximation Model (SAM)

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Module 6: Aesthetics in Learning Experience Design

Visual Aesthetics

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Instructional design lies at the crossroads of both the educational tradition (instructional) and the artistic tradition (design). Design is, of course, a complicated term due to its operationalized usage in the fields of art and engineering (e.g., graphic design, industrial design, architecture), as well as its universal meanings (Design, 2012). In artistic contexts, design connotes aesthetics as evaluative criteria while in scientific contexts it connotes functionality as evaluative criteria. Instructional design is a bit of both—art and science. An effective learning experience often includes the meeting of instructional objectives, which is part of the science of learning, but also the proverbial "lighting of a fire," or the art of learning. This is the primary value of aesthetics in instructional design: "the bridge between [an instructional] product and the user's emotion and feeling" (David & Glore, 2010, para. 6).

The word aesthetics originates from Ancient Greek words meaning "sensitive," "perceptive," and "to feel" (Aesthetic, 2011). The aesthetic and related ideas have a rich presence in philosophy dating at least as far back as Plato (Pappas, 2016), and more recent thinkers (Dewey, 1934/2005; Robinson, 2010) have applied the ideals of the aesthetic to the domain of learning. An aesthetic experience is one that is "heightened and intensified" (Dewey, 1934/2005, p. 306; Parrish, 2009) and "when [the] senses are operating at their peak" (Robinson, 2010, 5:55), as in when a user is in a state of flow (Csikszentmihalyi & Robinson, 1990). Some argue that this type of intensified, enlivening experience needs to play an increasingly crucial role in modern education. As Robinson (2010) puts it, "We shouldn't be putting [students] to sleep [i.e., anaesthetizing them]; we should be waking them up to what they have inside of themselves" (5:55). While the aesthetics of a learning experience encompass a variety of factors, this paper will focus primarily on the visual aesthetics (or visual design), which includes graphics, images, and a variety of other visual elements in instructional objects (e.g., textbooks, e-learning modules, etc.) that are created by instructional designers.

Within the field of instructional design, we have sometimes observed a hesitation to dwell on visual aesthetics (Parrish, 2009). This hesitation may stem from concern that artistically-approached designs will lack the ability to be replicated (Merrill & Wilson, 2006) or that the artistic elements will serve merely as window dressing—or worse, distraction—that provides no educational benefit to the learner. Additionally, many instructional designers lack training in visual literacy (Clark & Lyons, 2010; Malamed, 2015). Research and practice increasingly recognize that visual design does impact many aspects of the learning experience. It "affects the quality of learning, the value of the communication, and the motivation of the audience members. It leverages the brain's innate capabilities, improves engagement, and satisfies the audience's aesthetic sensibilities" (Malamed, 2015, p. 4).

In the age of highly visual multimedia, "we need guidance on the best use of visuals for learning" (Clark & Lyons, 2010, p. i). This paper aims both to raise awareness of the importance of visual aesthetics in instructional design and to provide some initial guidance for instructional designers in the process of creating and/or evaluating the visual aesthetics of what they produce.

How Visual Aesthetics Impact Learning

We as humans are deeply attuned to aesthetics. Our immediate perception of an object—in our case, a learning design—affects us on a visceral level, instantly making the object attractive or repellant to us (Norman, 2004). This emotional judgment, which occurs much faster than deliberate cognition, frames subsequent thoughts and has a strong impact on our future thinking and actions (Malamed, 2015; Norman, 2004). Ultimately, visual design influences and connects both emotional and cognitive aspects of the learning experience. Quality visual design piques interest, calls attention, and increases engagement and motivation while simultaneously improving communication, supporting cognitive processing of complex ideas, aiding retention, and fostering creativity. The following sections will discuss each of these ideas in more detail.

The Impact of Visual Aesthetics on Affective Aspects of Learning

Research suggests that the visual aesthetics of an object significantly impact a person's emotional response, both initially and over time. Taking into account a learner's emotional state is becoming an increasingly important aspect of instructional design. Gagne posited that gaining the attention of the learner is the first event of instruction (Kruse, n.d.); and attention and interest, which are interconnected and mutually dependent, are among the first emotional responses influenced by visual design. As learners pay attention to instruction, their interest often develops or changes over time; and that interest, in turn, affects their attention. The level of attention and interest further influences the learner's engagement and motivation to learn and achieve long-term progress in their educational goals (Järvelä & Renninger, 2014). Thus, appealing visual design ultimately affects users' motivation to engage and persist in the learning process (David & Glore, 2010). Each of these emotional states—interest, attention, engagement, and motivation will be discussed in the following section.

Interest. Attention, the mental focus demonstrated by the learner, is directly influenced by both the learner's individual interests and the interestingness of the learning material (Park & Lim, 2007). Learners' individual interests are specific to each individual, and since they are relatively stable, it is often quite challenging to design instructional material or a learning environment that would attend to all learners' diverse interests. On the other hand, situational interest is generated as an outcome of interestingness, or overall appeal. It is an emotional state triggered by specific features, including the visual design of a product or task within a learning environment, and this situational interest directly affects learners' attention (Park & Lim, 2007). This triggered situational interest has great value as it may develop into a maintained situational interest and possibly into an emerging or developed individual interest. The level of interest affects motivation and engagement of the individual learner and leads to curiosity, self-regulated learning, and deeper processing of information (Järvelä & Renninger, 2014).

Attention. Graphics hold attention longer than text, and graphical information is extracted with greater ease than textual information (Malamed, 2015). Aesthetically appealing visual design can capture, hold, and focus the learner's attention and their interest in the content (Haag & Snetsigner, 1993). When learners encounter an instructional product, the visual aesthetics of that product immediately issue an "intuitive invitation" (Haag & Snetsigner, 1993, p. 95)—either positive or negative—into the environment created by that product. This intuitive invitation exists because of the aesthetic impact on both the learner's interest and the learner's immediate judgment about the credibility of the product's content and the usability of its interface (David & Glore, 2010). These immediate judgments and their lasting effects can impact learners' attention, interest, motivation, engagement with the material, and performance on learning assessments (Haag & Snetsigner, 1993). Regardless of the medium, images of people and faces, bright colors, striking shapes, and motion draw learners' visual attention better than text without images (Malamed, 2015), and visuals should serve representational or explanatory functions in instructional materials to increase interest and attention and to intentionally promote learning (Clark & Lyons, 2011).

Engagement and motivation. Malamed (2015) explained that positive emotions experienced through visually pleasing instructional design or its elements can foster intrinsic motivation, which refers to the desire to learn without an external reward. Park and Lim (2007) found that both cognitive interest illustrations (i.e., graphics that promoted structural understanding of an explanation) and emotional interest illustrations (i.e., graphics that were interesting but irrelevant to the text structure) had a positive impact on promoting learners' motivation toward the instructional material, especially in terms of relevance. Well-designed graphic elements can affect users' motivation to "engage and persist" in the learning experience (David & Glore, 2010). Additionally, aesthetically pleasing objects, including instructional materials, are perceived as more user-friendly than are displeasing objects, and this perception, in turn, affects learner's engagement and motivation (Malamed, 2015).

Emotions influence human attention, motivation, engagement, and ultimately the outcome of the learning experience (Pekrun, 2006). Thus, taking into consideration a learner's emotional state is essential in the process of instructional design. A positive user experience creates a positive emotional state that influences the entire learning process and persists even after the learning event is completed. Activating positive emotions through an intentionally aesthetically-pleasing design contributes to a positive learning experience by influencing attitudes and motivation, increasing students' interest, and strengthening their attention and level of engagement with materials (Malamed, 2015).

The Impact of Visual Aesthetics on Cognitive Aspects of Learning

In addition to the extensive impact on emotion, visual aesthetics exert a strong influence on cognitive aspects of learning as well (Um, Plass, Hayward, & Homer, 2012). Visual elements do more than make an object look nice; they are an integral component of its ability to communicate the message (i.e., instructional content) to the user (i.e., learner). Simple, relevant, and effective visual design reduces extraneous cognitive processing and provides an additional mental channel for the most important information (i.e., the content) to be processed and retained.

Improving communication. Visuals aid in communication of information in several ways. Visuals facilitate semiotic communication, which is conveying information through symbols, signs, and elements. Visual communication occurs on a much deeper level than common language, cultivates interest, impacts emotions, and brings cultural concepts to mind (Amare & Manning, 2012). Visuals also emphasize details, demonstrate relationships, and improve understanding. Graphics, such as simple icons, elaborate illustration, and complex data visualization, support and facilitate thinking, problem solving, and learning by providing rich and textured language for expressing ideas. (Malamed, 2015). Diagrams or charts quickly communicate relationships, which may be more difficult to convey through text alone. Visuals in general "help learners understand complex text or narration because they convey information about spatial structure," which provides additional meaning (Malamed, 2015, p. 6). This structural organization of an image provides a certain level of scaffolding, which aids in construction of new mental models and facilitates processing and comprehension of the text (Eitel, Scheiter, Schuler, Nystrom, & Holmqvist, 2013).

Supporting cognitive processing. Visual perception is faster than thinking. Our brains devote more resources to processing visual information in comparison to auditory or other senses. If a graphic is clear and easy to understand, visual information can be decoded and processed rapidly (Malamed, 2015). Additionally, the brain processes verbal and visual information differently. When both of these channels—verbal and visual—are activated in a common task, giving the mind "two opportunities to build meaning," instructional products are most effective (Clark & Mayer, 2012, p. 314). For instance, Levie and Lentz (1982) reported in their synthesis of 46 studies that students who read illustrated text learned approximately one-third more about the specific points that were illustrated than students reading text alone.

Not all images are equally effective in supporting learning and creating a deeper understanding, however. The implementation of graphics ranges from simple diagrams that support textual content to rich visual illustrations that may increase motivation but may fail to promote learner comprehension. Clark and Mayer (2012) noted that images are usually most effective when they either eliminate extraneous elements or highlight the most relevant ones, but there is no simple formula that can be used to design or select visuals that improve learning and performance in all situations. Clark and Lyons (2010) further suggest that the learning value of a visual depends on three factors: (1) features of the visual itself, (2) the goal of instruction, and (3) the learners' differences, which go beyond the visual elements discussed in this paper. They introduce a comprehensive framework where features of graphics include the surface features (salient characteristics of the piece), communication function (decorative, representational, interpretive, etc.), and psychological function (support attention, minimize cognitive load, build mental models, etc.). The goal of instruction factor refers to the idea that different types of visuals are needed to effectively support learning of different content type (facts, concepts, processes, procedures, and principles). The learners' differences factor suggests that it is learners' prior knowledge of content, rather than their learning style, that most affect the value of graphics. For example, novice learners benefit much more from added graphics than do more knowledgeable learners because they have already formed internal visual imagery related to the content (Clark & Mayer, 2012). Clark and Lyons (2010) explain that it is important for instructional designers to understand these guidelines as the effective use of visuals varies depending on the unique mix of learners, specific learning goals, and content to be learned.

Retention of information and memory. Effective visual design supports not only initial cognition but also retention of the material. Images capture and hold attention longer than text, and concrete things are typically remembered better than abstractions (Malamed, 2015). Retention is best aided when the information has a "high correspondence to the verbal message" (Levie & Lentz, 1982), increasing the likelihood that visual information will be stored directly in the long-term memory of the learner (Haag & Snetsigner, 1993). For this reason, an effective use of visuals aids retention while an ineffective use of visuals can actually distract the learner from the intended learning outcomes (Clark & Mayer, 2012; Haag & Snetsigner, 1993). Additionally, some types of graphics, such as graphs, diagrams, and infographics, facilitate the process of making inferences and serve as an external memory aid through an intentional and meaningful organization of information (Malamed, 2015).

The Impact of Visual Aesthetics on Creativity

Visual aesthetics have a somewhat indirect, yet profound impact on creativity through stimulating positively valenced emotions, or positive affective response (Isen, 2002). In a way, creative thinking is the nexus where affective and cognitive aspects of learning meet to produce something truly wonderful: the ability to use both understanding and feeling to solve existing problems and expound, extend, question, and in turn create something unique and new. As mentioned earlier, emotions regulate how we solve problems and perform tasks. Negative emotions, such as anxiety, fear, and even anticipation, focus the mind and narrow concentration, leaving people less susceptible to interruption or distraction (Norman, 2002). Having the proper amount of negative emotions (e.g., facilitating anxiety) may help a learner focus and do their best; but when the negative affect is too strong, as in a case of debilitating anxiety, performance is inhibited (Isen & Reeve, 2005; Moyer, 2008). Positive emotions, such as enjoyment, interest, and inspiration, broaden the thought processes and enhance creative thinking. This state of mind is conducive to learning, problem solving, and innovation because positive emotions enable more flexible and adaptive thinking, which aids in accomplishing difficult tasks (Isen & Reeve, 2005; Norman, 2002). In fact, many studies indicate that "positive affect promotes flexible, adaptive thinking that is creative and at the same time effortful, effective, thorough, and responsive to the details of the problem and the context" (Isen, 2002, p. 57). Pekrun et al. (2006) also proposed that the pleasure students feel when learning, which may be in part induced by an enjoyable aesthetic encounter, correlates positively with their experience of flow, or a complete immersion into an activity. As suggested by Csikszentmihalyi, this state of flow brings about creative thinking and innovation (1996).

In sum, visual aspects impact emotion, cognition, and creativity. These influences are circular and recursive. Emotions impact cognition and cognition impacts emotion; both influence creativity, and creativity, in turn, fosters deeper thinking and increased positive affect. Visual design is admittedly only a part of this process, but research suggests that its impact on learning is indeed significant.

Improving Instructional Design through Visual Aesthetics

While an instructional designer needs to attend to all aspects of the design, Gibbons (2014) reminded us that "everything depends on what the designer chooses to see as being important" (p. xx). The implication is that a designer may be inclined to focus or specialize on particular elements of the design, such as the content, the media, or the strategy. Often, however, the instructional designer does not have the luxury of outsourcing the visual-aesthetic aspects of the design. This can be problematic if the designer feels "that visual literacy belongs to the domain of a talented few" (Clark & Lyons, 2010, p. xiii) and does not feel qualified. For this reason, we are providing this section as a brief guide to instructional designers to aid in their efforts to create and evaluate the aesthetic quality of visual elements in their designs.

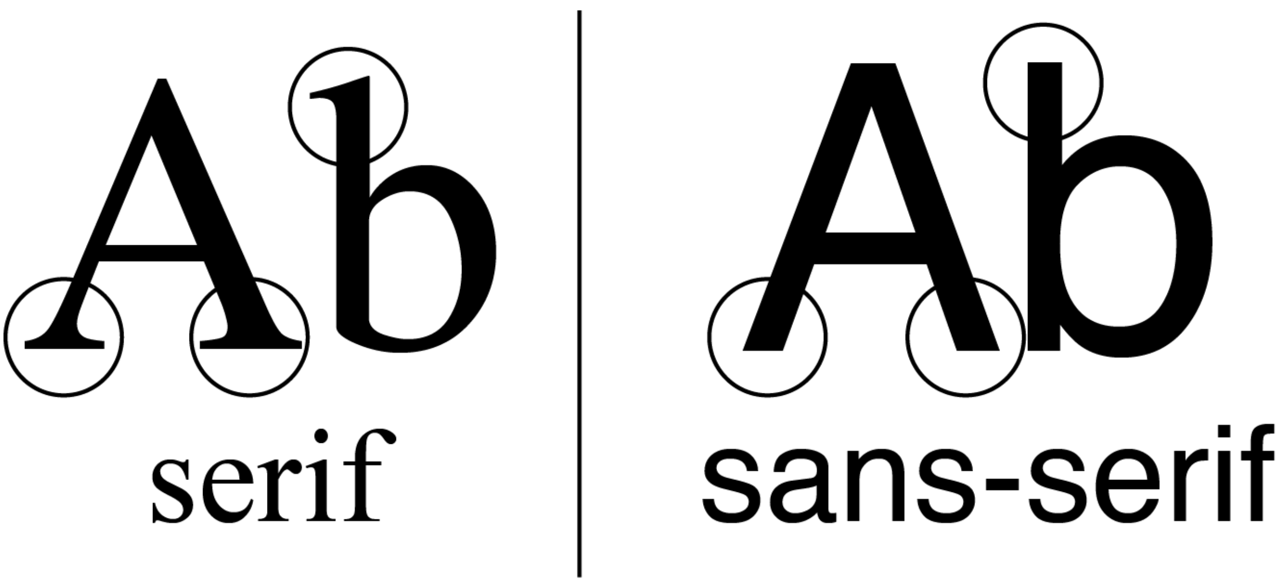
In instructional design, visual aesthetics refers to “the integration of individual visual elements that combine” to “promote communication between the student and the program in order to cultivate learning” (Haag & Snetsigner, 1993, pp. 92-94). There are six foundational elements of graphic design that every instructional designer can use to guide the visual design of their object: (1) fonts, (2) colors, (3) organization, (4) iconography and semiotics, (5) theme, and (6) appeal. These elements do not represent a comprehensive list but are intended as a starting point for further investigation in evaluating and improving the visual aesthetics of instructional designs.

Fonts

The font, or typeface, chosen for the text deserves careful consideration since it can affect readability (Poole, 2012; Malamed, 2015) and impact emotions (Koch, 2012). Fonts can also contribute to or reduce visual clutter by controlling how many typefaces and styles of fonts are used in a single design. Typically, two complementing typefaces are a good standard to work from—a headline font that may be more decorative and a text font that is more readable (Kliever, n.d.). When choosing fonts, the most basic feature to consider is whether the font is serif or sans-serif (see Figure 1). Which type of font is more readable depends on the type size, quantity of text, and the audience. Young readers may find the letterforms in sans-serif fonts to be more identifiable, and sans-serif fonts can be more legible at small sizes. Serif fonts have a more classic and familiar feel and may be more comfortable to read when used for long text entries (Poole, 2012).

Figure 1

A serif is the bracket terminating a stroke of a character in a serif font as circled. A sans-serif font is without that feature.



- Left-justify text, make it large enough to read, keep size and style uniform; centered text is rarely appropriate outside of headings
- Select a theme-appropriate font (comic sans for learning about medical treatments is probably a bad idea)
- The more prevalent a font is in your materials, the less-complex it should be; a swirly font might be used for a logo, and a somewhat wavy font might be used for headings, but a simple font should be used for the main content; just because a font exists does not mean it should be used
- Use variation sparingly (e.g., bold, italics), and only when it adds to the meaning of the content; your purpose for variation should be clear (e.g., a callout box for a key concept); 90-9-1 rule? 90% of your text should be simple, 9% can be somewhat fancy, and 1% can be extra fancy
- Never use different fonts for the same type of content; two fonts is okay if one is used for headings and the other for body text; three or more fonts is almost never advisable

Colors

The message and emotion can be influenced by the choice of color (Malamed, 2015). As well as impacting emotion, colors also have cultural significance of which designers should be cognizant when creating designs with an international audience (Madden, Hewett, & Roth, 2000). A defined color palette can enhance the visual language as well. For usability purposes, a color can become associated with a certain task or type of content which will aid the learner in navigating as well as in interpreting the meaning of figures and drawings. Furthermore, research shows that the use of certain colors and applying emotional design principles to learning materials can induce and maintain positive emotions while viewing instructional materials, which in turn facilitates learning (Um, Plass, Hayward, & Homer, 2012).

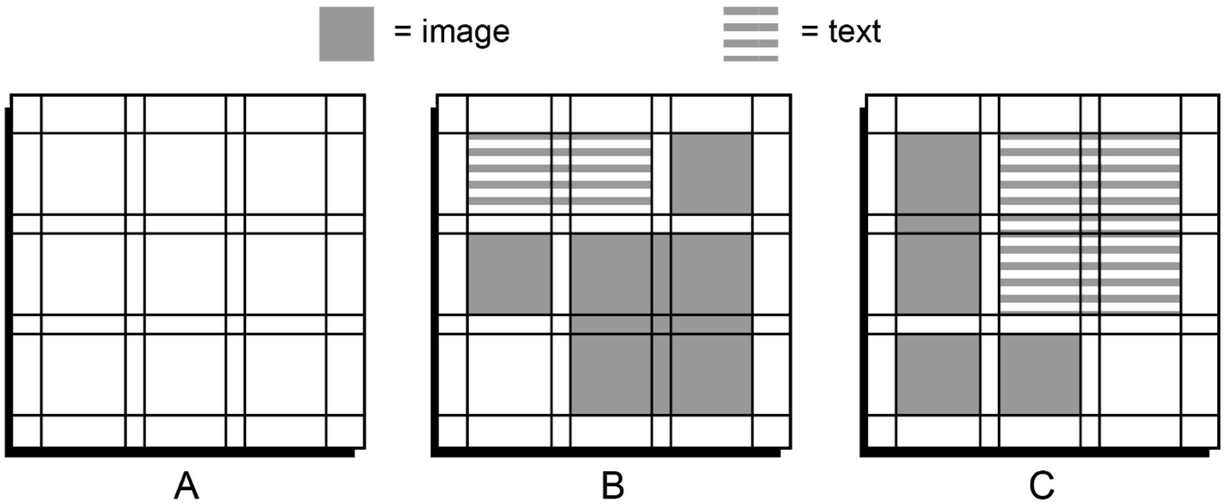
- Select a color scheme, monochromatic, etc.; you should generally pick one color as your primary color, coupled with a white, cream, or light gray for backgrounds, and then only use one to three additional colors as accents
- Choose a palette, use existing tools like http://color.adobe.com to find community-generated palletes or to generate a pallete directly from a pleasing or related image
- If gradients in material elements are to be used, they should be subtle, avoiding stark shifts
- High-contrast colors are helpful for drawing attention, improving accessibility, and reducing color

Organization

Every element on a screen or page in an instructional object requires the attention of the learner in order to process. Any unimportant or distracting elements must be diminished or removed so that distraction or confusion may be eliminated. Consistent placement of related elements from page-to-page aid in orienting the learner on where to find content (Müller-Brockman, 1996). A typical method of accomplishing this in graphic design is to develop a grid system, as shown in Figure 2, that will be followed throughout the publication. The established grid will standardize the placement of text and images into patterns that will become predictable to the learner and will reduce the cognitive load required to orient themselves each time a new page is encountered, thus greatly improving usability. In addition to a predictable layout, any embellishment on a shape or graphic element, such as an outline or drop shadow potentially adds to the visual clutter of the page. If such elements aren't justified by the needs of the visual presentation it is important to recognize that they may distract from the message.

Figure 2

A grid system defines the alignment of margins and columns, and it standardizes placements of text blocks and images in a layout. Page A represents a blank page with grid guides that will be invisible in the end product. Pages B and C show two layouts using the same grid system that establishes a pattern for predictable placement of text and images while providing the designer flexibility in their arrangement.



These organizational aspects of aesthetics reduce the negative emotions a learner may feel when they are presented with materials that are difficult to visually navigate in order to find needed information (Clark & Lyons, 2010; Malamed, 2015). In order for cognition to be focused on the content and metacognitive processes required for assimilation, visual design should focus on minimizing the cognitive load required to navigate and interact with the medium (Kirsh, 2005). Thus, "usability, simplicity, and clarity" (Kirsh, 2005, p. 148) emerge as guiding principles of effective visual design.

- Use a grid
- Organize your content according to your culture's reading direction (left-to-right, top-to-bottom)
- Use borders, lines, and horizontal rules carefully and only to intentionally disrupt your viewer's flow
- Avoid mixing 2d and 3d elements, and recognize that layered or stacked content conveys a sense of importance (we focus on what is on "top"); shadows convey a sense of depth that can be helpful or confusing

Icons

When using icons and symbols, it is important to make sure that they are easily understood. If the audience isn't well versed in the visual language, there must be a legend provided to orient the learners. Visual design concerns the semiotic communication that occurs with symbols, signs, and elements. It cultivates interest, impacts emotions and brings cultural concepts to mind. When choosing graphics to embellish or enhance an instructional design, a knowledge of the audience and cultural implications of certain graphics or symbols is important. Unintended messages might be conveyed which could distract from the purpose of the design (Amare & Manning, 2012).

- Use them to draw attention to commonly used or important elements; supplement with brief text descriptors (preferably action words) when they are used as buttons
- Make icons minimalist and intuitive (Fig. for minimalist vs. non-minimalist icon); as a rule, the larger the icon the more detail you can include (compare Mac OS X icons to Google Docs interface icons)
- Make icons universal in your product (don't use multiple "user" icons), monochromatic, and scalable with transparent backgrounds (to allow for reuse and application in various settings) (.svg, .ai for scalability; .png for transparency)

Theme

A theme coordinates organization and all graphical elements into a unified whole. It influences a selection of fonts, colors, and images used in the overall design (Malamed, 2015). A well-elected theme can cement the message of an instructional object. The theme can transport the learner into the world of the subject matter. For example, cursive headline fonts, earth tones, and parchment paper patterns would be appropriate for a course teaching the plays of Shakespeare, whereas sans-serif fonts, saturated primary colors, and images of planets may be appropriate for teaching about space exploration. A theme may add intuitive reinforcements to the message of the learning object and adds to the overall aesthetic experience of the design (Malamed, 2015).

- Know your audience (the A in ADDIE)
- Connect your colors, layout/organization, fonts, etc. to tell a common story (e.g., Comic Sans should not be used for a technical subject)

Appeal

Ultimately, one of the most useful questions instructional designers can ask of their work is if it is appealing to them or not. An individual who is not trained as a graphic artist might discount their ability to judge the aesthetic quality of their work, but they still have the ability to decide the assortment of clothes they wear from day to day. In reality, many creative individuals simply strive to make things that they personally like. In the process of doing so, they serendipitously generate materials that appeal to others' sensibilities as well.

- Aesthetic responses are intuitive, aesthetic design is not
- Take a break, similar to olfactory overload, and come back later
- Put your design in front of people, watch how they use it, and listen carefully to their initial reactions (if you have to argue for the merits of the design to them or explain how they should use it or feel while they are using it, then it is a bad design)
- Attention should be drawn to your theme, not the design itself; elements that are distracting or self-focused should be avoided

Conclusion

Considering the ultimate aim of any instructional object to be the optimum learning for the student, the aesthetic appeal of that object must be purposefully considered by the instructional designer. Otherwise, their inattention to the visual aspects of their work may result in a product that distracts the student from the message being communicated and fail to motivate them to further learn. Visual aesthetics may present a beneficial service to the learner if they are tailored to provide a positive emotional experience. This positive emotional experience will then aid in increasing interest, motivation, cognition, and creativity. Although many instructional designers may not view themselves as graphic artists, attention to common details such as fonts, colors, icons, theme, and appeal will go far in providing an aesthetically appealing learning experience. This article was intended to raise awareness of the importance of visual aesthetics in instructional design, to pique interest in the topic, and give initial guidance. The authors encourage instructional designers to seek and develop their skills of the best use of visuals for learning. We strongly recommend great resources, such as Design Aesthetics for the Web on Lynda.com, Graphics for Learning by Ruth Clark and Chopeta Lyons (2010), and Visual Design Solutions by Connie Malamed (2015).

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Beauty

What is beauty, and how does it apply to learning design?

Royce Kimmons & Spencer Yamada

> *"Beauty is everywhere—you only have to look to see it."*
>
> *Bob Ross*

Though only one aspect of our aesthetic experiences, beauty has historically been one of the most important and contested (Shelley, 2017), and it is often the first characteristic people think of when they hear words like "design," "art," and "visual." Despite its ubiquitous use in our language and understanding, actually defining beauty and explaining what makes something beautiful can be quite difficult. We all use words like "beauty" and "beautiful" on a daily basis, but we often have difficulty articulating what they mean. Furthermore, two people might disagree on whether something is beautiful, and even if they both think the same thing is beautiful, they may not agree on why it is beautiful. Just as we might say that something is "salty" but not be able to explain what "saltiness" is, beauty is easily recognized on an implicit level but is poorly articulated in an explicit manner.

At a basic level, if something is beautiful, then this implies that we have a positive or pleasing emotional response to it. Beautiful music might make us feel peaceful, a beautiful movie might make tears of joy well up in our eyes, and a beautiful painting might inspire a sense of euphoria or enlightenment in us. Thus, beauty relies on a stimulus-response relationship between an object and our consciousness, and if a stimulating object leads to a positive emotional response, then we ascribe beauty to the object.

However, because stimuli do not always impact people in the exact same way, philosophers have long debated whether beauty has any reality in objects themselves (e.g., by conforming to certain metaphysical realities, such as Plato, Aristotle, and others believed) or is "merely in the mind which contemplates them" with "each mind perceiv[ing] a different beauty" (Hume, 1757). This latter subjective stance is relativistic in the sense that it relies upon the personal, cultural, and perspectival experience of the observer; but many have nonetheless argued that intersubjective standards of beauty can develop over time as "the long-run consensus of people who are in a good position to judge functions analogously to an objective standard" (Sartwell, 2016). That is, even if things are not beautiful in-and-of themselves, over time people develop consensual attitudes about their beauty that can be accepted as semi-certain (and not purely subjective).

Furthermore, the concept of beauty is philosophically interesting because unlike other perception-inducing experiences in the world, we ascribe beauty to the object itself. For instance, though a fast-food sign might make us feel hungry, we do not say that the sign itself is hungry; yet, if an image invokes pleasure within us, we say that it (the object) is beautiful. For these and other reasons, modern philosophers argue that beauty is an outward-facing celebration of the world wherein "subject and object are juxtaposed and connected," also inviting us to enjoy further experiences, to share, and to connect with others on a social level (Sartwell, 2016).

Visual Beauty in Learning Design

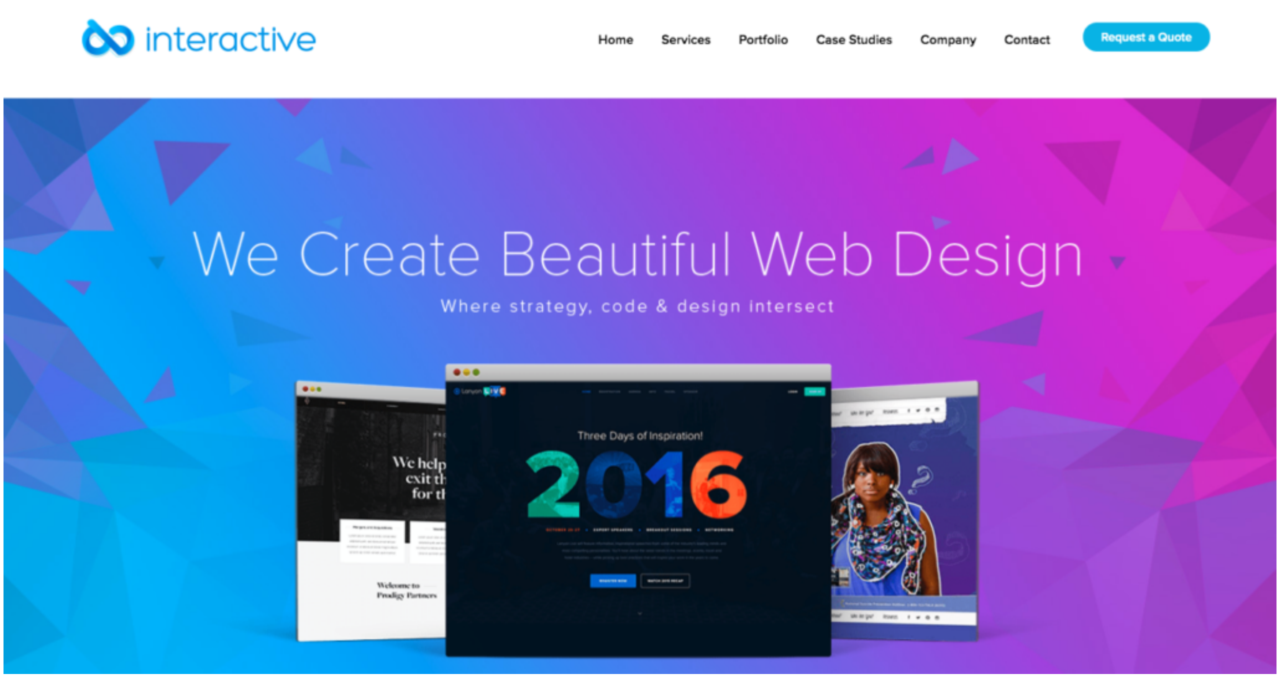
Applying these ideas to visuals in learning design, we should recognize a few helpful principles.

First, though the perception of beauty will always have some subjectivity associated with it, objects can be considered beautiful as they elicit positive reactions in more and more people over time, meaning that as we study how people react to our designs, we can confidently come to say whether they are beautiful or not based on how people are reacting to them.

Consider the screenshots of two websites below, and ask yourself "Which is more beautiful?"

Figure 1

Two Example Websites of Differing Beauty



Example Website A

Example Website B

My guess is that you answered Example Website A, which provides a nice combination of blues and purples on a white background with adequate spacing between elements along with an elegant font. In the years that I have done this experiment with students, I have never had any student say that they believe Example Website B to be more beautiful. This is because though humans are unique, we are often far more alike than we are different. Though you and I might be of different races, genders, or cultures, and though we might have very different life experiences, and our DNA may have millions of differences if compared, that same DNA is nonetheless about 99.9% identical (National Human Genome Research Institute, 2018). We both know what it feels like to be happy, sad, alone, included, joyous, depressed, encouraged, or frustrated. We are not identical, but we have more in common than we typically realize. So, as designers we can conclude that though beauty will always be somewhat subjective, we can nonetheless develop some certainty about what is and is not beautiful in our designs through practice, inquiry, and experience with human learners.

Second, designers should seek to make beautiful products as a means for inviting ongoing, pleasurable interactions with other social beings. When applied to learners, an ugly design is one that discourages learning by causing disconnection, isolation, or discomfort, while a beautiful design encourages learning by promoting connection, pleasure, and belonging.

If a designer claims that considerations of beauty have no place in learning design, then they are implicitly suggesting that pleasure, connectedness, and belonging also have no place in learning. And yet, though these aims are central to some learning theories, such as constructivism and connectivism, even the staunchest behaviorist or cognitivist must operate on the expectation that learners will use their designs and that making these designs pleasurable will encourage greater, more engaged use and (therefore) result in improved learning.

Thus, no matter what learning theory a designer happens to operate from, beauty must be a central consideration as they are designing learning objects and experiences for people who will have immediate physiological reactions to them.

And third, designers should recognize that beauty is not something that learners are convinced of; it is simply something that they experience (or don't). This may seem like an odd (and obvious) thing to say, but it often happens that after a designer has poured countless hours and thought into a product, they can be frustrated with how it is received by the learner and defensively seek to convince the learner of its beauty. I have also noticed a similar occurrence with educational games, where designers sometimes feel like they need to explain to learners why a game they have made is fun rather than relying upon the learner's word that it is not. Just as a game is fun to a learner or is not, a design is either beautiful to a learner or is not, and no amount of persuasion or explanation after the learner has engaged with the design will change their experience of it being fun or beautiful.

So, when you present a design to a learner or a client, there is never a need to attempt to tell them that it is beautiful. They will make that determination automatically, without any guidance, and without any training. As Kant argued, "I must immediately feel the pleasure in the representation of the object, and of that I can be persuaded by no grounds of proof whatever" (Kant, 1790). This means that any talk of what makes something beautiful must occur in the design of the product and not its implementation or delivery because though our design considerations to make something beautiful might be laboriously intentional, the evaluation of our efforts must always ever be instant and unsolicited.

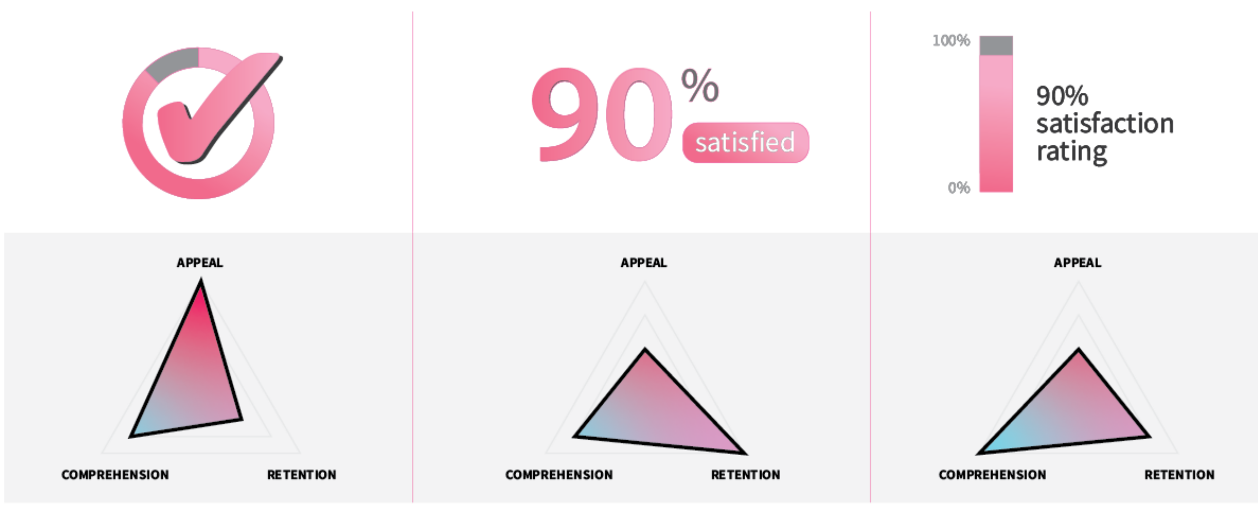
The Visual Designer's ARC

Depending on their purpose and context, visual designers generally have three potential purposes behind their designs. They are either (a) appealing to the viewer's aesthetic sensibilities of beauty (e.g., via a work of art), (b) influencing the viewer to remember something they are seeing (e.g., via an advertisement, sign, or notification), or (c) guiding the viewer to comprehend something (e.g., via a table, chart, or graph). These three purposes—appeal, retention, and comprehension—comprise the visual designer's ARC, and the choices a designer makes will depend upon the aspects of ARC that are most important for the current product.

For instance, if you were designing a dashboard with an element to tell a teacher that students were 90% satisfied with their course, you might either (a) make a simple but bold checkmark graphic that subtly shows the percentage in a circular graph without any words, (b) emphasize the actual numeric percentage with a smaller reminder of its meaning with the word "satisfied," or (c) spatially represent the percentage via a bar chart with the descriptive text "90% satisfaction rating" (see Figure 1). In each case, representing elements in different ways (e.g., simple shapes vs. numbers, charts vs. words) will emphasize particular aspects of ARC over others, with the checkmark perhaps being the most appealing but least comprehensible or the large 90% being the easiest to remember but the least appealing.

Figure 1

Example of Emphasizing Different Aspects of ARC to Adjust a Visual Design



Concrete design questions such as "which colors should I use," "should I use labels," or "how large should I make each element" will be shaped by your design goals, with some products requiring greater emphasis on simplicity or beauty and others requiring greater emphasis on complexity or clarity. We will reference the visual designer's ARC in subsequent chapters (especially the project chapters) because different types of designs will have different goals, and how you design will depend upon those goals, meaning that the same principles and guidelines you use to create a course splash page might not apply to a website, mobile app, infographic, icon, or book cover.

Recognizing these goals also helps the visual designer to realize that though beauty is important, it is not the only consideration guiding what is done, and sometimes decisions about how to make a design beautiful should be tempered with other visual aspects of the design that will also have direct impacts on the learner's experience and ability to learn.

Additional Readings

- "Why Aesthetics Matter to Learning" by Connie Malamed
- "Color Theory in Experience Design" by Royce Kimmons
- "Aesthetic Principles for Instructional Design" by Patrick E. Parrish
- "Visual Aesthetics: The Art of Learning" by Dennis West et al.

Learning Activity

After reading "Aesthetic Principles for Instructional Design" (Parrish, 2009) and "Visual Aesthetics" (West et al., 2018), choose a website, mobile app, video game, e-book, or online course to analyze (e.g., Facebook, Twitter, Apple.com, DuoLingo, a Canvas course). Then, in a reflective journal or class discussion forum, address the following questions:

- How does the product's design reveal differential attention to the three elements of ARC?
- How does the design exhibit attention to Parrish's 4 principles of artful instruction (or not)?
- How does the design exhibit attention to West's six foundational aspects of visual design (or not)?
- Does beauty play an appropriate role in the product's design? How could the product be improved in this regard?

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Color Theory in Experience Design

Royce Kimmons

1. Introduction

Outside the visual arts, color is rarely discussed by professionals in systematic ways; among UX and LX designers, color is generally approached in a strange give-and-take between technical prescription and intuitive preference. For instance, the color system outlined in Google's (n.d.) material design visual language provides precise guidance on how to generate a color palette from your primary color, what to use secondary colors for, and what colors are typical for specific elements (such as error screens), but it does not provide designers any guidance on what primary color to pick in the first place, when to use different types of color palettes (e.g., analogous, complementary, triadic), and why. This is likely because, when designing for a corporate client, designers are generally constrained by the preexisting branding requirements of the client (e.g., "our brand is periwinkle") and must work from a particular color starting point when making designs.

But designers must also often counterbalance their own and their clients' everyday assumptions and receive wisdom about color in order to create the best designs for end users and learners. For instance, early in my professional experience creating websites for clients, I delivered a mock-up that I thought looked good and met the client's requests perfectly. Frustrated with what he saw, the client furrowed his brow and slowly replied, "Yes, but I need something that pops." This, in turn, frustrated me, because the only explanation he then provided would result in what I thought would be a terrible-looking design. "What does 'pop' really mean?" I thought. And "How can I fix the design to be something that the client likes and something that I'm proud of?" And, perhaps most of all, "How can my client and I communicate about color in more meaningful ways?"

Beyond this need for designers to meaningfully communicate with clients, color also plays an important affective and cognitive role in learners' experiences. Various studies have shown that color-use influences learner attitudes, comprehension, and retention (Gaines & Curry, 2011). Some of these influences are broadly universalizable, others are contextual to the learner's age, gender, or culture, and others are contextual to the subject matter or learning objectives being targeted. Furthermore, there might be multiple right or useful ways to use color in a particular design project, and inappropriate or ineffective color-use in one project might constitute optimal use in another.

For these reasons, clear and reliable guidance on the what, how, when, and why of color-use in UX design is difficult to come by, and the problem of effective color-use is a prime example of why UX design cannot be approached purely as a science nor as an art but as a craft that synergistically merges the two. Toward this end, I will begin in this chapter by briefly providing some rudimentary groundwork on the underlying physics of color and its technical representation in digital formats. This will give us a common vocabulary for referencing specific aspects of color (e.g., hue vs. tone) as well as some technical knowledge necessary for actually using color in UX design scenarios. After this, I will briefly explore the science of color-use in UX by summarizing some of the emotional, cognitive, and physiological effects that color-use has on learners.

With this backdrop, I will then address some of the applied aspects of color-use that will influence the craft of UX and ongoing research in this area. Specifically, I will explore four guiding considerations of color-use that should be addressed in UX — contrast, attention, meaning, and harmony—and then provide guidance on how to use color schemes to improve harmony by highlighting five dominant types of color schemes. I will then conclude by providing specific craft guidance on using color for UX projects and comment on how this should connect to ongoing UX research.

2. Physics of Color and Technical Use

We must begin this chapter by reviewing some of the physics of light and color. Color is a visual sensation created in the mind of the viewer from differing wavelengths of visible light, ranging from low-frequency reds to high-frequency violets. Some color sensations can be produced by a narrow band of wavelengths, but others are produced as multiple color wavelengths are mixed. For instance, when all color wavelengths are mixed together, they make white light, which is why a dispersive prism can be used to split white light into a rainbow of spectral colors. By putting the primary colors of light together, then, white can be created additively, as in Figure 1, and various other colors not even present in the rainbow can be created by mixing light wavelengths together, such as red and blue making magenta.

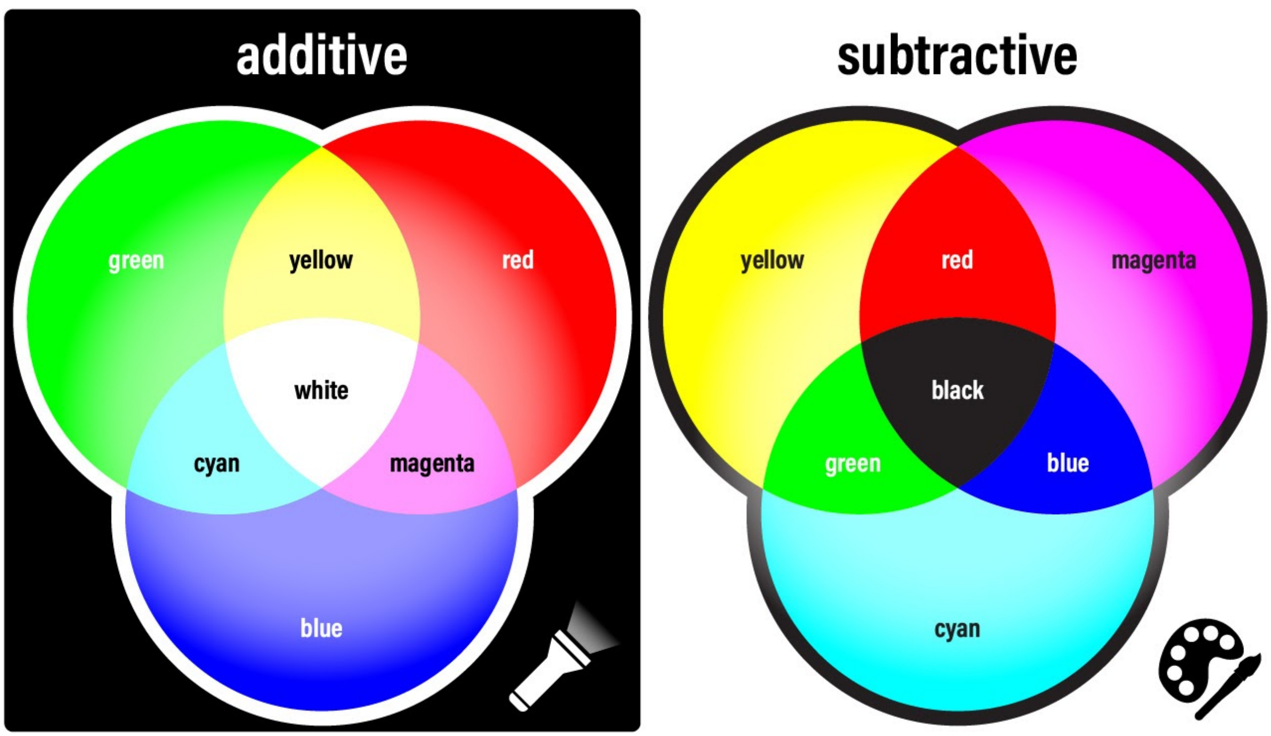

Figure 1

Additive and Subtractive Color Mixing Models

For this reason, computer screens and other displays have historically used differing intensities of only three primary colors of light: red, green, and blue (RGB). On screens, RGB dots are used in combination to create colors ranging from white, when they are at full intensity, to black, when they produce no light, and the millions of color combinations in between that are commonly used in movies, games, simulations, images, and websites.

However, visual media that rely upon physical materials to reflect (rather than generate) light, such as ink and paint, operate from a different model of color mixing. Though mixing a green ray of light and a red ray of light would produce yellow light, combining green paint and red paint would produce a dark brown. Such materials rely upon a subtractive color model (cf. Figure 1), wherein black is the sum of all colors and white is the absence of all colors.

Recognizing these two approaches to color mixing is important to understand common notations present in design and authoring software. For instance, when creating a website, video game, mobile app, or illustration, RGB notations are used, such as rgb(255,255,0) for yellow, wherein each number represents a range of 0 (lowest) to 255 (highest) intensity for the primary colors. Hexadecimal notations are also commonly used as a shorthand version of RGB, such as #ffff00, wherein the number ranges are converted to a base-16 number system, ranging from 0 to ff, without losing any information. When creating print media, on the other hand, CMYK notation is commonly used, such as cmyk(0,0,100,0) for yellow, wherein each of the primary colors is represented as a percentage of intensity (0-100%) and black is provided as a fourth color mixin, because true black is difficult to make through mixing (in real-world applications, mixing would only generate dark browns and grays). Table 1 provides some notation examples of common colors.

Name	Additive		Subtractive
	RGB	Hexadecimal	CMYK
White	rgb(255,255,255)	#ffffff	cmyk(0,0,0,0)
Black	rgb(0,0,0)	#000000	cmyk(0,0,0,100)
Red	rgb(255,0,0)	#ff0000	cmyk(0,100,100,0)
Green	rgb(0,255,0)	#00ff00	cmyk(100,0,100,0)
Blue	rgb(0,0,255)	#0000ff	cmyk(100,100,0,0)
Yellow	rgb(255,255,0)	#ffff00	cmyk(0,0,100,0)
Cyan	rgb(0,255,255)	#00ffff	cmyk(100,0,0,0)
Magenta	rgb(255,0,255)	#ff00ff	cmyk(0,100,0,0)
Gray	rgb(127,127,127)	#808080	cmyk(0,0,0,60)

Table 1

Notation Examples of Common Colors

Using any of these notations can generate millions of possible colors, including basic hues of the color wheel, low-saturation tints of hues (by lightening toward white), and low-brightness shades of hues (by darkening toward black), along with various mixtures of tinting and shading (cf. Figure 2). These terms will be important moving forward for understanding research on color effects for the affective domain. Thus, hue represents the color's position around the color wheel, saturation represents the amount of white mixed with the hue, and brightness represents the amount of black mixed with the hue.

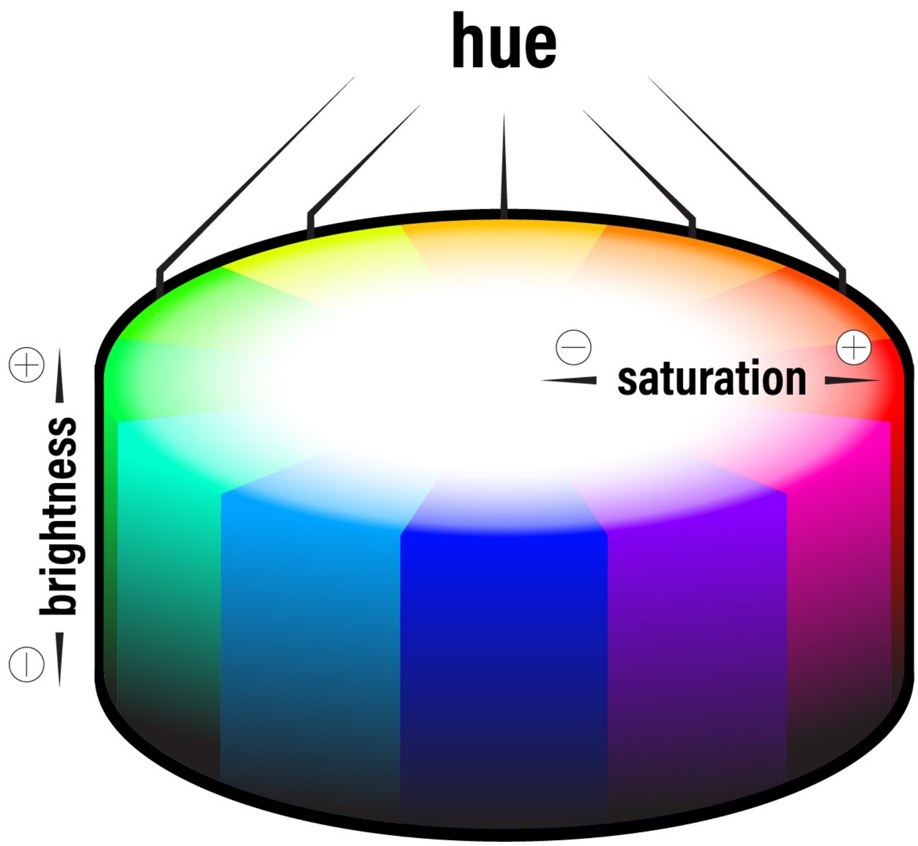

Figure 2

Hue, Saturation, and Brightness on a Color Wheel

3. Emotion and Learning

When people see the colors represented by the color wheel, they have various emotional and physiological reactions to them that influence their general experiences and also their learning. Alongside the famous cognitive domain taxonomy, Krathwohl, Bloom, and Masia (1964) also proposed a taxonomy for what they called the affective domain of learning, or the aspects of learning related to "a feeling of tone, an emotion, or a degree of acceptance or rejection" as expressed through goals oriented toward "interests, attitudes, appreciations, values, and emotional sets or biases" (p. 7). Recent years have seen renewed interest in the affective domain as educators and designers have struggled anew with how to support learner self-regulation, motivation, and persistence. Though the connection between color and learning may not be obvious at first, by influencing learner emotion, attitude, and interest, color can influence learner behaviors and attitudes, which in turn will influence their learning.

For instance, one study found that exposure to red prior to taking an IQ test subconsciously impaired performance, presumably by triggering feelings of danger, failure, or avoidance (Elliot et al., 2007). Though such emotional states might have limited direct effects on learning outcomes, they may play an important role in improving intrinsic motivation and the desire to keep working (Heidig et al., 2015); by employing positive emotion cueing, designers can help increase mental effort in the learner, reduce perceived difficulty of the material (Park et al., 2014; Um et al., 2012), and improve learner comprehension (Plass et al., 2014).

Psychological research on the emotional effects of color extends at least back to the 1950s. In their early work, Guilford and Smith (1959) found that, among the spectral colors, people preferred blue and green the most and orange and yellow the least. Subsequent research found that preference for blue, green, and white generally persisted across countries and cultures (Adams & Osgood, 1973). Additionally, some emotional reactions are universal, such as anger, fear, and jealousy being connected to red and black, while other colors, like purple, are more culturally mediated (Hupka et al., 1997) or are influenced by gender (Osgood, 1971). For example, women take slightly more pleasure in bright colors and find highly-saturated colors slightly more psychologically arousing (Valdez & Mehrabian, 1994). Furthermore, even within a single culture, emotional reactions may change somewhat with age, such as childhood feelings of surprise and fear toward green maturing into adult feelings of happiness (e.g., Terwogt & Hoeksma, 1995).

Physiologically, studies have shown that human reactions to color vary by hue, with long-wavelength colors (e.g., reds and yellows) being more arousing (e.g., increased heart rate and respiration) than short-wavelength colors (e.g., blues and greens; Jacobs & Hustmyer, 1974; Wilson, 1966). Additionally, many studies have found that primary hues are preferred to secondary or tertiary hues (Kaya & Epps, 2004) and that all of these are preferred to grays. Some of these reactions can be explained by differences in intensity of photoreceptor stimulation in the eye (e.g., the eye is more sensitive to red), while others likely stem from common environmental experiences, such as associating white with cleanliness and blacks and grays with dirtiness (Valdez & Mehrabian, 1994).

Figure 3

Four Interface Examples That Cue Differing Behaviors, Trust Levels, Attitudes, etc.

For a simple example of how this relates to UX and LX design, consider the password prompt interfaces in Figure 3. If you were presented with each of these interfaces, how might your emotional and behavioral reaction to the prompt differ based upon its color? Seeing a red prompt might make you stop and consider "Is this really a secure site?" On the other hand, an orange prompt might get your attention but be somewhat confusing or concerning, a gray prompt might feel bland but also seem secure or professional, and a blue prompt might make you feel comfortable about entering your information when perhaps you should not be comfortable.

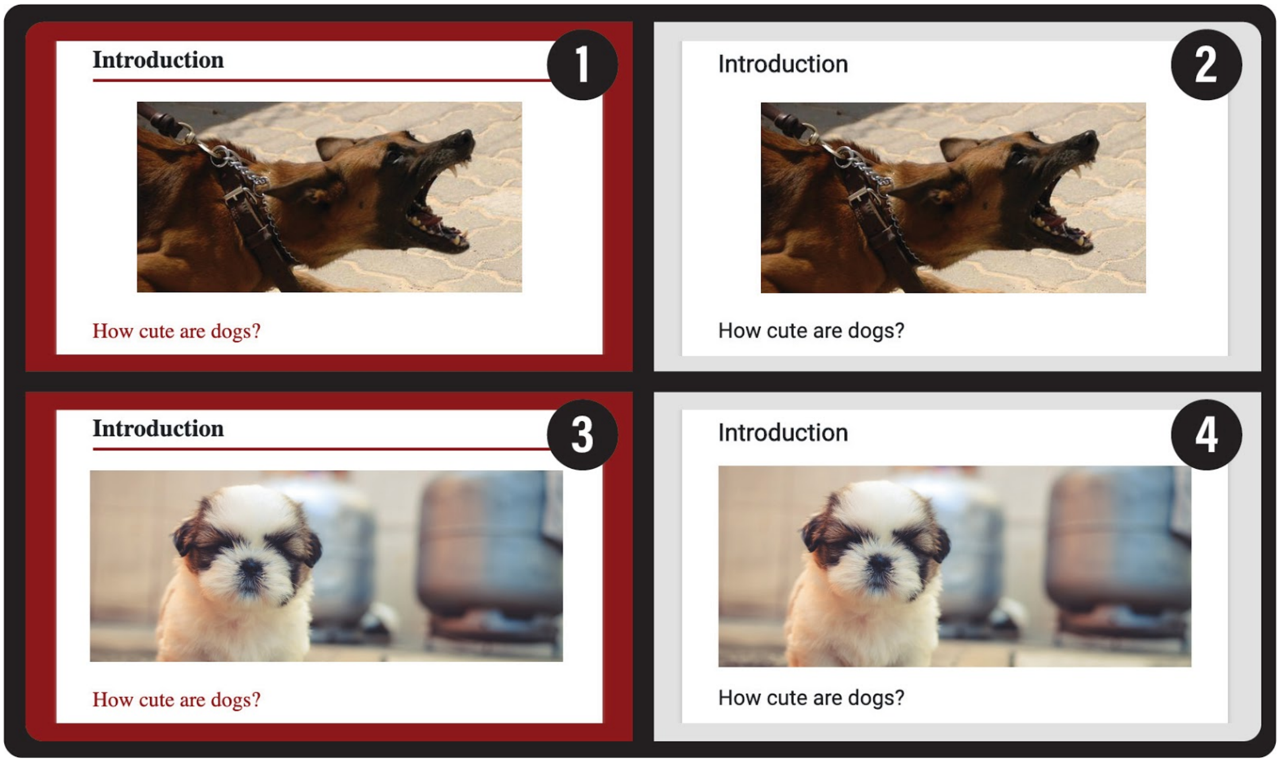

Figure 4

Four Display Options for a Mobile App About Pet Care With Variations on Color and Content

Similarly, suppose you are designing a learning app for young children on how to responsibly care for pets. In Figure 4, four options are provided. Two use an aggressive image of an adult dog (1, 2), while the other two use an image of a soft puppy (3, 4). Two also use a blood red background (1, 3), while the other two use a neutral grey (2, 4). What might be student affective reactions to each of these and how might it impact their ability to achieve learning objectives related to being a responsible pet owner? Option (1) feels very aggressive both because of the content and the color, while option (3) feels like there is a mismatch between what is shown and how it is presented, thereby evoking conflicting emotions. The neutral grey background for (2) and (4), however, allows the content to convey the emotion. And so, if our objective is for children to have a positive attitude toward pet care, then option (4) would likely be the best.

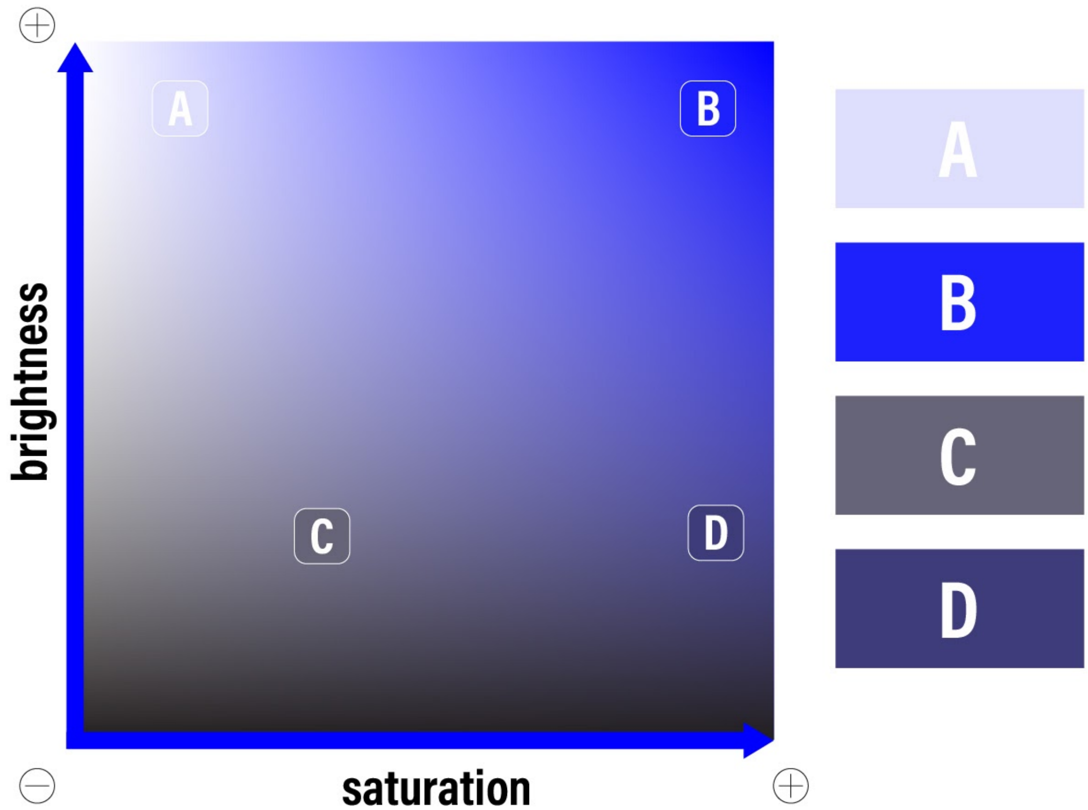

Figure 5

Brightness and Saturation Levels of the Primary Blue Hue With Four Examples

Hue is not the only aspect of color that influences emotion; a color's saturation (how little white is mixed in with it) and a color's brightness (how little black is mixed in with it) also has an effect. In research studying color effects on the Pleasure-Arousal-Dominance emotion model (Mehrabian & Russell, 1974), brightness was found to positively impact pleasure and negatively impact arousal and dominance, while saturation positively impacts all three (Valdez & Mehrabian, 1994). So, if using a blue hue, as in Figure 5, you might choose from a variety of brightness and saturation levels, including (a) light blue (high brightness, low saturation), (b) azure (high brightness, high saturation), (c) blueish gray (low brightness, low saturation), or (d) indigo (low brightness, high saturation). Though each of these is a variant of blue, they all elicit different emotional responses in the viewer. For instance, (a) would be fairly pleasurable but not arousing or dominant, eliciting a feeling of tranquility; (b) would be the most pleasurable and somewhat arousing but not dominant, eliciting a feeling of amazement or awe; (c) would be the least pleasurable and fairly neutral for arousal and dominance, eliciting a feeling of boredom; and (d) would be the most arousing and dominant but neutral-positive for pleasure, eliciting more of a feeling of boldness or antagonism (Valdez & Mehrabian, 1994). In fact, brightness and saturation account for two-thirds to three-fourths of the detected variance in users' feelings toward color (Valdez & Mehrabian, 1994). This means that shifting from soft pink to blood red in a design would likely impact users' feelings more than shifting from soft pink to soft green or blue.

Figure 6

Four Variations of the Same Design That Elicit Different Affective Responses

In addition, the context of color-use is important, as in the case of otherwise pleasant colors being used in inappropriate or unnatural ways (Valdez & Mehrabian, 1994). Consider the four variations of the same website design in Figure 6. Which of the four color variations is your favorite? For most people, (1) would likely be the preferred variation, because not only are the colors pleasant but the color-use more appropriately aligns with prior positive experience. In the other examples, the skin color of the hand looks a bit green, which may subconsciously suggest experiences of bodily disease or death to the user; similarly, the stems of the tulips in (4) are red rather than the expected green, which signals to the user that the experience is artificial or unnatural. In such ways, whether intentionally or unintentionally, our designs evoke affective responses; just as (1) might evoke memories of beautiful blue spring days with new life, the others might conversely evoke experiences of sadness, frustration, confusion, or discomfort, all of which will influence a user's motivation and persistence with using the product.

4. Guiding Considerations

All of this research into the science of color-use is valuable, but how each of us then translates these findings into the actual, embedded craft of UX and LX design is a different matter. For this reason, a few considerations may be useful for guiding any color-use in UX and LX projects, including attending to contrast, attention, meaning, and harmony.

4.1. Contrast

First, ensuring high contrast is important in all designs for aesthetics but is especially important in those that use text. It is also a legal requirement for many UX projects to meet minimum accessibility expectations in many countries, such as those stipulated in the W3C's Web Content Accessibility Guidelines (WCAG) 2.0. Contrast problems are widespread in learning products. In fact, a recent study on K-12 school website accessibility across the U.S. found that contrast errors were the most common type of error among all sites (Kimmons & Smith, 2019). Contrast errors arise because, though two similarly-saturated colors, such as crimson and blue, may look quite different to most viewers, when superimposed (as in Figure 7) they can become difficult to decipher from one another. As a simple check of this, colored designs can be converted to grayscale to allow you to quickly see how similar the colors are to one another, or an automated contrast checker like [the one provided by WebAIM]() can be helpful. To solve contrast problems, white and extremely light tints should be used to contrast highly-saturated colors, and black and dark grays should be used to contrast light tints.

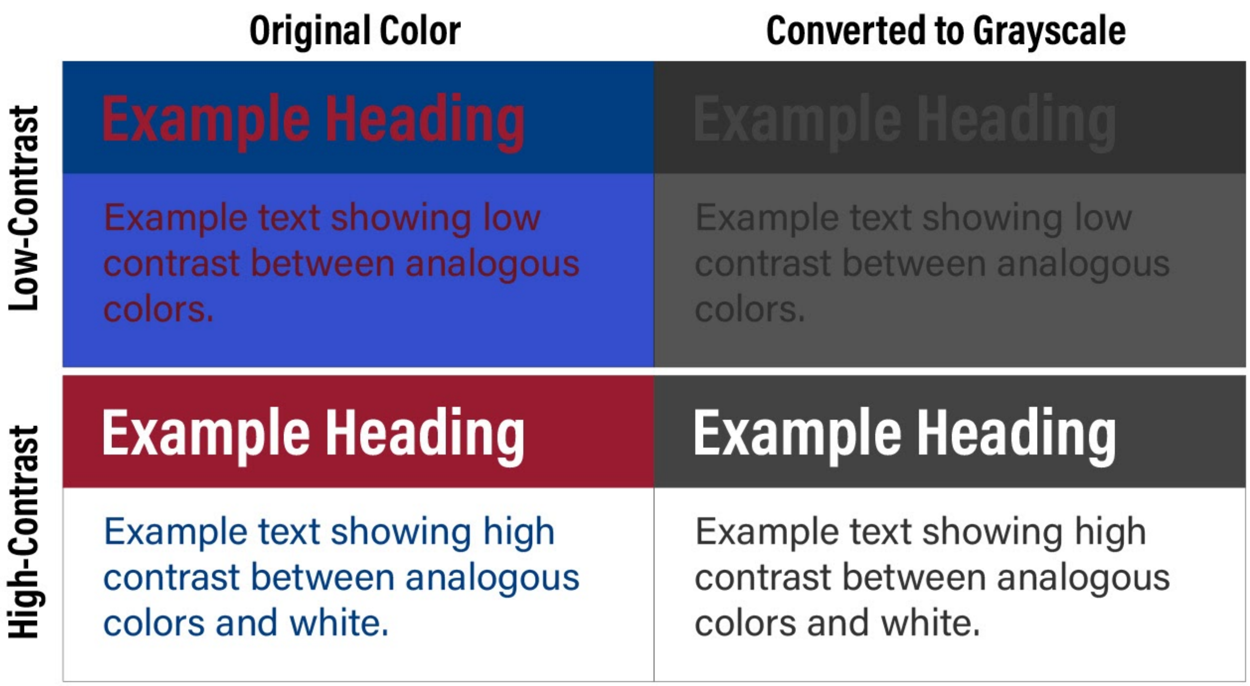

Figure 7

Low-Contrast and High-Contrast Examples of Analogous Color-use With Grayscale Conversions

4.2. Attention

Second, colors can be used to quickly and efficiently draw the attention of the eye to visual elements that matter. For instance, one eye-tracking study found that adding random colors to word labels on a grayscale figure moderately improved learner retention and transfer performance by improving the efficiency by which learners could differentiate textual elements (Ozcelik et al., 2009). On an app or VR interface, this might mean using a vibrant color only to effectively draw the learner's attention to a few important elements, such as commonly-used buttons or interactive elements necessary for progression. Similar principles are often applied to print media, with color only being applied to text in the case of headings, key terms, or blockquote elements. Any variation in color will generally draw the eye of the learner to the variation, and this means that UX designers should use this principle to intentionally draw user attention to elements that matter and avoid unnecessary color variation in elements that are less important. It also means that color cues can effectively be used as guideposts for directing the learner through progressive elements and to influence user pathways in desired ways.

4.3. Meaning

Third, because color conveys emotional (and sometimes even conceptual) meaning to learners, colors should be used in a manner that synergistically emphasizes the intended meaning conveyed by the overall project and individual content elements. As with the pet care mobile app example in Figure 4, improperly using color can subvert intended meaning or set a tone that is either unhelpful, dissonant, or repulsive for learners. As mentioned early, actual meaning and affective influences of color can be complicated, contextual, and individual, but some influences are fairly universal, such as grays denoting lack of importance; warm colors evoking passion, dissent, or engagement; cool colors evoking comfort, closeness, or agreement; and so forth.

4.4. Harmony

And fourth, to use colors well in any design effort, the designer must not only understand the emotions elicited by each color itself but also understand how to use colors together in harmonious ways that meet the intended purposes of the project. For instance, it is common knowledge that warm (low-wavelength) colors draw more attention than cool (high-wavelength) colors and that highly saturated colors draw more attention than washed-out tints, but the mark of a skilled designer is knowing both (a) which colors to use and (b) how to use varieties of colors together in harmonious and intentional ways.

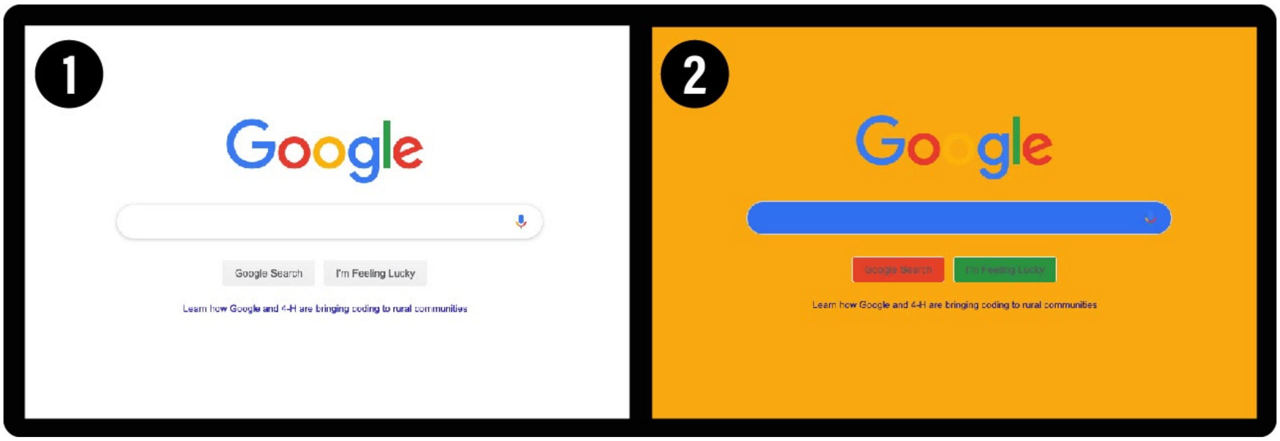

Figure 8

Two Websites Using the Same Colors but in Different Ways

Even when two products use the exact same colors (as in Figure 8), how the colors are used in relation to one another will influence the learner's affective experience. So, though both 8.1 and 8.2 use the same colors, 8.1 might feel cool, inviting, and professional, while 8.2 might feel comical, distracting, and amateurish.

As a rule of thumb, many designers propose following what is called the 60-30-10 rule, which is commonly used in many other visual fields such as interior design. According to this rule, you should choose a primary color to dominate 60% of the field of view, followed by a secondary color for 30%, and an accent or tertiary color for no more than 10%. For most UX products, this would mean choosing a subdued color as the primary color (such as the soft blue in Figure 6.1 or the white in 8.1), a vibrant color as the accent color (such as the pink in Figure 6.1 or the "Google" primary colors in 8.1), and some variation in between as the secondary color (such as the brown in Figure 6.1 or the grays in 8.1).

5. Color Schemes

To promote color harmony, and to implement the other guiding considerations mentioned above, most designers will begin color-use in a project by developing what is called a color scheme. In most cases, color schemes include between two and six colors that will be drawn upon in intentional ways. Common color scheme types include: (a) monochromatic, (b) analogous, (c) complementary, (d) complex, and (e) achromatic. Each type has its own strengths and weaknesses as well as design considerations to attend to, which I will now explain. For each type, an example image will also be provided, which has the five scheme colors depicted on the right of the image and the color wheel placements of each scheme depicted on the bottom-right.

5.1. Monochromatic

Monochromatic schemes (from mono meaning one and chroma meaning color) utilize a single, dominant color and provide color variation only by using desaturated versions (or tints) of the dominant color. Since they rely on a single color, monochromatic schemes are easy to use in complicated designs to provide a sense of cohesion and uniformity. Because the overall scheme is simple (i.e., one color), this also allows you to include richer secondary elements, such as images in a Facebook news feed or a variety of images on a Pinterest board. The trade-off, however, is that monochromatic designs can be boring or overbearing if highly-saturated versions of the dominant color are overused. To prevent this, use plenty of white and very lightly-saturated tints of the dominant color to offset the more highly-saturated attention areas. In the provided example (Figure 9), the navigation bars are a highly-saturated blue, so the content on the rest of the design needs to use plenty of white and very light blues for balancing.

Figure 9

Monochromatic Schemes Use a Single Dominant Color of Different Saturations

5.2. Analogous

Analogous schemes rely upon two or more nearby colors on the color wheel, generally spanning no more than one-third of the color wheel (e.g., red and blue, green and orange, cyan and violet). Since the colors are not distinct enough from one another to allow them to be placed side-by-side, plenty of white space should be used to separate instances of the two colors. Analogous schemes are more visually interesting than monochromatic schemes, because they provide more color variation, but they are also more difficult to use, because the two dominant colors must be well-separated, and any other visual elements should fit the scheme. In the provided example (Figure 10), the crimson logo and carousel are clearly separated from the blue events block, and the image in the carousel has a dominant blue color (via the woman's sweater) that roughly matches the other blues in the design. If the woman's sweater was orange or green, however, the design would struggle to be harmonious; because the design is already using so much color complexity, any more complexity introduced by the secondary elements would be distracting. Because their colors are so close to each other on the color wheel, analogous color schemes in particular may introduce contrast problems.

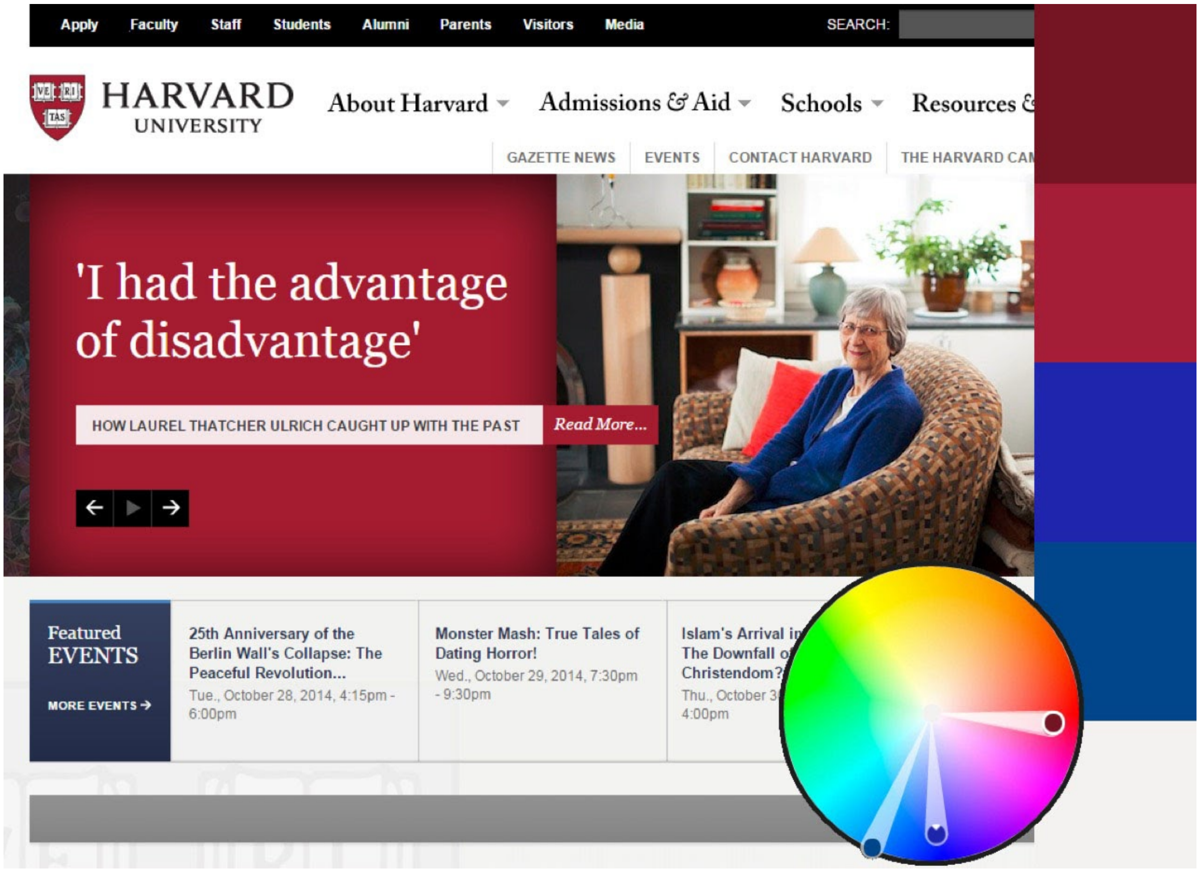

Figure 10

Analogous Schemes Use Two Dominant Colors Less Than One-Third of the Distance on the Color Wheel From One Another

5.3. Complementary

The color wheel is conceived as circular rather than linear, because colors on opposite sides when (additively) mixed will make white. These are called complementary colors (cf. Figure 11). Complementary schemes, then, use two dominant colors that are on opposite sides of the color wheel, such as blue and gold, orange and cyan, or pink and green.

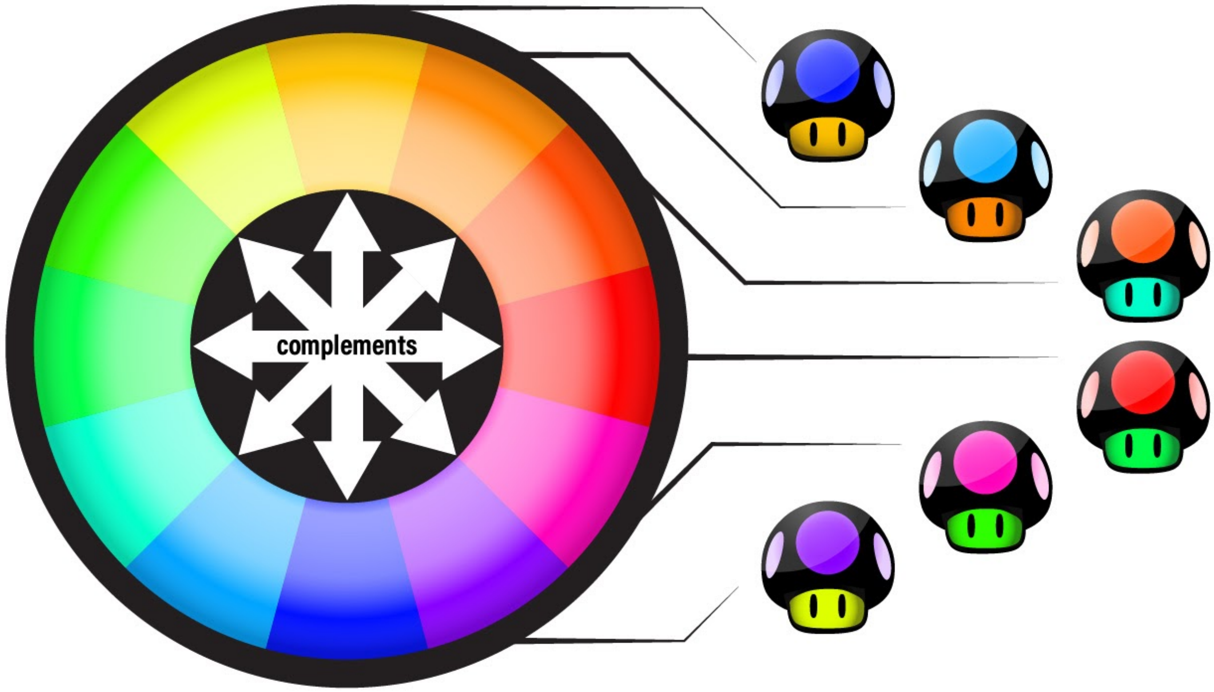

Figure 11

Complementary Colors Reside Opposite One Another on the Color Wheel

Complementary schemes are also visually interesting, but the dominant colors are distinct enough from one another that they can be used in closer proximity than can analogous colors. In the provided example (Figure 12), the orange logo and thin horizontal bars are placed nicely beside or on top of the dark blues of the menu. However, though the two colors complement each other, one should be treated as the visually dominant color, and the other should be treated as the accent (in this case, the orange is the accent). Typically, the cooler color is used as the visually dominant color, and the warmer color is used as the accent. This allows for the design to show interesting variation while also using the accent color to draw the viewer's attention to specific parts of the design, such as the logo, buttons, or content separators.

Figure 12

Complementary Schemes Use Two Dominant Colors on Opposite Sides of the Color Wheel From One Another

5.4. Complex

As the name suggests, complex schemes are the most complicated, because they use three or more dominant colors equally situated around the color wheel (e.g., blue, orange, red, and green). Because they use so much color variation, the visual space that the color takes up in the design should be very small and offset with plenty of white space. In the provided example (Figure 13), the website uses a large logo with four very different colors but offsets this by using little to no color in the rest of the design. Because of their variation, complex schemes can be very bright and interesting but can quickly become overpowering if the visual footprint of any of the colors becomes too pronounced (as in Figure 8.2).

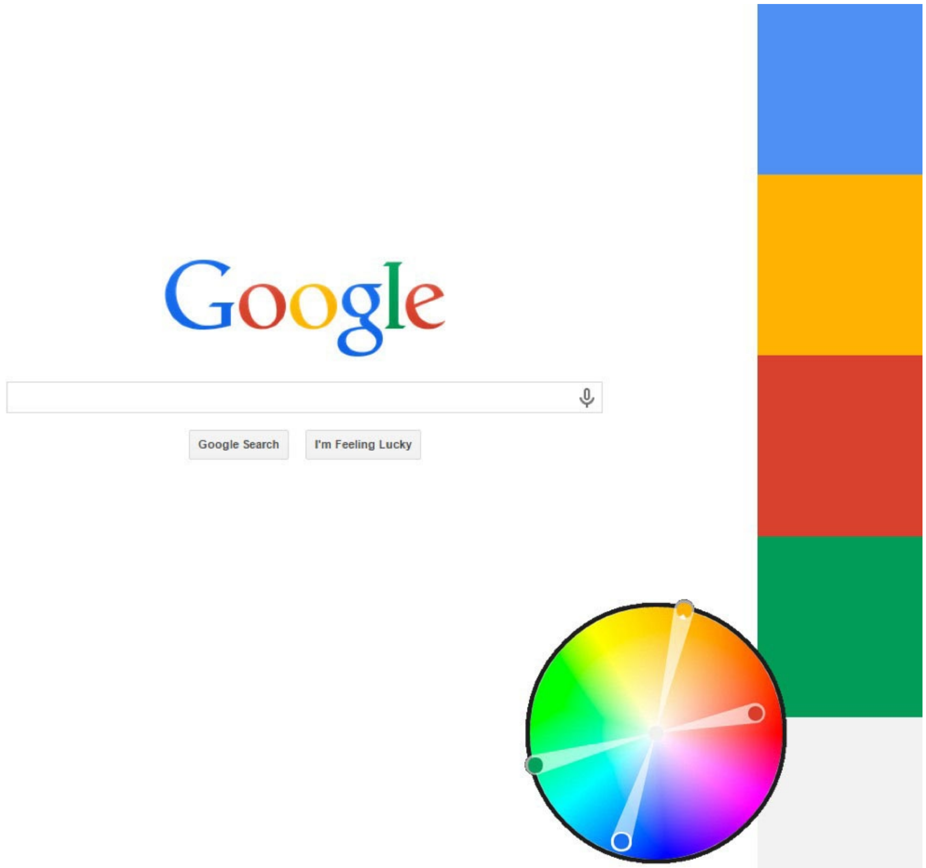

Figure 13

Complex Schemes Use Three or More Colors Equally Situated Around the Color Wheel From One Another

5.5. Achromatic

Achromatic color schemes (meaning no color) use only variations on black, white, and gray. Of all the schemes, this scheme is the easiest to use but can also be the least interesting, because it provides the least color variation. Sometimes, however, less design complexity is desirable. In the provided example (Figure 14), the overall site design uses an achromatic scheme so that when colors are used in secondary elements they will draw the attention of the viewer (in this case, products that the vendor is seeking to sell are provided in full color, while menu items and logos are muted grays). Achromatic schemes may be helpful if secondary elements are complex and rich, but without these secondary elements, the design itself would be visually boring.

Figure 14

Achromatic Schemes Use Only Black, White, and Grays

5.6. Choice and Use

Various tools are available to designers that provide color scheme examples, such as the [Adobe Color](#) website or the [Google Material Palette Generator](#), and there are many different ways to create a color scheme. For our purposes, however, I will offer two simple techniques to create professional-looking color schemes that anyone can follow.

The first approach is to start with a single, dominant color that matches your overall emotional objective for your product—blues might be calming or sad, greens might be fresh or healthy, yellows might be fun or playful, reds might be outrageous or dangerous, etc. However, this decision might already have been made for you via institutional branding or logo decisions. Once you have this color, plug the color into a color scheming tool such as Adobe Color, and use the provided radio buttons to switch between color scheme types (e.g., analogous, monochromatic, complementary). If you want a simpler, safer design, go with a monochromatic type, and drag the circles on the color wheel to various saturation levels to give you sufficient variation in the five-color scheme. If you want something more interesting, try the complementary or analogous type. In the case of analogous, you can drag the circles around the color wheel to increase color variation, but the colors generally should not extend more than one-third (120-degrees) the circumference of the circle, lest the variation be too great. In the example image (Figure 15), I started with the Twitter logo blue (#00bbff) and found that an orange hue (#ff8400) might serve as a nice accent (complementary) color.

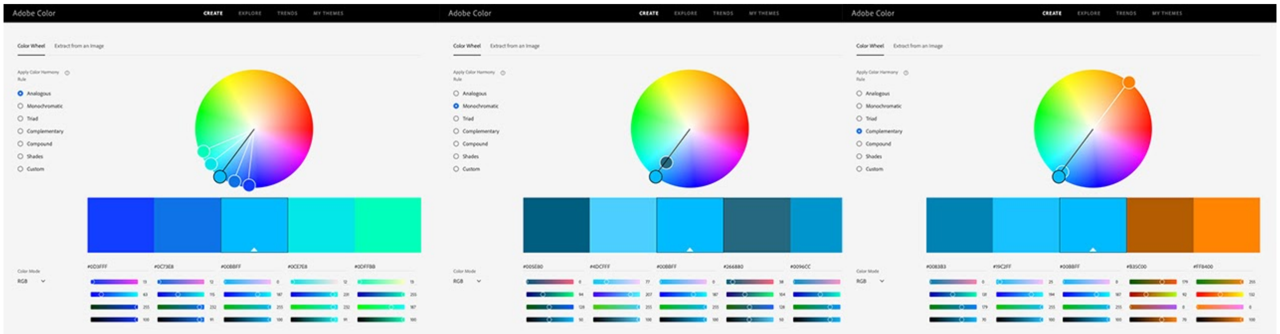

Figure 15

Choosing Different Color Scheme Types in Adobe Color From a Single Dominant Color

The second approach is to choose a picture or painting that you enjoy (preferably of a natural setting) that you feel exemplifies the emotional state you want to create with your design. Then, upload the image to Adobe Color via the "Extract from an image" feature. This will attempt to identify the dominant colors in the picture and to situate them in relation to one another in a harmonious manner. Once imported, you can click back on the color wheel to see where the colors fall and to switch between color scheme types. In the provided example (Figure 16), the image of trees in autumn generated an analogous color scheme of oranges, yellows, greens, and burnt orange.

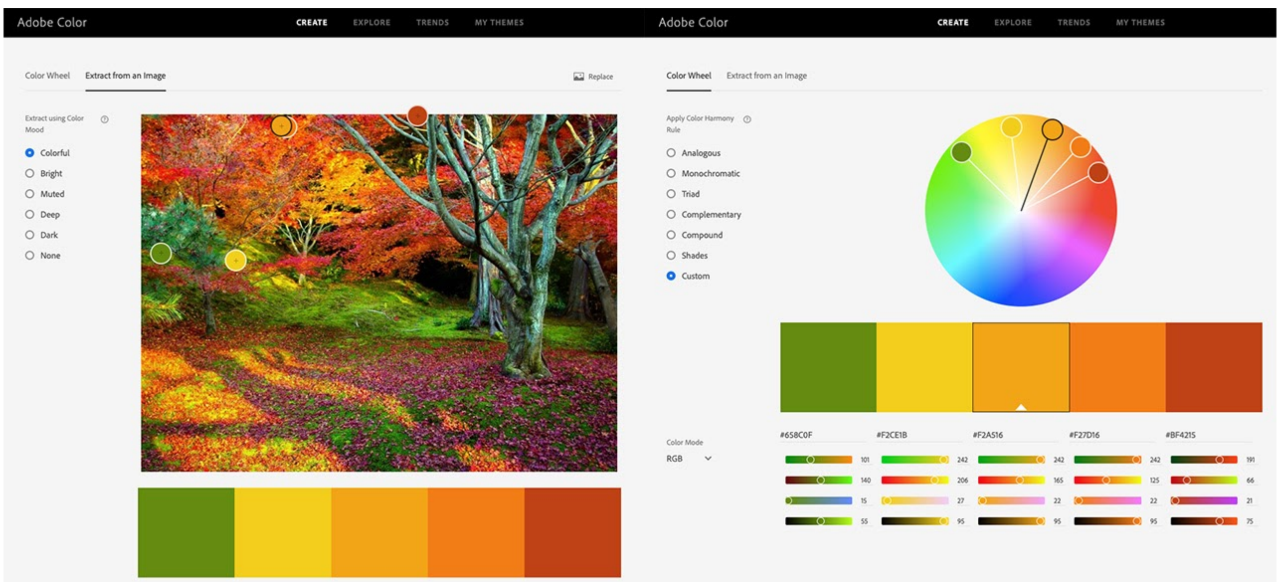

Figure 16

Extracting a Color Scheme in Adobe Color From an Existing Image

Once you have created a color scheme you are happy with, you can import the color scheme into other applications in a variety of ways. The simplest and most versatile method, however, is to simply take a screenshot and place it into your authoring tool or to manually transfer the hexadecimal codes.

6. Conclusion

This chapter has provided an overview of (a) the physics and technical notations for color, (b) scholarly literature on the relationships between color, emotion, and learning, (c) some guiding considerations on how to use color in UX design, and (d) concrete information on effectively using color schemes to improve harmony and contrast in designs. Some major takeaways for designers should include the following:

- Choose dominant colors that will influence emotions aligning with your intended design goals.
- Use colors in ways that are intentional (e.g., accentuating important content) and natural or appropriate by drawing upon users' prior experiences.
- Ensure that color contrast is sufficient and that color is used strategically to allow learners to clearly and readily identify important content and follow intended user pathways.
- Choose a color scheme that counterbalances the complexity of your content (complex content requires a simpler color scheme, while simpler content can use a more complex color scheme).
- Use whitespace and white, black, or gray text to increase contrast and to balance color-use.

By following these suggestions, UX and LX designers can create designs that increase motivation and persistence by making user experiences more pleasing, more intentional, and less frustrating.

From a research perspective, much work is still needed to help designers better understand issues of contextual color-use, differential affective influences on learners, and interactions between various colors as well as between color, content, and objectives. Because effective color-use in UX design is best described as craft (or synergy between science and art) and because learning contexts vary so greatly, it is reasonable that the most important research in this area moving forward will focus on applied, focused uses of color through iterative design cases and continual improvement. Though UX designers might not have the same obsession with color that Monet expressed, hopefully our obsession for learning will help us to more fully recognize that color is an important aspect of the learner's experience that should be better understood and more skillfully applied.

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Aesthetic principles for instructional design

Patrick Parrish

This resource can be accessed at the below URL:

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(Supplement) High Quality Resources on Aesthetics in Learning Design

Resource Title	Description	Link
A Picture Is Worth 1000 Words: Visual Design in E-Learning	Overview of visual design principles as applied to learning design.	https://edtechbooks.org/-nEce
The importance of visual design and aesthetics in e-learning	Brief overview of visual design principles. Quick read and informative.	https://edtechbooks.org/-vLFS
Using Visual Design to Improve the Online Learning Experience: A Synthesis of Research on Aesthetics	A review of the academic literature focusing on how to design online courses in an aesthetically pleasing manner.	https://edtechbooks.org/-UYJL
The Power of Simplicity	Brief overview of simplicity/minimalism in learning design.	https://edtechbooks.org/-QzcL

The Essential Guide to Minimalist Design for E-Learning	Short article providing practical advice for creating minimalist designs. Focus is more on visuals. Very little discussion of learning.	https://edtechbooks.org/-VeBz

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Module 7: Learning Design Evaluation

Methods of User Centered Design and Evaluation for Learning Designers

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Editor's Note

A previous version of this chapter was included in a prior publication (cited below). The current version extends on the previous version by providing examples relevant to the field of Learning/Instructional Design, further clarifications, and additional illustrative figures.

Earnshaw, Y., Tawfik, A., & Schmidt, M. (2017). User experience design. In R. E. West (Ed.), *Foundations of learning and instructional design technology* (1st ed.). EdTech Books. https://edtechbooks.org/-ENoi

1. Introduction

Educators and learners are increasingly reliant on digital tools to facilitate learning. However, educators and learners often use technology in ways that are different than developers originally intended (Straub, 2017). For instance, educators may be faced with challenges trying to determine how to assess student learning in their learning management system (LMS), so they use a different tool and then copy/paste the results. Or they might spend time determining workarounds to administer lesson plans because the LMS does not directly support a particular pedagogical approach. From the perspective of learners, experiencing challenges navigating an interface or finding homework details might result in frustration or even missed assignments. When an interface is not easy to use, users tend to develop alternative paths to complete a task to accomplish a learning goal. Long recognized in the field of human-computer interaction (HCI), such adjustments, accommodations, and improvisations are the result of design flaws (cf. Orlikowski, 1990; Grudin, 1988). These design flaws are often the result of the software development team failing to consider the user sufficiently in the design process. This extends to the field of learning design and instructional design and technology (collectively LIDT) and can create barriers to effective instruction (Jou et al., 2016; Rodríguez et al., 2017). Increasingly, user-centered approaches to design are being accepted as particularly useful in supporting positive user experience. User-centered design (UCD) emphasizes understanding users' needs and expectations throughout all phases of design (Norman, 1986).

Understanding how educators and learners interact with learning technologies is key to avoiding and remediating design flaws. HCI seeks to understand the interaction between technology and the people who use it from multiple perspectives (Rogers, 2012)—two of which are user experience (UX) and usability. UX describes the broader context of technology usage in terms of "a person's perceptions and responses that result from the use or anticipated use of a product, system, or service" (International Organization for Standardization, 2010, Terms and Definitions section, para

2.15). UX considers all aspects of a user's interaction with technology, including how pleasing and usable the technology is. More specifically, usability describes how easy or difficult it is for users to interact with a user interface in the manner intended by the software developer (Nielsen, 2012). Highly usable user interfaces are easy for users to become familiar with, support users achieving their goals, and are easy to remember. From the perspective of learning design, these design factors are used strategically to focus cognitive resources primarily on the task of learning.

The principles of HCI and UCD have implications for the design of learning environments. While the field of LIDT has focused historically on theories that guide learning design (e.g., scaffolding, sociocultural theory), less emphasis has been placed on learning technology design from the view of HCI and UCD (Okumuş et al., 2016). This chapter addresses this issue. We begin with a discussion of some of the theories used in the field of LIDT that align with UX. We then discuss the importance of iteration in design cycles and provide implications with details of UCD-specific methodologies that allow learning designers to approach design from both pedagogical and HCI perspectives. Multiple case examples drawn from the authors' real-world experiences are provided, illustrating how this can be enacted in practice. The intention of this chapter is to highlight how the fields of HCI and LIDT can intersect synergistically by aligning theories and design approaches of LIDT with methods and processes more commonly used in the field of HCI.

2. Theoretical Foundations

Usability and HCI are often situated in established theories such as cognitive load theory, distributed cognition, and activity theory. LIDT is a sister of these disciplines; hence, these theories also have ramifications for the design and development of learning technologies. In the following sections, we discuss each theory and the importance of conceptualizing UCD, usability, and UX from the LIDT perspective.

2.1. Cognitive Load Theory

Cognitive load theory (CLT) contends that learning is predicated on effective cognitive processing; however, an individual only has a limited number of resources needed to process the information (Mayer & Moreno, 2003; Paas & Ayres, 2014). The three categories of CLT include: (a) intrinsic load, (b) extraneous load, and (c) germane load (Sweller et al., 1998). Firstly, intrinsic load describes the active processing or holding of verbal and visual representations within working memory. Secondly, extraneous load includes the elements that are not essential for learning but are still present for learners to process (Korbach et al., 2017). Thirdly, germane load describes the relevant load imposed by the effective instructional/learning design of learning materials (hereafter referred to simply as learning design). Germane cognitive load is therefore relevant to schema construction as information is subsumed into long-term memory (Paas et al., 2003; Sweller et al., 1998; van Merriënboer & Ayres, 2005). It is important to note that the elements of CLT are additive, meaning that, if learning is to occur, the total load cannot exceed available working memory resources (Paas et al., 2003).

Extraneous load is of particular importance for UCD. Extraneous cognitive load can be directly manipulated by a designer (van Merriënboer & Ayres, 2005) through improved usability. When an interface is not designed with usability in mind, the extraneous cognitive load is increased, which impedes meaningful learning. From a learning design perspective, poor usability might result in extraneous cognitive load in many forms. For instance, a poor navigation structure in an online course might require the learner to extend extra effort to click through the learning modules to find relevant information. Further, when an instructor uses unfamiliar terms in digital learning materials that do not align with a learners's mental model or the different web pages in a learning module are not consistently designed, the learner must exert additional effort toward understanding the materials. Another example of extraneous cognitive load is when a learner does not know how to progress in a digital learning environment, resulting in an interruption of learning flow. Although there are many other examples, each depicts how poor usability taxes finite cognitive resources. Creating highly usable digital environments for learning can help reduce extraneous cognitive load and allow mental resources to remain focused on germane cognitive load for building schemas (Sweller et al., 1998).

2.2. Distributed Cognition and Activity Theory

While cognitive load theory helps describe the individual experience of user actions and interactions, other theories and models focus on broader conceptualizations of HCI. Among the most prominent are distributed cognition and activity theory, which take into account the broader context of learning and introduce the role of collaboration between various individuals. Distributed cognition postulates that knowledge is present both within the mind of an individual and across artifacts (Hollan et al., 2000). The theory focuses on the understanding of the coordination "among individuals and artifacts, that is, to understand how individual agents align and share within a distributed process" (Nardi, 1996, p. 39). From the perspective of LIDT, individual agents (e.g., learners, instructors) operate within a distributed process of learning, as facilitated by various artifacts (such as content, messages, and media). The distributed process of learning is mediated by intentional interaction and communication with learning technologies (e.g., learning management systems, web conferencing platforms) in pursuit of learning objectives (Boland et al., 1994; Vasiliou et al., 2014). For example, two learners collaborating on a pair of programming problems might write pseudo-code and input comments into a text editor. In this case, distributed cognition is evident in collaborating on the programming problem and by conceptualizing various solutions mentally but also by using a tool (the text editor) to extend their memory. Cognition in this case is distributed between people and tools; distributed cognition, therefore, would focus on the function of the tool within the broader learning context (Michaelian & Sutton, 2013). In contrast with the more narrow perspective of cognitive load theory that considers the degree to which a specific learner's finite cognitive resources are affected when interacting with a technology system, distributed cognition adopts a broader cognitive, social, and organizational perspective (Rogers, 1997).

Activity theory is a systems-based, ecological framework that shares some similarities with distributed cognition but distinguishes itself in its specific focus on activity and the dynamic interplay of actors, artifacts, and sociocultural factors within an interconnected system. Given its ecological lens, activity theory can be a useful framework for describing and understanding how a variety of factors can influence human activity. Central to activity theory is the concept of mediation. In activity theory, activity is mediated by tools, also called artefacts (Kaptelenin, 1996). From a technological perspective the concept of tools is often in reference to digital tools or software. These technological tools mediate human activity within a goal-directed hierarchy of (a) activities, (b) actions, and (c) operations (Jonassen & Rohrer-Murphy, 1999). Firstly, activities describe the top-level objectives and fulfillment of motives (Kaptelinin et al., 1999). Secondly, actions are the more specific goal-directed processes and smaller tasks that must be completed in order to complete overarching activities. Thirdly, operations describe the automatic cognitive processes that group members complete (Engeström, 2000). However, they do not maintain their own goals but are rather the unconscious adjustment of actions to the situation at hand (Kaptelinin et al., 1999). Engström's (2000) sociocultural activity theory framework is commonly depicted as an interconnected system in the shape of a triangle, as depicted in Figure 1.

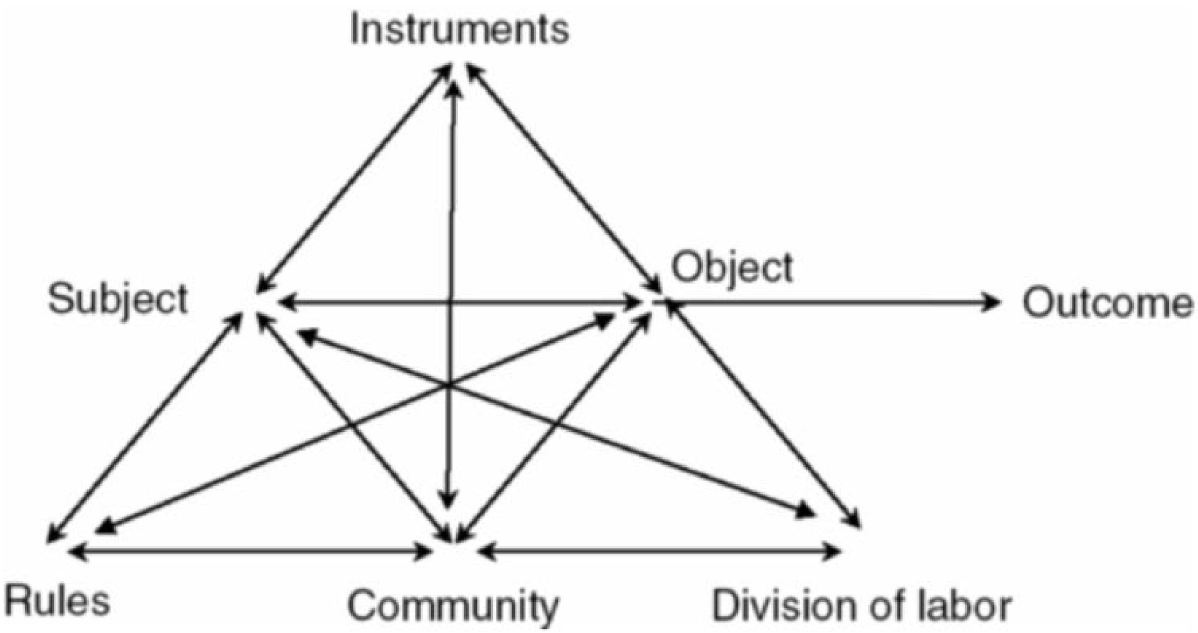

Figure 1

Activity System Diagram

Note. Adapted from Engeström (2000, p. 962).

Activity theory is especially helpful for learning design because it provides a framework to understand how objectives are completed within a learning context. Nardi (1996) highlights the centrality to activity theory of mediation via tools/artefacts. These artefacts are created by individuals to control their own behavior and can manifest in the form of instruments, languages, or technology. Each carries a particular culture and history that stretches across time and space (Kaptelinin et al., 1999) and serves to represent ways in which others have solved similar problems. As applied to learning contexts, activity theory suggests that tools not only mediate the learning experience but that learning processes are often altered to accommodate the new tools (Jonassen & Rohrer-Murphy, 1999). This underscores the importance of considering the influence of novel learning technologies (e.g., LMSs, educational video games) from within a broader context of social activity when implemented by schools and/or organizations (Ackerman, 2000). The technological tools instituted in a particular workgroup should not radically change work processes but should present solutions on the basis of needs, constraints, history, etc. of that workgroup (Barab et al., 2002; Yamagata-Lynch et al., 2015). As learning is increasingly collaborative through technology (particularly online learning), activity theory and distributed cognition can provide important insights for learning designers into the broader sociocultural aspects of human-computer interaction.

3. User-Centered Design

The brief overview of theoretical foundations provided in the above sections highlights how theories of cognition and human activity in sociocultural contexts can be useful in the design of digital environments for learning. However, the question remains as to how one designs highly usable, pleasing, and effective digital environments for learning on the basis of these theories. Answering this question is difficult because these theories are not prescriptive. Specific guidance for how they can be applied is lacking, meaning that how best to design theoretically inspired, highly usable and pleasing learning environments is ultimately the prerogative of the designer. Iterative design approaches can be useful for confronting this conundrum. While the field of LIDT has recently begun to shift its focus to more iterative design and user-driven development models, there is a need to more intentionally bridge learning design and user-centered design approaches to support positive learner experience in digital environments. To this end, a number of existing learning design methods can be used or adapted to fit iterative approaches. For example, identifying learning needs has long been the focus of front-end analysis. Ideation and prototyping are frequently used methods from UX design and rapid prototyping. Evaluation in learning design has a rich history of formative and summative methods. By applying these specific design methods within iterative design processes, learning designers can advance their designs in such a way that they can focus not only on intended learning outcomes but also on the learner experience and usability of their designs. In the following sections, UCD is considered with a specific focus on techniques for incorporation into one's learning design processes through (a) identifying user needs, (b) requirements gathering, (c) prototyping, and (d) wireframing.

3.1. Developing Requirements Based on Learners' Needs

One potential pitfall of any design process occurs when designers create systems based on assumptions of what users want. Only after designers have begun to understand the user should they begin to identify what capabilities or conditions a system must be able to support to meet the identified needs. These capabilities or conditions are known as requirements. The process a designer undertakes to identify these requirements is known as requirements gathering. Generally, requirements gathering involves gathering and analyzing user data (e.g., surveys, focus groups, interviews, observations) and assessing user needs (Sleezer et al., 2014).

In the field of LIDT, assessing learner needs often begins with identification of a gap (the need) between actual performance and optimal performance (Rossett, 1987; Rossett & Sheldon, 2001). Needs and performance can then be further analyzed and learning interventions designed to address those needs. Assessing user (and learner) needs can yield important information about performance gaps and other problems. However, knowledge of needs alone is insufficient to design highly usable and pleasing learning environments. Further detail is needed regarding the specific context of use for a given tool or system. Context is defined by learners (and others who will use the tool or system such as administrators or instructors), tasks (what will learners do with the tool or system), and environment (the local context in which learners use the tool or system).

Based on identified learner needs, a set of requirements is generated to define what system capabilities must be developed to meet those needs. Requirements are not just obtained for one set of learners but for all learner types and personas (including instructors and administrators) that might utilize the system. Data-based requirements (a) help learning designers avoid the pitfall of applying ready-made solutions to assumed learner needs, (b) position the learner and their needs centrally in the design process, and (c) allow for creation of design guidelines targeting an array of various learner needs. Requirements based on learner data are therefore more promising in supporting a positive learner experience. However, given the iterative nature of UCD, requirements might change as a design evolves. Shifts in requirements vary depending on design and associated evaluation outcomes. Two methods commonly used in UCD for establishing requirements are persona and scenario development.

3.1.1. Personas

In UCD, a popular approach to understanding users is to create what is known as personas (Cooper, 2004). Personas provide a detailed description of a fictional user whose characteristics represent a specific user group. They serve as a methodological tool that helps designers approach design based on the perspective of the user rather than (often biased) assumptions. A persona typically includes information about a user's demographics, goals, needs, typical day, and experiences. In order to create a persona, interviews or observations should gather information from individual users and then place them into specific user categories. Personas should be updated if there are changes to technology, business needs, or other factors. These archetypes help designers obtain a deep understanding of the types of users for the system. Personas are especially helpful for learning designers in considering cultural diversity. Learning design teams tend to be small (2-3 members) or consist of an individual learning designer. Such teams can lack sufficient sociocultural perspective to design for a culturally sensitive and diverse learner experience. However, developing personas of, for example, a 25 year-old African-American woman who is a first generation college student or a 17 year-old, male Asian-American high school student athlete can provide context for designers to consider these sociocultural perspectives more intentionally in their learning designs. Because learner personas should be developed based on data that have been gathered about those learners, implicit bias can be reduced.

Table 1 provides an example of a culturally-situated persona in the context of Hawaiian public schools that was created by novice designers in an introductory learning design course using a template. The design context was development of a parent-teacher communication portal for public schools throughout the state using the Hawaii Department of Education E-School course management system. This particular persona highlights the value that Hawaiian families tend to place on family and interpersonal relationships.

User Goals: What users are trying to achieve by using your site, such as tasks they want to perform
1. Parents seek advice on improving teacher/parent interactions 2. Parents seek to build and foster a positive partnership between teacher and parents to contribute to child's school success 3. Parents wish to find new ways or improve ways of parent-teacher communication
Behavior: Online and offline behavior patterns, helping to identify users' goals
1. Online behavior: "Googling" ways to improve teacher communication with parent or parent communication with teacher; parent searching parent/teacher communication sites for types of technology to improve communication; navigating through site to reach information 2. Offline behavior: Had ineffective or negative parent-teacher communication over multiple occurrences; parents seeking out other parents for advice or teachers asking colleagues for suggestions to improve communication with parents 3. Online/Offline behavior: Taking notes, practicing strategies or tips suggested, discussing with a colleague or friend.
Attitudes: Relevant attitudes that predict how users will behave
1. Looking for answers 2. Reflective 3. Curiosity-driven
Motivations: Why users want to achieve these goals
1. Wishing to avoid past unpleasant experiences of dealing with parent-teacher interaction 2. Looking to improve current or future parent-teacher relationships 3. Looking to avoid negative perceptions of their child by teacher
Design team objectives: What you ideally want users to accomplish in order to ensure your website is successful?
1. Have an interface that is easy to navigate 2. Inclusion of both parent and teacher in the page (no portal/splash page) 3. Grab interest and engage users to continue reading and exploring the site

Table 1

Persona of Parent-Teacher Communication Portal Users

Note. Derived from: http://usabilitybok.org/persona

3.1.2. Scenarios

A complimentary method to personas is scenarios. Scenarios provide a means to situate the user/learner persona and technology within a realistic context of usage while the learner attempts to achieve his or her goal. Scenarios are presented as narratives that describe user activity in an informal story format (Carroll, 2000). While scenarios are widely used in software development, there is little specific guidance on how they should be developed. Generally speaking, scenarios should be developed in such a way that they are able to provide the designer useful detail about contexts, needs, and goals, which can be used to highlight necessary requirements.

Table 2 provides an example scenario that was created in the context of a virtual reality (VR) learning intervention for youth with autism spectrum disorders. The design target of this scenario was a tool that would allow learners to compare snapshots of their own facial expressions with a standard model inside of the VR world. In this scenario, the learner persona "John" interacts with the teacher persona "Carla" to engage in the task. This scenario illustrates how a scenario helps to illustrate how a learner persona (in this case, John) engages with a learning technology.

Component	Component Description
Context	John is viewing images of faces showing emotions and states including happy, surprised, and disappointed in the collaborative virtual world. His teacher, Carla, has asked him to make a face showing he is sad and share it with the group.
Goal	John's goal is to take a webcam picture of himself using the tools provided in the VR interface and to discuss his picture with his teacher and the rest of his group.
Activity	John learned to use the camera when he was completing his orientation, so he knows how to do this. John tries to make a sad face and snaps his picture using the Live Images application on the heads-up display. His picture shows up automatically on a shared media board in the virtual world. John's picture takes up a large portion of the media board, since it is the only picture. Carla and John look at the picture, and then Carla makes a suggestion for how his expression could better show sadness. Carla says, "I'll remove this picture and would like you to try again?" She deletes the first image. John retakes the image and asks Carla, "Does this face look sad enough?" Carla provides positive praise, "I really like how you asked me about your picture!" and continues, "Let's ask the rest of the group."
Outcome	The whole group discusses John's picture and provides their input. After their discussion is over and John has some feedback, he asks if he can try again. Carla deletes his image and John takes another image to share. After everyone praises John for getting it right this time, Carla deletes John's image and asks Mary to try to show a surprised look.

Table 2

3.2. Prototyping Digital Environments for Learning

Gathering data to design and develop digital environments for learning is an iterative process. Based on personas and identified requirements, an initial prototype of the user interface or the online learning environment will be created. Prototypes tend to follow a trajectory of development over time from low fidelity to high fidelity (Walker et al., 2002). Fidelity refers to the degree of precision, attention to detail, and functionality of a prototype. Examples range from lower fidelity prototypes, which include the proverbial “sketch on a napkin” and paper prototypes, to higher fidelity prototypes, which include non-functional “dummy” graphical mockups of interfaces and interfaces with limited functionality that allow for evaluation. Typically, lower fidelity prototypes (lo-fi prototypes) do not take much time to develop and higher fidelity prototypes take longer because prototypes become more difficult to change as more details and features are added. Prototyping is a useful skill for all learning designers, including those who create online courses by arranging various content, media, and interactive experiences to those who develop educational software such as educational video games or mobile apps.

3.2.1. Rapid Prototyping

Rapid prototyping is an approach to design that emerged in the 1980s in engineering fields and began to gain traction in instructional design in the early 1990s (Desrosier, 2011; Tripp & Bichelmeyer, 1990; Wilson et al., 1993). Instead of traditional instructional design approaches with lengthy design and development phases, rapid prototyping focuses on fast, or “rapid,” iterations. This allows instructional designers to quickly gather evaluative feedback on their early designs. Considered a feedback-driven approach, rapid prototyping is seen by many as a powerful tool for the early stages of a learning design project. The rapid prototyping approach relies on multiple, rapid cycles in which an artifact is designed, developed, tested, and revised. Actual users of the system participate during the testing phase. This cycle repeats until the artifact is deemed to be acceptable to users. Although high fidelity prototypes can emerge from the process of rapid prototyping, rapid prototypes themselves are usually lo-fi. An example of rapid prototyping applied in an instructional design context is the successive approximation model or SAM (Allen, 2014). The SAM (version 2) process model is provided in Figure 2.

For example, a learning designer developing a course in a LMS can benefit from rapid prototyping processes like SAM2 before a course is deployed. After gathering information and materials (preparation phase), he or she can quickly incorporate as many course elements and materials as are immediately available into the LMS (iterative design phase). For any materials or content that is missing, simple placeholders are used with relevant descriptions (e.g., an image with an “X” on it to designate a graphic or a screenshot of a video player to designate a video). These materials are then arranged to provide a rough estimation of how the course navigation, structure, sequence, and associated learning materials will be organized. This is then reviewed by students (who do not necessarily need to be students enrolled in the course) and iterated over two or three redesign and revision cycles. Once the organization has been refined, course materials can be developed (e.g., multimedia, text-based content) and evaluated (iterative development phase). These materials are often evaluated by subject matter experts in the form of expert review. After two or three rounds of revisions and refinements are completed, the course is ready to be rolled out. Due to the revisions the course has a far greater likelihood to promote a positive learner experience than a course that is organized based solely on an LMS template or designer intuition.

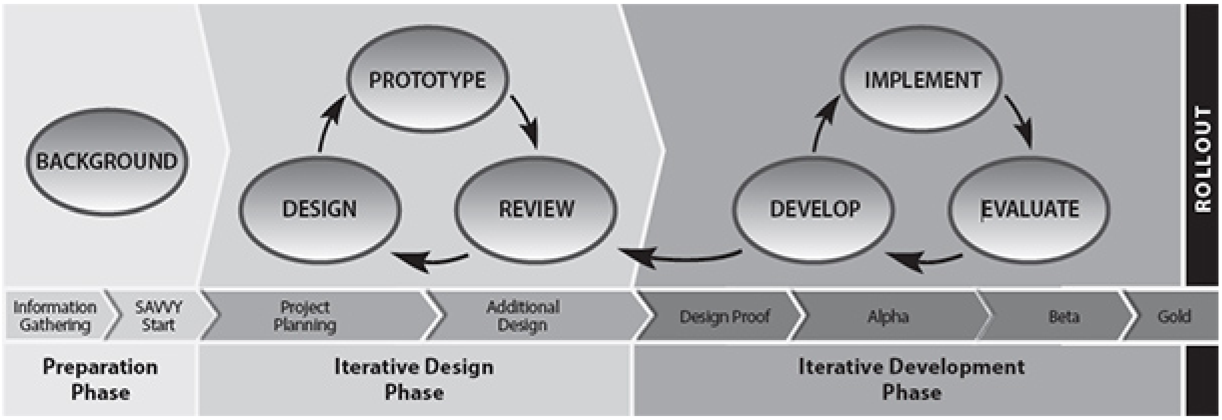

Figure 2

Successive Approximation Model Version 2 (SAM2) Process Diagram

Note. Adapted from Allen (2014). Copyright 2014 by the American Society for Training and Development.

3.2.2. Paper Prototyping

Paper prototyping is a lo-fi method of prototyping used to inform the design and development of many different kinds of interfaces, including web, mobile, and games. The focus of paper prototyping is not on layout or content but on navigation, workflow, terminology, and functionality. The purpose of creating these prototypes is to communicate designs among the design team, users, and stakeholders, as well as to gather user feedback on designs. A benefit of paper prototyping is that it is rapid and inexpensive—designers put only as much time into developing a design as is absolutely necessary. This makes it a robust tool at the early stages of design. As the name implies, designers use paper to create mockups of an interface. Using pencil and paper is the simplest approach to paper prototyping, but stencils, colored markers, and colored paper can also be used. These paper prototypes can be scanned and further elaborated using digital tools (Figure 3). The simplicity of paper prototyping allows for input from all members of a design team, as well as from users and other stakeholders. The speed of paper prototyping makes it particularly amenable to a rapid prototyping design approach. The process of creating paper prototypes can be individual, in which the designer puts together sketches on his or her own, or collaborative, in which a team provides input on a sketch while one facilitator draws it out. For further information on paper prototyping, refer to Snyder (2003) and UsabilityNet (2012).

For example, a learning designer planning to create a learning object using an authoring tool such as Articulate Storyline or Adobe Captivate can benefit from paper prototyping by establishing rough drafts of animations, interactions, or navigation before devoting time and effort to developing those things in the authoring environment. For example, Figure 3 illustrates a case vignette in which a child avatar with a behavior disorder gets into an intense verbal argument with a caregiver avatar. The scene sets up an interactive activity in which the learner selects from a variety of responses to the situation and receives specific feedback based on those decisions. The initial sketch considers visual design (sequence of scenes, positioning of the avatars, avatar facial expressions, placement of user interface elements, etc.), the tone of the language, potential animations (fade-in of "what could I do diff?"), how learners will interact with the learning object (e.g., should the scenes "autoplay" or should the user manually advance them?), and anticipates the following interactive activity. The design team has also added a design idea of potentially presenting the vignette in a comic book style. As the reader will note, there are deep and meaningful learning design considerations represented in this paper prototype that took less than three minutes to sketch, photograph, and digitally annotate. This then served as the basis for further discussions within the design team and to solicit feedback from a subject matter expert. These conclusions were then incorporated in another rapid prototype, and another, and so-on until the design was sufficiently developed to build out in a more robust authoring tool.

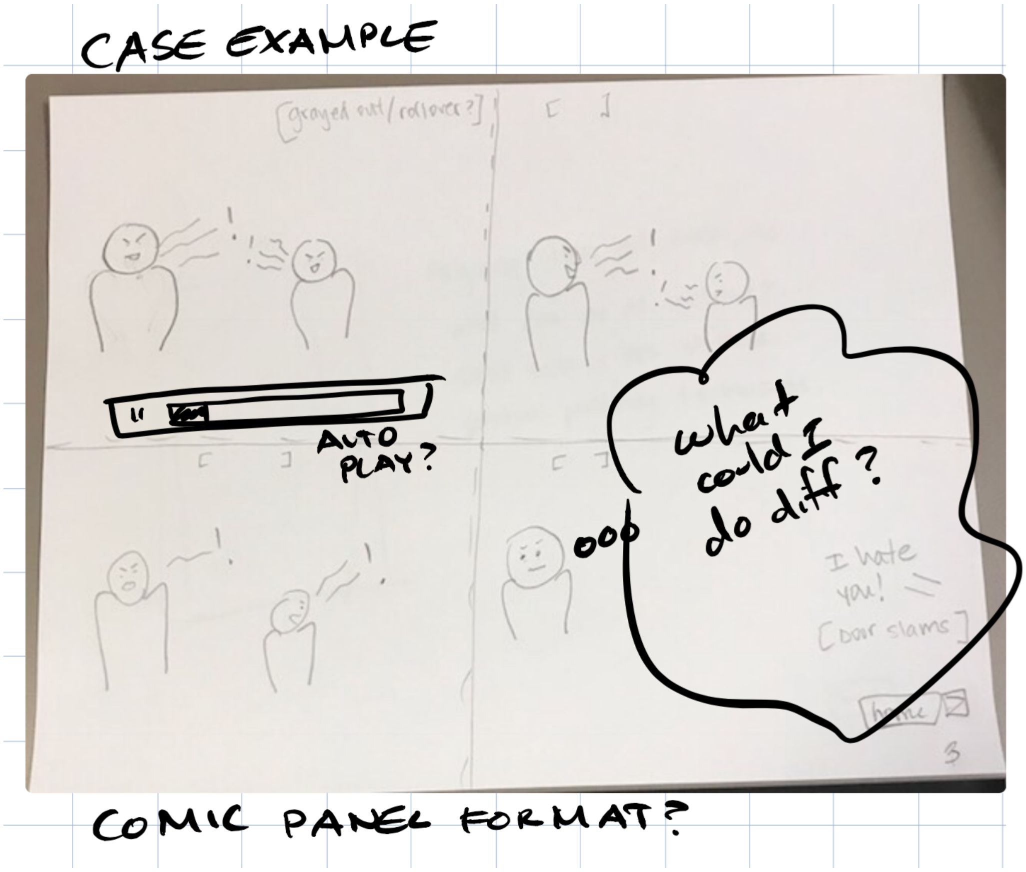

Figure 3

Example of a Paper Prototype That Has Been Scanned and Annotated Using Digital Tools

3.2.3. Wireframing

Wireframes are medium fidelity representations of interfaces that visually convey their structure (see Figure 4). Wireframing results in prototypes that are of higher fidelity than paper prototyping but lack the functionality and visual elements of high fidelity prototypes. Wireframing commonly occurs early in the design process after paper prototyping. It allows designers to focus on things that paper prototyping does not, such as layout of content, before more formal visual design and content creation occurs. Wireframing can be seen as an interim step that allows for fast mockups of an interface to be developed, tested, and refined, the results of which are then used to create higher fidelity, functional prototypes.

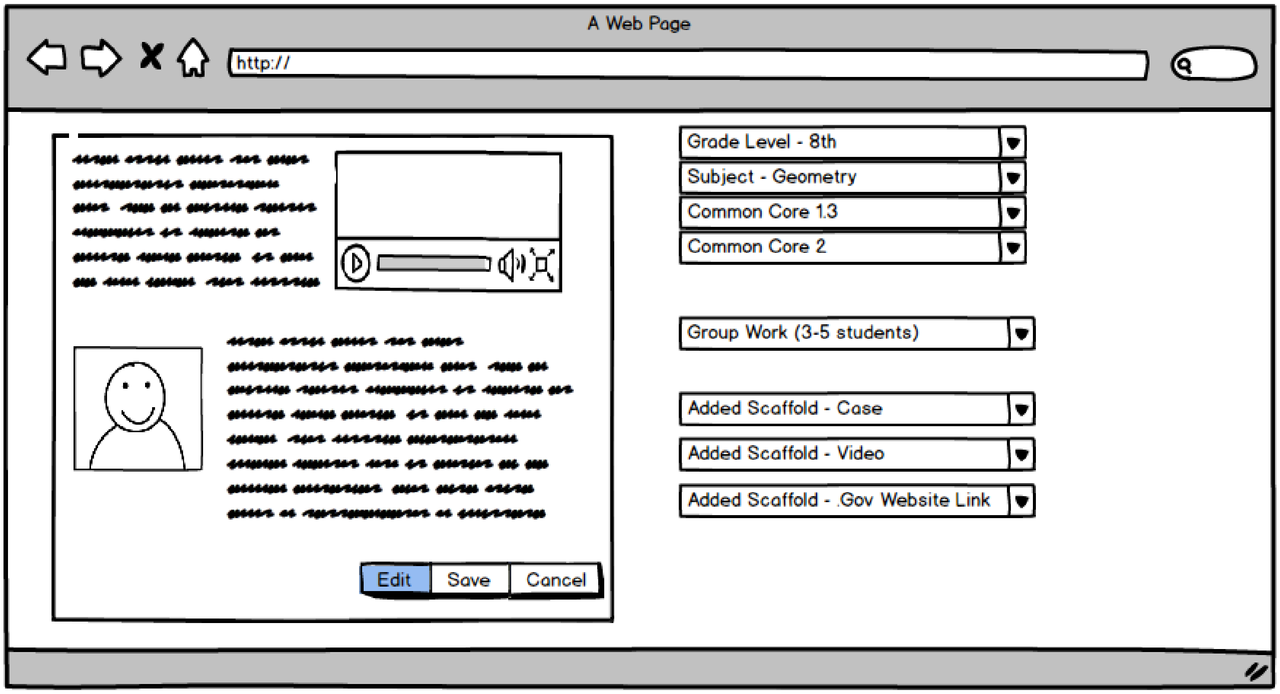

Figure 4

Example of a Wireframe

Wireframes consist of simple representations of an interface, with interface elements displayed as placeholders. Placeholders use a variety of visual conventions to convey their purpose. For example, a box with an "X" or other image might represent a graphic, or a box with horizontal lines might represent textual content. Wireframes can be created using common software such as PowerPoint or Google Drawings or with more specialized software such as OmniGraffle or Balsamiq. Wireframes are particularly amenable to revision, as revisions often consist of simple tweaks, such as moving interface elements, resizing, or removing them. A key benefit of wireframes is that they allow designers to present layouts to stakeholders, generate feedback, and quickly incorporate that feedback into revisions.

For example, learning designers developing a course in an LMS often incorporate multiple multimedia elements on a single LMS page. This could be a page consisting primarily of text interspersed with graphical illustrations or a page that presents three interactive three-dimensional models within a quiz. Learning designers can avoid unnecessary effort by developing wireframes for how content will be structured on these pages and then soliciting feedback. While creating wireframes for individual pages can increase designer efficiency, economies of scale can be achieved by wireframing entire learning modules and even entire course structures. These collections of wireframes provide a basis upon which to solicit feedback (i.e., from SMEs, students, etc.) and make subsequent improvements, thereby increasing the likelihood of a more positive learner experience. In addition, after designs are approved, the wireframe set can serve as a "punch list" for a learning design team, allowing the team to keep track of what content is needed, how it should be structured, and where it should be organized. As such, wireframes can be a tremendously useful communication and project management tool for a learning design team.

3.2.4. Functional Prototyping

Functional prototypes are higher-fidelity graphical representations of interfaces that have been visually designed such that they closely resemble the final version of the interface and that incorporate limited functionality. In some cases, content has been added to the prototype. A functional prototype might start out as a wireframe interface with links between screens. A visual design is conceived and added to the wireframe, after which graphical elements and content are added piece-by-piece. Then, simple functionality is added, typically by connecting different sections of the interface using hyperlinks. An advanced functional prototype might look like a real interface but lack full functionality. Functional prototypes can be created using PowerPoint or with more specialized software like InVision and UXPin. During evaluation, functional prototypes allow for a learner to experience a mockup online course, mobile app, or educational software interface in a way that is very similar to the experience of using the actual product. However, because functionality is limited, development time can be reduced substantially. Functional prototypes provide a powerful way to generate feedback from learners in later stages of the learning design process, allowing for tweaks and refinements to be incorporated before time and effort are expended on development.

For example, imagine that a learning designer has received approval on a wireframe set for mobile microlearning materials for parents and caregivers of children with epilepsy (Figure 5). The designer imports the wireframes into InVision, a clickable prototyping tool, and sets up “hotspots” on the wireframe images. These hotspots are hyperlinks to other wireframes. By creating hotspots on all wireframes, the learning designer creates a simulation of how learners will interact with the mobile microlearning materials. The designer then sends this functional prototype to subject matter experts, who are attending an academic conference. These subject matter experts review the functional prototype and also share it with other academics in their discipline. By allowing other experts to actually experience how the mobile microlearning materials look and function, a wealth of informal feedback is generated that is then fed back to the learning designer. The learning designer then incorporates the expert feedback into the wireframes and creates a new clickable, functional prototype. This new functional prototype is then usability tested with a representative parent, and the process continues. In this way, content, visual design, and interaction design can all be tested before any actual learning materials are created or development takes place. This allows for continual, rapid, and targeted refinements, thereby increasing the likelihood for a positive learner experience.

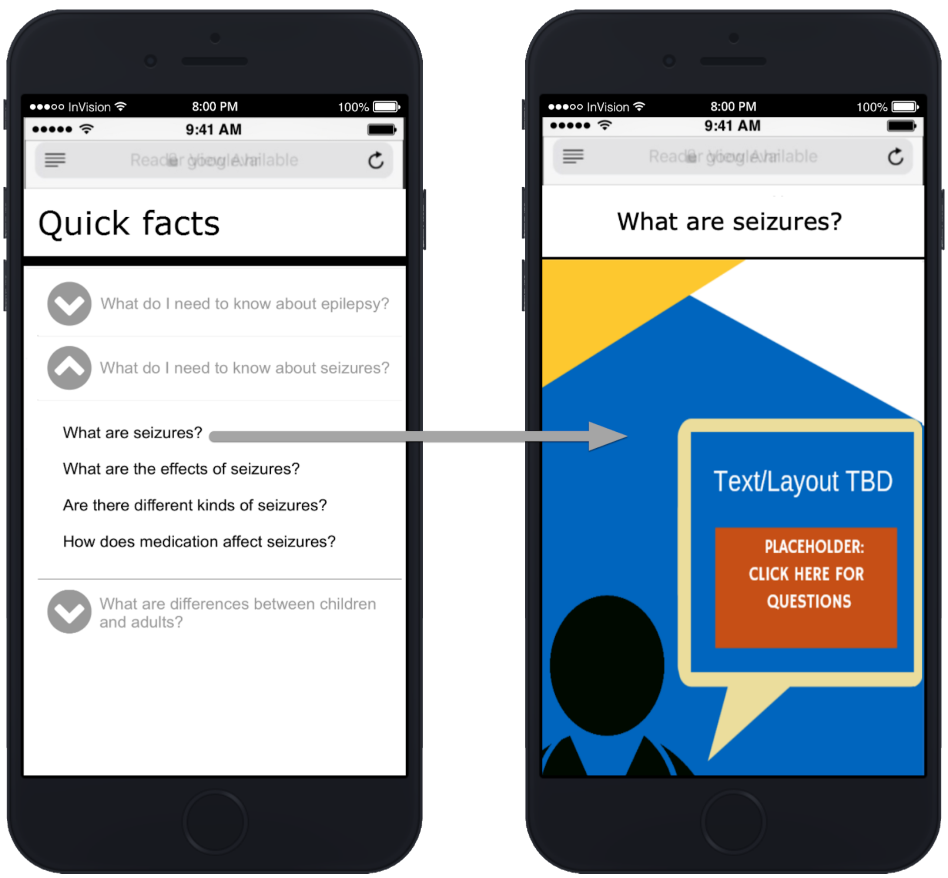

Figure 5

Functional Prototype of a Mobile Microlearning ASK System Developed for Parents of Children With Epilepsy Illustrating Clickable “Hotspots” That Allow Designers to Simulate How a Learning Environment Functions

To reiterate, the goal of UCD is to approach systems development from the perspective of the end-user. Using tools such as personas and prototypes, the learning design process becomes iterative, dynamic, and more responsive to learner needs. Learning designers often use these tools in conjunction with a variety of evaluation methods to better align prototype interface designs with learners' mental models, thereby reducing cognitive load and improving usability. Evaluation methods are discussed in the following section.

4. Evaluation Methodologies for User-Centered Design

While UCD is important for creating usable interfaces, a challenge is knowing when and under what conditions to apply evaluation methodologies. In the following sections, several evaluation methodologies commonly used in UCD are described, with descriptions of how these evaluation methodologies can be used in a learning design context. These can be applied during various phases across the learning design and development process (i.e., front-end analysis, low-fidelity to high-fidelity prototyping). While a case can be made to apply any of the approaches outlined below in a given design phase, some evaluation methodologies are more appropriate to overall learner experience, while others focus more specifically on usability. Table 3 provides an overview of methods, in which design phase they can be best implemented, and associated data sources.

Method	**Design phase**				**Data source**
		Prototyping			
	Front-end analysis	**Paper (low fidelity)**	**Wireframe (medium fidelity)**	**Functional (high fidelity)**	
Ethnography	•				Single user or users
Focus groups	•	•			Group of users
Card sorting	•	•			Single user, multiple users or group of users
Cognitive walkthrough		•	•	•	Expert
Heuristic evaluation		•	•	•	Experts
A/B testing		•	•	•	Multiple users
Think-aloud				•	Multiple users
EEG/ Eyetracking				•	Multiple users
Analytics				•	Multiple users

Table 3

Evaluation Methodologies, Design Phases, and Data Sources

4.1. Ethnography

A method that is used early in the front-end analysis phase, especially for requirements gathering, is ethnography. Ethnography is a qualitative research method in which a researcher studies people in their native setting (not in a lab or controlled setting). During data collection, the researcher observes the group, gathers artifacts, records notes, and performs interviews. In this phase, the researcher is focused on unobtrusive observations to fully understand the phenomenon in situ. For example, in an ethnographic interview, the researcher might ask open-ended questions but would ensure that the questions were not leading. The researcher would note the difference between what the user is doing versus what the user is saying and take care not introduce his or her own bias. Although this method has its roots in the field of cultural anthropology, UCD-focused ethnography can support thinking about design from activity theory and distributed cognition perspectives (Nardi, 1996). This allows the researcher to gather information about the users, their work environment, their culture, and how they interact with the device or website in context (Nardi, 1997). This information is particularly valuable when writing user personas and scenarios. Ethnography is also useful if the researcher cannot conduct user testing on systems or larger equipment due to size or security restrictions.

A specific example of how ethnography can be applied in learning design is in the development of learner personas. Representative learners can be recruited for key informant interviews with the purpose of gathering specific data on what a learner says, thinks, does, and feels, as well as what difficulties or notable accomplishments they describe. The number of participants needed depends on the particular design context but does not need to be large. Indeed, learning designers can glean critical insights from just a few participants, and there is little question that even small numbers of participants is better than none. For example, to develop online learning resources for parents of children with traumatic brain injuries, a learning designer might interview two or three parents and ask them to relay what their typical day looks like, to tell a story about a particular challenge they have encountered with parenting their child, or to describe how they use online resources to find information about traumatic brain injury. The interviews could then be transcribed, and the learning designer could use a variety of analysis techniques to categorize the interview data thematically. For an approachable method of thematic analysis, the reader is referred to Mortinsen (2020). This information from thematic categories could then be generalized into the development of learner personas that are illustrative of themes derived from the key informant interviews.

4.2. Focus Groups

Focus groups are often used during the front-end analysis phase. Rather than the researcher going into the field to study a larger group as in ethnography, a small group of participants (5-10) are recruited based on shared characteristics. Focus group sessions are led by a skilled moderator who has a semi-structured set of questions or plan. For instance, a moderator might ask what challenges a user faces in a work context (i.e., actuals vs. optimals gap), suggestions for how to resolve it, and feedback on present technologies. The participants are then asked to discuss their thoughts on products or concepts. The moderator may also present a lo-fidelity prototype and ask for feedback. The role of the researcher in a focus group is to ensure that no single person dominates the conversation in order to hear everyone's opinions, preferences, and reactions. This helps to determine what users want and keeps the conversation on track. It is preferred to have multiple focus group sessions to ensure various perspectives are heard in case a conversation gets side-tracked. Analyzing data from a focus group can be as simple as providing a short summary with a few illustrative quotes for each session. The length of the sessions (typically 1-2 hours) may include some extraneous information, so it is best to keep the report simple.

For example, a learning designer developing an undergraduate introduction to nuclear engineering course invited a group of nuclear engineers, radiation protection technicians, and nuclear engineering students to participate in a focus group. The learning designer had created a semi-structured set of questions to guide the session. These questions focused on issues the designer had gleaned from discussions with subject matter experts and from document analysis, such as the upcoming challenge facing the industry of an aging workforce on the brink of retirement and with no immediate replacements, the stigma of nuclear power, and the perceived difficulty of pursuing a career in nuclear engineering. These issues were then explored with the focus group participants, with the designer acting as facilitator. Sticky notes were used to document key ideas and posted around the room. Participants were asked to use sticky notes to provide brief responses to facilitator questions. The facilitator then asked the participants to find the sticky notes posted on the walls that best aligned with the responses they had provided and post their sticky notes near those others. These groups of notes were then reviewed by the groups, refined, and then named. The entire process took two hours. These named groups ultimately formed the basis of the content units of the online course, such as using nuclear medicine to diagnose and treat cancer and irradiation of food to increase shelf life.

4.3. Card Sorting

Aligning designs with users' mental models is important for effective UX design. A method used to achieve this is card sorting. Card sorting is used during front-end analysis and paper prototyping. Card sorting is commonly used in psychology to identify how people organize and categorize information (Hudson, 2012). In the early 1980s, card sorting was applied to organizing menuing systems (Tullis, 1985) and information spaces (Nielsen & Sano, 1995).

Card sorting can be conducted physically using tools like index cards and sticky notes or electronically using tools like Miro (https://miro.com/) or Lloyd Rieber's Q Sort (http://lrieber.coe.uga.edu/qsort/index.html). It can involve a single participant or a group of participants. With a single participant, he or she groups content (individual index cards) into categories, allowing the researcher to evaluate the information architecture or navigation structure of a website. For example, a participant might organize "Phone Number" and "Address" cards together. A set of cards placed together by multiple participants suggests to the designer distinct pages that can be created (e.g., "Contact Us"). When focusing on a group, the same method is employed, but the group negotiates how they will group content into categories. How participants arrange cards provides insight into mental models and how they group content.

In an open card sort, a participant will first group content (menu labels on separate notecards) into piles and then name the category. Participants can also place the notecards in an "I don't know" pile if the menu label is not clear or may not belong to a designated pile of cards. In a closed card sort, the categories will be pre-defined by the researcher. It is recommended to start with an open card sort and then follow-up with a closed card sort (Wood & Wood, 2008). As the arrangement of participants are compared, the designer iterates the early prototypes so the menu information and other features align with how the participants organize the information within their mind. For card sorting best practices, refer to the work of Righi et al (2013).

Card sorting is particularly useful for learning designers creating courses in learning management systems. After identifying the various units, content categories, content sections, etc., the learning designer can (a) write these down on cards (or use other methods discussed above); (b) present them to a SME, course instructor, or student; and (c) ask them to arrange the cards into what they perceive to be the most logical sequence or organization. This approach can be particularly educative when comparing how instructors feel a course should be organized with how a learner feels a course should be organized, which can sometimes be quite disparate. Findings can then be used to inform the organization of the online course.

4.4. Cognitive Walkthroughs

Cognitive walkthroughs (CW) can be used during all prototyping phases. CW is a hands-on inspection method in which an evaluator (not a user) evaluates the interface by walking through a series of realistic tasks (Lewis & Wharton, 1997). CW is not a user test based on data from users, but instead is based on the evaluator's judgments.

During a CW, a UX expert evaluates specific tasks and considers the user's mental processes while completing those tasks. For example, an evaluator might be given the following task: Recently you have been experiencing a technical problem with software on your laptop and you have been unable to find a solution to your problem online. Locate the place where you would go to send a request for assistance to the Customer Service Center. The evaluator identifies the correct paths to complete the task but does not make a prediction as to what a user will actually do. In order to assist designers, the evaluator also provides reasons for making errors (Wharton et al., 1994). The feedback received during the course of the CW provides insight into various aspects of the user experience including:

- first impressions of the interface,
- how easy it is for the user to determine the correct course of action,
- whether the organization of the tools or functions matches the ways that users think of their work,
- how well the application flow matches user expectations,
- whether the terminology used in the application is familiar to users, and
- whether all data needed for a task is present on screen.

In learning design, the CW is particularly valuable when working in teams that consist of senior and junior learning designers. Junior learning designers can develop prototype learning designs (e.g., learning modules, screencasts, infographics), which can then be presented to the senior designer to perform a cognitive walkthrough. For example, a junior designer creates a series of five videos and sequences them in the LMS logically so as to provide sufficient information for a learner to correctly answer a set of corresponding informal assessment questions (e.g., a knowledge check). The junior designer then presents this to the senior designer with the following scenario: You don't know the answer to the third question in the knowledge check, so you decide to review what you learned to find the answer. The senior designer then maps out the most efficient path to complete this task but finds that videos cannot be easily scrubbed by moving the playhead rapidly across the timeline. Instead, the playhead resets to the beginning of the video when it is moved. The senior designer explains to the junior designer that learners would have to completely rewatch each video to find the correct answer, and the junior designer then has specific feedback that can be used to improve the learner experience for this learning module.

4.5. Heuristic Evaluation

Heuristic evaluation is an inspection method that does not involve directly working with the user. In a heuristic evaluation, usability experts work independently to review the design of an interface against a predetermined set of usability principles (heuristics) before communicating their findings. Ideally, each usability expert will work through the interface at least twice: once for an overview of the interface and the second time to focus on specific interface elements (Nielsen, 1994). The experts then meet and reconcile their findings. This method can be used during any phase of the prototyping cycle.

Many heuristic lists exist that are commonly used in heuristic testing. The most well-known heuristic checklist was developed over 25 years ago by Jakob Nielsen and Rolf Molich (1990). This list was later simplified and reduced to 10 heuristics which were derived from 249 identified usability problems (Nielsen, 1994). In the field of instructional design, others have embraced and extended Nielsen's 10 heuristics to make them more applicable to the evaluation of eLearning systems (Mehlenbacher et al., 2005; Reeves et al., 2002). Not all heuristics are applicable in all evaluation scenarios, so UX designers tend to pull from existing lists to create customized heuristic lists that are most applicable and appropriate to their local context. Nielsen's 10 heuristics are:

1. Visibility of system status
2. Match between system and the real world
3. User control and freedom
4. Consistency and standards
5. Error prevention
6. Recognition rather than recall
7. Flexibility and efficiency of use
8. Aesthetic and minimalist design
9. Help users recognize, diagnose, and recover from errors
10. Help and documentation

An approach that bears similarities with a heuristic review is the expert review. This approach is similar in that an expert usability evaluator reviews a prototype but differs in that the expert does not use a set of heuristics. The review is less formal and the expert typically refers to personas to become informed about the users. Regardless of whether heuristic or expert review is selected as an evaluation method, data from a single expert evaluator is insufficient for making design inferences. Multiple experts should be involved, and data from all experts should be aggregated. This is because expert review is particularly vulnerable to an expert's implicit biases. Different experts will have different perspectives and biases and therefore will uncover different issues. Involving multiple experts helps ensure that implicit bias is reduced and that problems are not overlooked.

For learning designers developing online courses, established quality metrics such as Quality Matters (QM) can be used for guiding heuristic evaluations (MarylandOnline, Inc, 2018). QM provides evaluation rubrics for certified evaluators to assess the degree to which an online course meets QM standards. The aggregate QM score can then be used as a quality benchmark for that course. However, when applied in the context of a heuristic evaluation, the QM materials should only be used to evaluate prototypes in the interest of making improvements and not for establishing a quality benchmark for a finalized course. A QM-guided heuristic evaluation performed by a skilled evaluator can provide tremendously valuable insights along the dimensions of learner experience outlined above. These can serve as the basis for subsequent design refinements to an online course, which promotes a more positive overall learner experience.

4.6. A/B Testing

A/B testing or split-testing compares two versions of a user interface and, because of this, all three prototyping phases can employ this method. The different interface versions might vary individual screen elements (such as the color or size of a button), typeface used, placement of a text box, or overall general layout. During A/B testing, it is important that the two versions are tested at the same time by the same user. For instance, Version A can be a control and Version B should only have one variable that is different (e.g., navigation structure). A randomized assignment, in which some participants receive Version A first and then Version B (versus receiving Version B and then Version A), should be used.

Learning designers do not frequently have access to large numbers of learners for A/B testing, and therefore need to consider how to adapt this approach to specific design contexts. For example, a design team building a case library for a case-based learning environment is struggling with the design of the cases themselves. One learning designer has created a set of cases that highlight the central theme of the different cases but are fairly text heavy. Another learning designer has taken a different design approach and created a comic-book layout for the cases, which has visual appeal, but the central theme of the cases is not emphasized. The design team asks six students to review the designs. Three students review the more thematically-focused cases and three review the comic-book cases. The students are then asked to create a concept map that shows the central themes of the cases and how those themes are connected. The design team learns that students who used the thematically-focused cases spent much less time reviewing the cases and their concept maps show a very shallow understanding of the topic, although they did appropriately identify thematic areas. The students who used the comic-book cases spent more time reviewing the cases, and their concept maps are richer and show a more nuanced understanding of the topic, despite missing the specific names of the thematic areas (although they describe the areas in their own words). With this information, the team decides to continue iterating prototypes of the comic-book design while better emphasizing the central themes within those cases. On this basis, a potentially more effective learner experience was uncovered.

4.7. Think-Aloud User Study

Unlike A/B testing, a think-aloud user study is only used during the functional prototyping phase. According to Jakob Nielsen (1993), “thinking aloud may be the single most valuable usability engineering method” (p. 195). In a think-aloud user study, a single participant is tested at any given time. The participant narrates what he or she is doing, feeling, and thinking while looking at a prototype (or fully functional system) or completing a task. This method can seem unnatural for participants, so it is important for the researcher to encourage the participant to continue verbalizing throughout a study session. To view an example of a think-aloud user study, please watch Steve Krug’s “Rocket Surgery Made Easy” video.

A great deal of valuable data can come from a think-aloud user study (Krug, 2010). Sometimes participants will mention things they liked or disliked about a user interface. This is important to capture because it may not be discovered in other methods. However, the researcher needs to also be cautious about changing an interface based on a single comment.

Users do not necessarily have to think-aloud while they are using the system. The retrospective think-aloud is an alternative approach that allows a participant to review the recorded testing session and talk to the researcher about what he or she was thinking during the process. This approach can provide additional helpful information, although it may be difficult for some participants to remember what they were thinking after some time. Hence, it is important to conduct retrospective think-aloud user testing as soon after a recorded testing session as possible.

Think-aloud user testing is the most widely used method of usability evaluation in practice, including in the field of LIDT. Indeed, usability testing has long been recognized as a useful evaluation method in the design of interactive learning systems (cf. Reeves & Hedberg, 2003). Increasingly, usability testing is gaining acceptance in LIDT as a viable and valuable evaluation method for informing research related to advanced or novel learning technologies, for which existing research is neither substantial nor sufficient, such as 360-video based virtual reality (Schmidt et al., 2019) or digital badging (Stefaniak & Carey, 2019). 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 (often only five participants are needed to assess the usability of an online course) and with open source or free-to-use tools. For a primer on how to conduct think-aloud user testing, readers are referred to the U.S. government's online resources for usability at https://www.usability.gov.

4.8. Eye-Tracking

Similar to the think-aloud user study, eye-tracking is an evaluation method that involves the user during the functional prototype phase. Eye-tracking is a psychophysiological method used to measure a participant's physical gaze behavior in responses to stimuli. Instead of relying on self-reported information from a user, these types of methods look at direct, objective measurements in the form of gaze behavior. Eye-tracking measures saccades, eye movements from one point to another, and fixations, areas where the participant stops to gaze at something. Saccades and fixations can be used to create heat maps and gaze plots, as shown in Figures 6-8, or for more sophisticated statistical analysis.

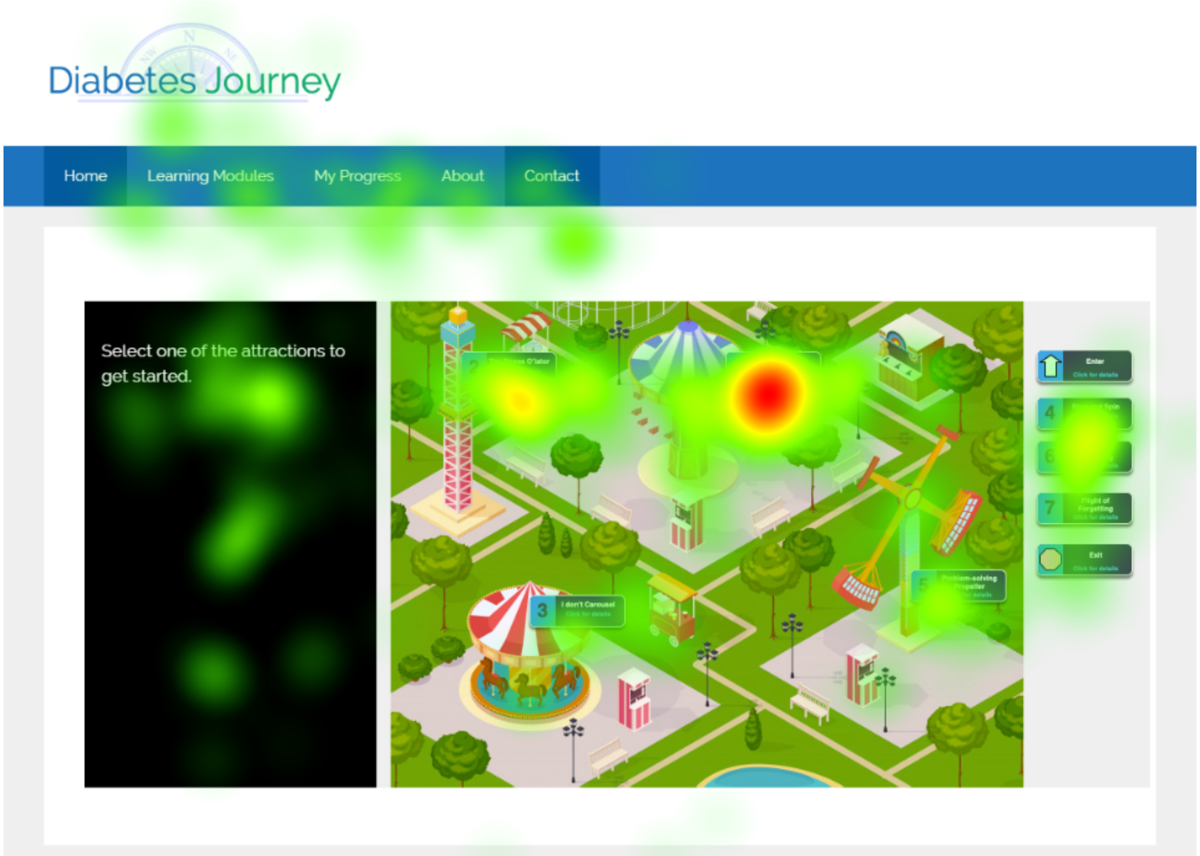

Figure 6

Heat Map of a Functional Prototype's Interface Designed to Help Learners With Type 1 Diabetes Learn to Better Manage Their Insulin Adherence

Note. Eye fixations are shown with red indicating longer dwell time and green indicating shorter dwell time. Photo courtesy of the Advanced Learning Technologies Studio at the University of Florida. Used with permission.

Figure 7

Heat Map of a Three-Dimensional Interface Showing Eye Fixations and Saccades in Real-Time, With Yellow Indicating Longer Dwell Time and Red Indicating Shorter Dwell Time

Note. Adapted from Schmidt et al. (2013). Reprinted with permission.

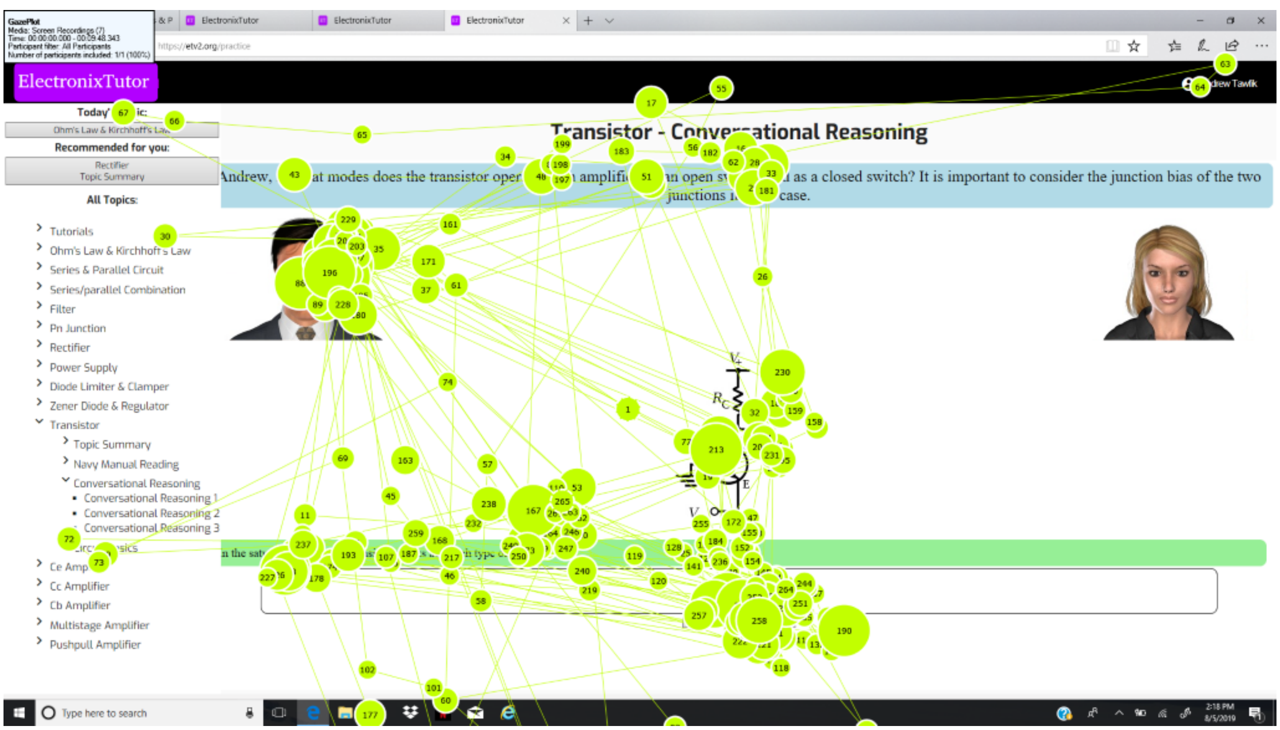

Figure 8

Gaze Plot of a Learner Engaged With the ElectronixTutor Learning Environment

Note. Photo courtesy of the Instructional Design Studio at the University of Memphis. Used with permission.

4.9. Electroencephalogy

Another psychophysiological method used to directly observe participant behavior is electroencephalogy (EEG). EEG measures participant responses to stimuli in the form of electrical activity in the brain. An EEG records changes in the brain's electrical signals in real-time. A participant wears a skull cap (Figure 9) with tiny electrodes attached to it. While viewing a prototype, EEG data such as illustrated in Figure 10 can show when a participant is frustrated or confused with the user interface (Bergstrom et al., 2014).

From the perspective of learning design, eye-tracking and EEG-based user testing are typically reserved for very large training programs (i.e., for large corporations like Apple or Facebook) or for learning designs that are more focused on research than on practical application. It is not very common for small learning design teams to have access to EEG and eye tracking resources. Nonetheless, these approaches can serve as a way to understand when learners find something important, distracting, disturbing, etc., thereby informing learning designers of factors that can impact extraneous cognitive load, arousal, stress, and other factors relevant to learning and cognition. A disadvantage of this type of data, for example, is that it might not be clear why a learner was fixated on a search field, why a learner showed evidence of stress when viewing a flower, or if a fixation on a 3D model of an isotope suggests learner interest or confusion. In these situations, a retrospective think-aloud can be beneficial. After the eye-tracking data have been collected, the learning designer can sit down with a participant and review the eye-tracking data while asking about eye movements and particular focus areas.

Figure 9

A Research Study Participant Wears an EEG While Viewing an Interface

Note. Photo courtesy of the Neuroscience Applications for Learning (NeurAL Lab) at the University of Florida. Used with permission.

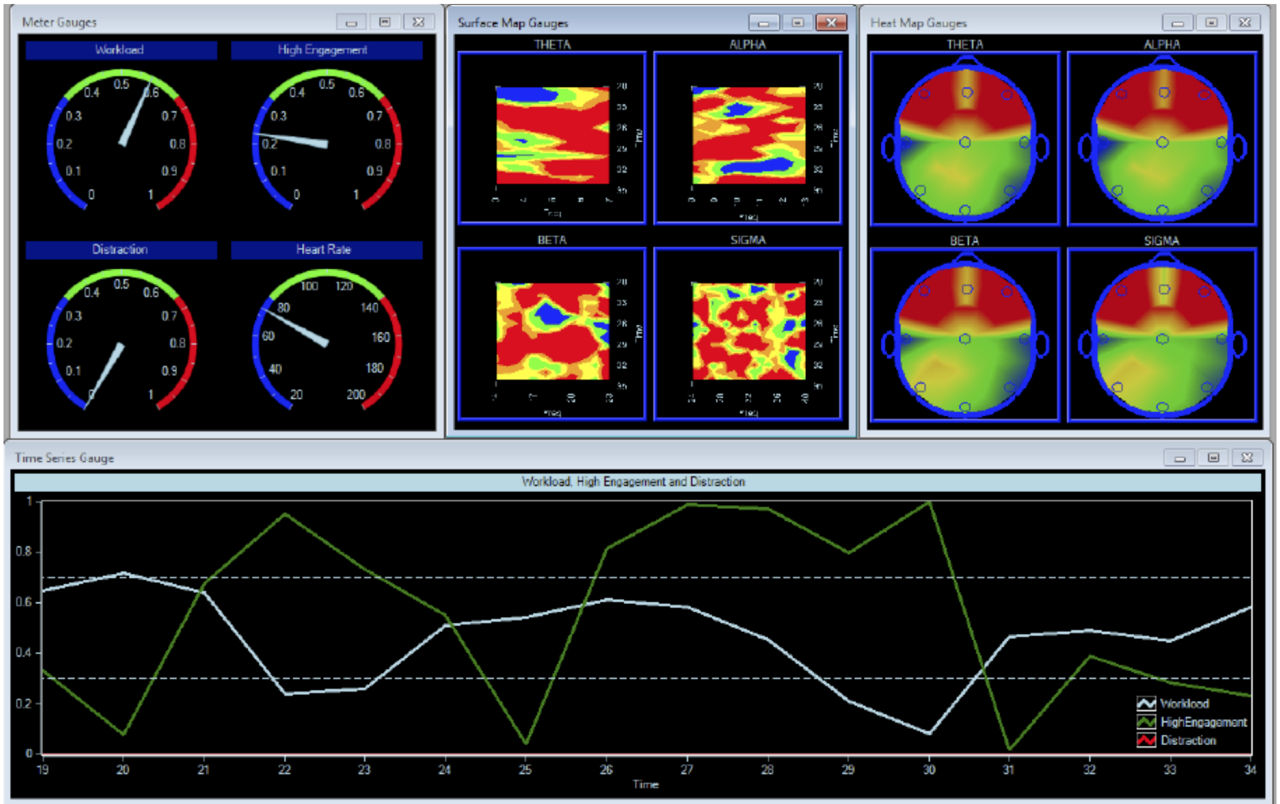

Figure 10

Output From EEG Device in a Data Dashboard Displaying a Variety of Psychophysiological Measures (e.g., Workload, Engagement, Distraction, Heart Rate)

Note. Photo courtesy of the Neuroscience Applications for Learning (NeurAL Lab) at the University of Florida. Used with permission.

4.10. Analytics

A type of evaluation method that is gaining significant traction in the field of learning design due to advances in machine learning and data science is analytics. Analytics are typically collected automatically in the background while a user is interfacing with a system and sometimes without the user even being aware the data are being collected. An example of analytics data is a clickstream analysis in which the participants' clicks are captured while browsing the web or using a software application (see Figure 11). This information can be beneficial because it can show the researcher the path the participant was taking while navigating a system. Typically, these data need to be triangulated with other data sources to paint a broader picture.

Figure 11

An Example of a Clickstream, Showing Users' Paths Through a System

Note. Adapted from Schmidt & Tawfik (2019). Reprinted with permission.

Increasingly, learning analytics and data dashboards are being incorporated into the tools of the learning design trade, including LMSs, video conferencing suites, video hosting providers, and a myriad of others. Indeed, the massive collection of learners' personal usage data has become so ubiquitous that it is taken for granted. However, analytics and data dashboards remain novel tools that learning designers do not necessarily have the training to use for making data-based decisions for improving learning designs. That said, data dashboards are maturing quickly. Less than a decade ago, only the most elite learning designers could incorporate learning analytics and data dashboards into their designs, whereas today these tools are built-in to most tools. Clearly, these tools have enormous potential for the field of LIDT, for example, for creating personalized learning environments, providing individualized feedback, improving motivation, and so-on. With advances in machine learning and artificial intelligence, learning analytics hold great promise; however, privacy concerns, questions of who owns and controls learner data, and other issues remain. Learning designers are encouraged to carefully review the data usage agreements of the software used for developing and deploying digital environments for learning. As mentioned previously in this chapter, LX considers the entire experience of the learner when using a technology, which includes their experiences with the collection of personal data. Carefully safeguarding this data and using it judiciously is paramount for a positive learner experience.

5. Conclusion

As digital tools for learning have gained in popularity, there is a rich body of literature that has focused on designing for learning with and through these tools. Indeed, a variety of principles and theories (e.g., cognitive load theory, distributed cognition, activity theory) provide valuable insight to situate the learning design process. While the design of learning technologies is not new, issues of how learners interact with the technology can sometimes become secondary to pedagogical concerns.

In this chapter, we have illustrated how the field of HCI intersects with the field of instructional design and provided specific examples of how to approach learning design using methods and processes commonly associated with UCD. Moreover, we have provided examples of iterative design processes and commonly used evaluation methodologies that can be employed to advance usable and pleasing learning designs, along with illustrative examples of how these methods and processes can be used in practice. The concepts of HCI, UX, and UCD provide insight into how learning technologies are used by educators and learners. A design approach that connects the principles of UCD with theories and processes of learning design can help ensure that digital environments for learning are constructed in ways that best support learners' achievement of their learning goals.

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Evaluation Basics

Randall S. Davies

What is Evaluation?

A basic dictionary definition of evaluation will often state that to evaluate is to make a judgment. And, unlike other forms of inquiry, a fundamental aspect of evaluation practice requires an evaluator to make value-based judgments. Building on that idea, Michael Scriven (1991) described evaluation as determining the value, merit, and worth of something. Scriven's definition is concise and aligns well with the dictionary definition. In addition, it has been widely accepted within the field of evaluation; however, in 1994, the Joint committee on Standard in Educational Evaluation's (JCSEE) definition of evaluation added the notion that evaluation should be systematic. JCSEE's 1994 definition states that "evaluation is a systematic assessment of the worth and merit of an object" (pg. 3). While this definition excluded the word "value," evaluation's root term, value, implies that the act of evaluating (i.e., determining merit and worth) will always require some value-based criterion by which the judgment will be made (Stufflebeam & Coryn, 2014). In fact, The American Evaluation Association's (AEA) Guiding Principles for Evaluators (AEA, 2018) expressed the need for evaluators to identify and clearly communicate stakeholders' values when conducting an evaluation. Fitzpatrick et al. (2011) point out that evaluators differ in the value they assign the things they are evaluating because their criteria differ. Therefore, it is incumbent that evaluators clearly articulate the criteria by which they will base their evaluation findings. The expectation is that formal evaluations will be based on defensible criteria or clearly defined standards.

> **To evaluate requires us to make judgments.**
>
> **Evaluation is the process of determining the merit, worth, and value of things.**

Values and Valuing.

Part of the reason some choose to leave out the term "value" from the definition of evaluation has to do with the verbal association this term has with the concept of valuing and the distinction that needs to be made between something having value and one's personal values. Aside from the verbal association issue, understanding the relationship between value and values is essential. Something will have value for a specific reason given a specific context. The value (merit or worth) assigned by individuals to an object will differ depending on their values (morals, preferences, interests, goals, ethics).

Understanding this point is vital for evaluators because things rarely have intrinsic value. We all agree that life-sustaining objects like air, food, and water have intrinsic value. Having basic needs met are also considered necessary. Things like being loved, feeling that you belong, and being safe are widely valued as they are considered essential for our well-being and development (Maslow, 1970). Beyond that, things have value because they are useful or desirable to someone for some reason. In most cases, the act of valuing is personal. We decide that something has merit or worth because our morals, preferences, interests, goals, or ethics lead us to arrive at that conclusion.

Personal values influence the value (merit and worth) we place on things.

Criteria and Standards.

We can assess the value of things (i.e., evaluate) using personal criteria or some agreed-upon standard. When using personal criteria, our value assessment can be entirely subjective and potentially unreliable (inconsistent). Individuals don't always carefully consider the criteria by which they assess value. In addition, the context of the situation will influence our assessments of value. Failure to identify and use appropriate criteria may render our evaluation results invalid (i.e., inaccurate in terms of the object's actual value). In many cases, the consequence of making a poor evaluation is minor. However, some evaluations we make have higher stakes; in these situations, the consequences of obtaining inaccurate evaluation findings can be costly.

We set standards (agreed-upon criteria) to reduce the subjectivity of our value assessments. If no standards exist, we need to clearly articulate the criteria or define the standard by which we will judge the evaluand's value, merit, and worth (i.e., the thing we are evaluating). Even when conducting informal personal evaluations, we would do well to identify and articulate the values by which we will make judgments.

Various types of criteria exist. An object might have value because of what we can accomplish with it (a utility or functionality criteria). Often things are valued for religious or ethical reasons (a moral or ethical criteria). Objects can have value for sentimental reasons or simply because they are attractive or interesting (a personal satisfaction or aesthetics criteria).

Formal evaluation should include defensible criteria.

Everybody Evaluates

People conduct evaluations every day. Most of these evaluations are informal. Some are important, and some are trivial. We consider the value, merit, or worth of various things every day; most often, we do this to help us make decisions. We might need to decide whether to have breakfast, so we consider the value of doing so. We might want to purchase an item, so we consider the item's worth in relation to the benefit we can derive from owning it. We might also consider the need to shower before going out and the merits of doing so compared to the consequences of not taking the time for personal hygiene. Our evaluations are always contextual, value-based, and influenced by personal preferences, interests, and goals.

The evaluations we will be discussing in this course are formal evaluations. Formal evaluations should be systematic, comprehensive, accurate, and ethical. Quality evaluations are based on defensible criteria and credible data collection methods; in addition, the data interpretations and the recommendations made must be deemed credible by some standard.

Evaluation and Research

When attempting to define evaluation, a distinction must inevitably be made between evaluation and research. Both are forms of inquiry and use similar methods. There are, however, a few key differences.

Purpose – one difference between research and evaluation is the reason for conduction the inquiry. The researcher's goal is to add to a field's body of knowledge, and the evaluator's goal is to provide information and recommendations to the client extensively to decide something.

Context – evaluation is conducted in a specific context, and the results may or may not be valid in other contexts. Research is meant to produce generalizable knowledge.

Investigator's Role – evaluators often work for a client as a consultant or service provider. As such, the client determines the questions and focus of the evaluation with advice from the evaluator. Researchers decide what they will study and what questions they will attempt to answer.

Quality Standards – research is considered valid if appropriate methods were used, the research controls for confounding variables, and the findings support the conclusions. Evaluations are regarded as credible when the evaluator is responsive to the needs of stakeholders, uses appropriate methods and procedures, and provides recommendations that are justified by the evidence, ethical, practical, and realistic.

Training – Researchers need to be experts in their specific field; they need to be trained in the methods used within their field. Evaluator training is broader. The evaluator (or the evaluation team) needs to work collaboratively with clients (i.e., develop soft skills); they must facilitate and manage evaluation projects efficiently and competently. They must be familiar with a variety of data collection and analysis methods. Evaluators may be experts in the field, but more importantly, they must develop evaluative thinking skills and effectively (persuasively) present information in various ways.

Overlap between research and evaluation is common. Evaluators will use research findings to inform their evaluation efforts; and, evaluation research is conducted to provide generalizable information and recommendations. The main difference between research findings and evaluation findings is the value-based judgments made by evaluators. Researchers attempt to be objective and present factual information, whereas evaluators need to provide an opinion (i.e, make a judgment) about the factual information they obtain.

For example, a research study may determine that the average achievement of sixth-grade students at one school was statistically different from the average performance of similar students elsewhere. They might also calculate the effect size (i.e., practical significance). In research, obtaining a statistically significant result means the observed difference was not likely due to chance. In contrast, the practical significance of an observed difference estimates the mathematical magnitude of that difference. While these findings represent factual information, they are not evaluations. These results would be categorized as descriptive. There is no judgment made nor opinion given about the acceptability of the individual student's performance. An evaluation would require a judgment be made about the results based on some criteria. Did the students do admirable or abysmally? Based on this information, what recommendations are appropriate? Sometimes research provides these kinds of evaluative opinions, but usually not. Evaluation will always provide a value-based judgment of some kind.

Chapter

- Evaluation is the process of determining the merit, worth, and value of things.
- Objects have value because it is useful or desirable to someone for some purpose or reason.
- People differ in the value, merit, and worth they assign to things because their values and the criteria they deem important differ.
- Evaluations are improved when we identify and articulate our personal values as well as the criteria and standards we will use.
- People conduct informal, personal evaluations all the time.
- To maximize their usefulness, formal evaluations should be systematic, comprehensive, accurate, and ethical. They should be based on defensible criteria and data collection methods.

Discussion Questions

1. Explain the benefits of establishing clear defensible criteria to guide an evaluation. What are the likely consequences of not doing so? Provide an example.
2. Consider something you value. Articulate the criteria you used to make this determination. What criteria or standard was most significant in your determination (utility, safety, cost, moral, ethical, personal satisfaction or preference, other)? What criteria, if any, did you neglect to consider?

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An Examination of the People and Processes Involved in Quality Assurance

Colin Taper & Ginu Easow

What is Quality Assurance?

Quality Assurance (QA) in higher education is a concept owing its beginnings to quality assurance in the industrial sector. A rapidly changing higher education scenario in response to the ever-expanding need of skilled individuals across various disciplines and the call for a return on their investment from parents and students are some of the underlying causes for higher education to pursue QA (Wilger, A. 1997).

There are many definitions of quality assurance in higher education. In a literature review for the National Center for Postsecondary Improvement (NCPI), Wilger (1997) identifies the *most complete* definition, as follows:

> *"Quality Assurance is a collective process by which the University as an academic institution ensures that the quality of educational process is maintained to the standards it has set itself. Through its quality assurance arrangements the University is able to satisfy itself, its students and interested external persona or bodies that:*

- *Its courses meet the appropriate academic and professional standards,*
- *The objectives of its courses are appropriate*
- *The means chosen and the resources available for delivering those objectives are appropriate and adequate, and*
- *It is striving continually to improve the quality of its courses"*

(Wilger, 1997; pg 2-3)

What Does Literature Say About Quality Assurance?

There is a plethora of research (Ryan, 2015; Wilger, 1997) that examines available literature in relation to quality assurance in higher education. Some of the major themes that have emerged across the various publications were considerations for building a QA program and the impact of QA program on all primary stakeholders, which include students, faculty, senior leadership. The reviewed literature (Ryan, 2015; Wilger, 1997) also identified the need to focus on the primary emphasis of a QA process, the process itself, how it operates, and how the information produced is used and reported. When discussing impacts of a QA program, a majority of the literature highlights the perception of the QA program among the key entities, the acceptance based on the institutional culture as well as skepticism in choosing one QA model over another due to a lack of universally agreed upon QA framework between local, regional, national and international higher ed institutions (Ryan, 2015).

There are myriad quality assurance agencies within the higher education environment. In the United States, regional accreditation is conducted by seven accrediting bodies in six regions. The accrediting bodies are:

- Western Association of Schools and Colleges (WASC) Accreditation Commission for Senior Colleges and Universities
- Southern Association of Colleges and Schools Commission on Colleges (SACSCOC)
- Middle States Commission on Higher Education (MSCHE)
- New England Association of Schools and Colleges(NEASC)
- the Higher Learning Commission (HLC) and the
- Northwest Commission on Colleges and Universities (NWCCU)

In addition, professions that require licensure and certifications mandate their own set of guidelines that the specific programs have to meet. Review of the literature indicated a variety of QA models that can be adapted to suit a specific need. One of the most prominent ones in recent times has been the Quality Matters program (https://www.qualitymatters.org/) that has a systematic QA process laid out with tools, rubrics as well as professional development with a focus on continuous improvement of design of online programs. However, it does not account for the quality of faculty interaction and delivery in the online programs. These differences inherent in the emphasis of a single QA model combined with other themes discussed before showcase why the higher education community does not have a universally agreed upon QA framework.

Developing a QA framework that can be universally used requires much collaboration across the various local, regional, national and international agencies. What follows provides instructional designers starting the QA process with some practical considerations based on research (Ryan, 2015; Wilger, 1997) and practical experience irrespective of the model or QA agency utilized. The focus is on practical considerations from the "people" and the "process" perspective – the two critical components that play a significant role in the efficient and effective implementation of QA. Understanding these perspectives allows an instructional designer to map QA processes accordingly.

The People

In the following sections we describe three primary stakeholders of a university's online learning QA effort: students, faculty, and upper administration. All three should be accounted for if such an effort is to be successful. The rationale is that all three are connected by common themes: quality course design, facilitation, and revision. Our aim is to provide QA-useful insight into each stakeholder.

Students

Unlike faculty, an instruction designer (ID) will seldom interact directly with students; rather, interaction occurs via the instructor and the student feedback received. Based on our higher ed experience, a challenge that an ID faces is assisting faculty in determining the appropriate/relevant method of collecting student feedback to use, the frequency of its use, and an approach to using that feedback to inform course adjustments.

Student Role in QA

We have yet to encounter a faculty member who denies the role of student feedback in determining course quality. What is noteworthy, however, is that some faculty are not comfortable receiving feedback from students. As one faculty stated:

> *It's never a nice email to get when something's goofed up or it's just explained poorly and needs to be improved. So, some people I think are more open to that than others. If you're defensive, then you're going to say, 'Well, that student just doesn't know what they're doing. They should be more cognizant of what they're doing in the class or more tuned in' versus really stepping back [and stating] "Wait, I didn't actually communicate what I thought I was communicating or that didn't look as good and intuitive as I thought it should have"*

It is important, therefore, for an ID to recognize that some faculty may be hesitant to collect feedback from students. Additionally, faculty may only feel comfortable, at least initially, receiving student feedback in the form of end-of-course evaluations.

Means of Collecting Student Feedback

Most institutions use an end-of-course student evaluation tool; our institution uses the IDEA Student Rating System. In this section, the focus will predominately be on instructor-driven student feedback tools and recognizing the importance of providing instructors with options for feedback collection. Faculty who have taught exclusively in a face-to-face format may be used to gathering student feedback in an informal or ad hoc manner, such as after or before class conversations, which can provide the instructor with insight into the student's experience. Such conversations are less likely to occur in an online course and consequently, an instructor will need to be more deliberate in collecting student feedback.

One way to view instructor-driven tools is through the lens of two categories: continuous and time-specific. An example of a continuous tool is a weekly reflective student journal. An example of a time-specific tool is a mid-course survey. Collection tools can additionally be broken down by question type: students' opinion regarding the course (e.g., What aspects of the course would you change?), students' opinion regarding a specific aspect of the course (e.g., What did you find challenging about group assignment *X*?), and a students' reflective analysis of their own academic performance (e.g., Was the Chapter 5 quiz challenging for you? Why was that the case?). It can be helpful to make faculty aware of their options regarding collecting student feedback.

Incorporating Feedback

Once faculty have gathered student feedback, they may need assistance classifying the feedback to answer questions such as: Does it address aspects of course design, course facilitation, or neither? For instance, a student may state that the course assessments were quite difficult. An ID may be better positioned than the faculty member to review the course learning activities to determine if students were provided enough opportunities to practice the skills that the assessments required of them.

Additionally, faculty may need assistance with an approach for incorporating student feedback. One approach appropriate for weekly or midpoint feedback is to disclose to students the feedback that they submitted. Faculty can place feedback into two categories (i.e., possible change and not possible change) and define what steps, if any, will be taken to address these changes. Our experiences have shown us that such an approach validates that students' voices are being heard and that the faculty is addressing students' needs.

For changes or adjustments to future iterations of a course (e.g., student feedback on an assignment), it may be helpful to provide faculty with a strategy to incorporate those changes. This may involve creating a system for cataloguing student suggestions and creating a plan that allows for enough time to make alterations. A plan such as addressing one module or unit a day in the semester prior to the one in which the course will run may provide structure not previously considered.

Faculty

At institutions where a significant percentage of online courses are facilitated by the faculty who design them, faculty are gatekeepers of course quality. In implementing a QA effort, IDs need to consider general faculty awareness of what constitutes a quality online course and effective and ineffective approaches to achieving faculty buy-in with a QA effort.

Faculty Awareness

Based on our experience, faculty do not need to be convinced of the significant role they play in online course QA. There is a perceived sense of agency. An ID does need to consider faculty's familiarity with an external validation process. Some programs or schools regularly go through an accreditation process that examines its academic efficacy. For example, because of licensure exams, certification exams, and the need to meet both accreditation and state standards, faculty in some schools are quite familiar with external guidelines. Other faculty may not have any experience with such efforts. Lack of familiarity implies a need to convince such faculty of the validity of the QA effort. Convincing could take the form of testimonials from faculty peers who have successfully implemented QA-informed practices into the design, delivery, or revision of a course. If such faculty cannot be identified, an ID could reach to other institutions where such faculty may be found.

Another consideration is whether faculty are aware of what constitutes online course quality. The answer to this varies from institution to institution. QA is impacted by factors such as the following:

- the number of staff and faculty who formally support the pedagogical side of online learning,
- prioritization of online learning by the institution's upper administration
- a number of years the university has offered online programs.

At our institution quality online courses are those that are formally developed with an ID and reviewed using a rubric similar to the Quality Matters (QM) Higher Education Rubric for Online & Blended courses or are courses comprise a program seeking QM certification. For example, at one university, current program-level QA efforts require faculty to participate in either the Quality Matters (QM) "Applying the QM Rubric" workshop or an internally developed three-week workshop. Both focus on foundational concepts of course design, the latter also focuses on foundational concepts regarding course facilitation.

With respect to effective and ineffective approaches to achieving faculty buy-in with a QA effort, it is a fair assumption that QA efforts increase a faculty's workload. Some suggestions as to how to effectively achieve faculty buy-in for a QA effort follow:

1. *Define a faculty champion*. Some faculty members have expressed to us that strictly top-down efforts are seen as ineffective. Therefore, having a fellow faculty member speak to peers about a QA effort could be a more effective strategy. As Rogers (2003) suggests, a champion's people skills, as opposed to his or her position in an organizational chart, will be the asset most valuable to achieving buy-in (p. 383). Another consideration is that the champion may need to be positioned to engage with administrators about resources the faculty need, such as course release or stipends, to successfully engage with the QA effort.
2. *Involve faculty from the beginning*. It may be the case that the QA effort is a top-down mandate. Nevertheless, faculty should be involved in the specifics of the QA effort from the outset. A good suggestion is to have the faculty champion lead these conversations. The faculty champion is better positioned to listen to faculty grievances and to effectively applaud the efforts that the faculty are making.
3. *Establish connections for faculty*. Perhaps a faculty member is seeking tenure. It may be helpful to see how the work being done to improve the quality of online course design could be included in a retention, tenure, and promotion packet. Perhaps a faculty member is quite invested in the effectiveness of their teaching. Experience indicates faculty are much more familiar with the phrase *teaching effectiveness* than they are with the term quality assurance. Our interactions have revealed that faculty perception about the latter term is the implication that something is currently wrong with the course, a message that faculty may not take well.

Another type of connection deals with the jargon an ID may use. It is important that faculty are able to grasp the concepts related to the QA effort. Terms such as *alignment*, *objectives*, *formative assessment*, and *accessibility* may be foreign to faculty, thus there is a need to explain such concepts in a manner that allows faculty to reinvention of their pedagogical practices will not be necessary.

Upper Administration

Very few upper administrators would sincerely state that they do not support an institutional QA effort. Yet, there is potentially a significant gap between a chancellor, president, or provost stating "I am for this QA effort" and the allocation of resources to make the effort possible. As one administrator put it to us:

> *If in any case where the leaders do not fully invest or do not provide full support, it would be difficult to achieve the QA process solely from bottom-up process, as it would be much more difficult to overcome the administrative or functional divisions to get adequate data and resources, and would usually discourage the efforts to end up as status-quo, within a silo.*

It is crucial, therefore, that QA efforts have the support, both in word and in resources, from an institution's upper administration. However, the reality is that all institutions will not be able to allocate resources towards the effort. This is especially true during trying economic times. Additionally, an ID may not even have access to the institution's upper administration. If either or both is the case, an ID could consider leveraging any available resources from peer institutions or reduce the scope of the effort. The template (see Appendix) provided will allow those who do not currently have access to resources and/or senior leadership to make a strong case for resources once they become available.

Getting a Seat at the Table

It is probable that many IDs are not able to directly address their institution's upper administration. At some universities there is an associate vice chancellor who advances QA efforts, but this may not be the case for all. If the structure of an institution is such that there is not a direct report position who can advance the cause to upper administration (i.e., a champion), one needs to be identified.

Speaking the same language

What makes for a quality online course or program? If there have been previous QA efforts regarding online courses or programs, it may not be necessary to have a champion engage the president or provost in an education campaign about what quality means when applied to online courses. The QA champion would need to associate the effort with a topic viewed as important to upper administrators. For example, student enrollment and retention are key considerations for an institution's administration. What motivates a student to enroll and persist in a face-to-face program can be quite different from what motivates them to enroll in an online program. While the institution's overall reputation may consistently be a factor, variables such as location, amenities, or a successful athletic team are less likely to attract and retain online students.

Sustainable, Data-driven Efforts

Two important considerations of a QA pitch to upper administration are whether it is data-driven and whether sustainability has been considered. One person who has knowledge of this subject informed us:

> *I have seen enough cases where misunderstanding and therefore misuse of the QA process from the upper administration end up wasted resources and efforts, and especially closing the door for true opportunity because of the lack of trust in the validity of the process.*

This insight lends credence to the template (See Appendix) provided, a template that is informed by institutional data and promotes the sustainability of the QA effort.

By focusing on practical considerations of a QA effort from the "people" and the "process" perspective, we believe an ID will be well-positioned to successfully map and implement a QA effort.

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Appendix

Roadmap to Plan the Quality Assurance Journey at Your Institution

Understanding the contributions of people to the QA process will lay the foundation to leverage interpersonal skills in relevant processes to create a QA roadmap at your institution. As a first step, to help you get started with creating your roadmap to plan your QA journey, we have attempted to provide you with a template broken down into a series of six steps and key questions to consider. As an instructional designer, you will be able to see glimpses of the ADDIE process in the various steps identified below. We would also like to clarify that this template is an adaptation of a plethora of templates that you might find on the world wide web.

<table>
<tr><td colspan="2">Step 1: Needs Assessment for your Institution
(Suggested timeline: 8-10 months prior to implementation date)</td></tr>
<tr><td colspan="2">Description: The first step is identifying the need for QA in your institution. This step is identical to the Analysis phase in the ADDIE process. While this could be a daunting task, the recommendation would be to start small by attempting to get answers to the following questions:</td></tr>
<tr><td>Questions to Consider:</td><td>Notes</td></tr>
<tr><td>1. Why is QA a need at my institution?
• is it for a program or a process?
• is it at the local, regional, and or national level?
2. Why was the request made?
3. Who made the request?
4. Who are the key project sponsors?
5. Who can make decisions that will help you implement the QA process?
6. What knowledge and skills levels will be needed to plan, develop and implement the quality assurance (Remember it is not and cannot be a one-person endeavor)
7. Are there any licensure and certifications that might be required for the QA team (that you will need to put together)?</td><td></td></tr>
<tr><td colspan="2">Once you get answers to the above questions, your objective should be to get all the identified stakeholders at the table for a meeting. The purpose of this meeting will be to discuss the following:
(Suggested Timeline: At least 6 months before you would like to start the implementation)</td></tr>
<tr><td>Questions to Consider:</td><td>Notes</td></tr>
<tr><td>1. Set the goals for the QA journey for the identified program or process (number of goals and description of the goals)
2. Do these goals need to have subtasks or component parts?
3. Identify the external (local, regional, national, or global) QA recognition that the program or process your institution would like to pursue (if applicable).
4. Identify a liaison from the program/department(s) that can be your implementation partner.</td><td></td></tr>
</table>

Step 2: Planning the QA Implementation (Setting Goals & Building Teams) **(Suggested Timeline: at least three-six months of time prior to implementation)**	
Description: This second step is geared towards laying the foundation for your roadmap. During this step, research the basics of the Quality Assurance process that you need to establish and implement. This would mean that you will need to take into account the following considerations:	
Considerations:	**Notes**
Set up recurring meetings with the identified program/department liaison to research and respond to the following questions:	
What: 1. What are the specific goals and outcomes that need to be achieved? 2. What data points will be needed to show as evidence to support the achievement of the identified goals? 3. What will the reporting structure look like or what will be the chain of command for any decisions to be made? 4. What are the benchmarks to evaluate the success of the quality assurance program?	
Who: 5. Who are the key stakeholders who will need to do the work to execute and implement the plan? (For ex: Program coordinators, Institutional Research and planning, Student Success Center; Instructional Design peers from your own department etc.) 6. Who can be your champion (leadership within your department, faculty and stakeholders)?	
When: 7. Develop a backwards timeline which means who you need to start by: 8. Identifying the target date of achieving the goal and work backwards 9. Identify a timeline for the specific program or process to achieve those goals and its sub parts. 10. Are there some goals that need to be achieved first because others can build on them? 11. Are there resource constraints that will impact the timeline? If yes, what adjustments will need to be made to the timeline? 12. Are there any dependencies from other departments that will impact the timeline?	
How: 13. How will you keep this effort organized? 14. Do you need to identify a collaborative software? 15. Where will you store the files and documents developed/shared for this effort? 16. How will you communicate with all the stakeholders and partners and how often will you do it? (Recommend to do it on a weekly or bi-weekly basis at least for an hour) 17. How will the progress/setbacks be communicated to the project sponsors and leadership?	

Step 3: Building the Plan and the Cadence **(Suggested Timeline: at least two-three weeks prior to implementation)**	
Description: At this point, you have set the goals and have the teams (resources) identified to help you with the implementation. Now it's time to build the plan using the following considerations:	
Questions to Consider:	**Notes**
1. Create a Quality Assurance Implementation Plan (QuIP) document based on the information gathered in Step 1 and Step 2 ***[Note*:** Most QA entities do provide templates specific to their Quality Assurance program. We recommend using the specific program template or use any project plan template to document your implementation plan.**]** 2. Identify specific institution entities who will need to provide approval to the plan 3. Identify if they need to document their approval by signing the implementation plan. If yes, create a specific section in your plan to document all approvals 4. Identify a timeline to gather these approvals	

Step 5: Celebrate the Launch Success
Description: Congratulations! You have started the QA journey at your institution. Celebrate the launch and remember, this is just the start. As with any project, you have to continue to monitor and track the project to ensure a successful implementation.

Step 6: Monitoring QA Implementation to Identify Enhancements
Description: As with any project, monitoring the project is key to make sure that all the identified components are working together to achieve the targeted goals. So, make sure to use the proposed meeting cadence to **communicate, communicate and COMMUNICATE!**

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Evaluation for Instructional Designers

Randall S. Davies

> *"Everything we evaluate is designed. Every evaluation we conduct is designed. Every report, graph, or figure we present is designed. In our profession, design and evaluation are woven together to support the same purpose—making the world a better place."*

President John Gargani
American Evaluation Association
Announcing the Annual Conference theme for 2016

Evaluation is a transdisciplinary field. While teachers and nurses will receive specific training and certifications to work in schools and hospitals, trained evaluators work in a variety of workplaces and businesses. Evaluation is like statistics in this sense. People benefit from using statistics in a variety of different occupations. In fact, people effectively use statistics in their jobs all the time, even when they have limited training and a rudimentary understanding of the statistics they use. As a transdisciplinary art, evaluation is practiced in a variety of contexts. It could be argued that nowhere is evaluation more prevalent than in the field of instructional design. And while designers often conduct evaluations without receiving extensive evaluation training, training and practice will improve their ability to evaluate well; and as a result, it will improve their design and development efforts.

What is an Instructional Product?

As evidenced by the instructional design models developed in the late 1900s (e.g., ADDIE, Dick & Carey), the focus of instructional design was just that, the development of instruction or training. The instructional product was instruction. The modality of the instruction was typically limited to in-person classroom instruction (both academic and corporate). The process included the development of instructional objectives, tests to measure the learning outcomes, and resources (primarily textbooks, learning activities, and videos) the designer believed would achieve the specific instructional goals of that course. The designer would structure the course using a pedagogy they felt would facilitate the intended learning. This method of creating instruction still happens; however, as technology advanced and the internet became more widely available, the notion of what constitutes an educational product has expanded. In addition to instruction, instructional products include educational technologies, learning apps, and educational services in the form of collaborative learning tools, resource repositories, how-to guides, self-improvement and skill development apps, educational games, discussion boards, communication tools, and crowdsourcing apps. The primary modality for delivering instruction has also changed. In addition to classroom instruction, instructors provide training using e-Learning and online instruction, both synchronous and asynchronous, in blended and informal learning environments. In addition, some instructional products have educational purposes related to the facilitation and support of learning in general; these products are not tied to a specific course, and learners use these resources for numerous purposes and in a variety of ways.

It might be helpful to differentiate instructional products (those directly used for training and classroom instruction) from the more generic term of educational products (any product used in an educational setting), but they all have a similar end goal, to facilitate and support learning.

You will also be aware that many users of instructional products would not classify themselves as students. The intended users for a product may include teachers, administrators, and students attending school in a traditional classroom setting. However, more recently, designers have been creating instructional products for non-traditional learners seeking educational opportunities outside of the classroom and any formal educational context. Many eLearning tools are created as supplementary learning resources and knowledge creation services for corporate training or personal enrichment. Several of the more contemporary instructional design approaches (e.g., rapid prototyping and design-based research) have adapted earlier instructional design models to accommodate this expanded view of what an instructional product might be. They still all utilize similar product development stages as all instructional products need to be designed, developed, tested, and maintained, which inevitably requires evaluation.

An instructional product might include any educational resource that facilitates or supports learning regardless of the setting or context.

Instructional Design Models

Many instructional design models have been proposed, but all tend to be an adaptation of the ADDIE model. ADDIE stands for **A**nalyze, **D**esign, **D**evelop, **I**mplement, and **E**valuate.

Figure 1: Original phases of the ADDIE Instructional Design Model.

From the acronym for this model, you may erroneously assume that evaluation only occurs after the designer has implemented the product. This was never the intent, and in practice, evaluations of various types are conducted throughout the project, as depicted in Figure 2.

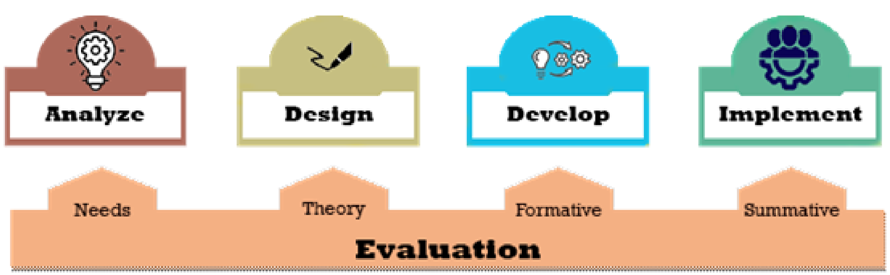

Figure 2: Evaluation Integration within the original ADDIE Instructional Design Model.

Scholars have created many innovative adaptations of the ADDIE model, including the Navy's own modifications to their original training development framework. The PADDIEM version of ADDIE includes a planning phase to augment the analysis phase and a maintenance phase which expands the original purpose of the implementation phase. And while this and other design models each make subtle improvements to ADDIE, they all incorporate an analysis (concept planning), a design (theoretical planning), a development (creation), and an implementation (distribution and testing) phase. A few are presented here as examples of where evaluation occurs in the process.

The Dick and Carey ISD model and ADDIE

Dick and Carey's ISD model was one of the early efforts to formalize the instructional design process. This model focused on lesson planning for classrooms and formal training situations. It was intended to help a designer figure out what to teach and how to teach it. It relies heavily on what has recently become known as "backward design." It starts by creating learning objectives and developing assessment instruments (tests) to measure whether students achieved the expected learning outcomes. The findings from the formative evaluation step informed revisions in the instruction. The summative evaluation took the form of an objectives-oriented evaluation, which focused primarily on whether students' test scores were deemed adequate. Achieving adequate test scores was seen as an indicator that the instruction was good and often was the only criteria used to judge the quality of the instructional product.

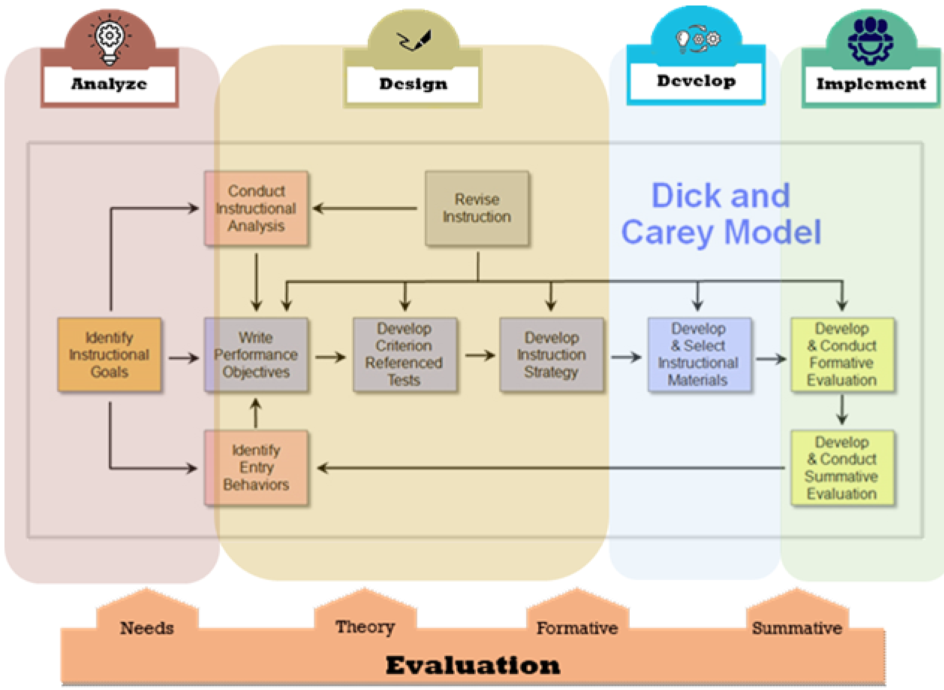

Figure 3: Evaluation Integration within Dick and Carey's Instructional Design Model.

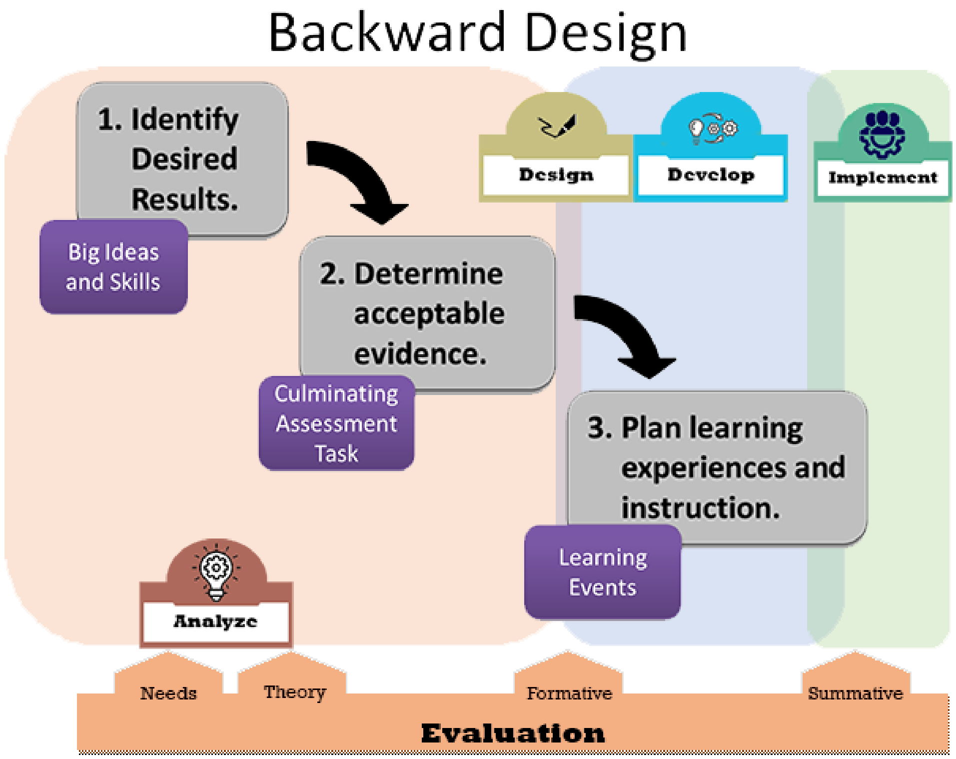

Figure 3a: Evaluation Integration within Backward Design Approach to Design.

Rapid Prototyping and ADDIE

Rapid prototyping was first used in the manufacturing industry. Instructional designers and others adopted rapid prototyping as a quick and cost-effective way to build and test a working version of their product. The innovation that rapid prototyping offers the design process is a quick iterative design and development cycle. The principle supporting this is similar to that used in action research, a trial and error method. The evaluation aspect of this model includes a quick formative review process that informs needed improvements and is repeated until the product meets specifications. Rapid prototyping activities are:

1. Define instructional goals and requirements,
2. Formulate a feasible solution.
3. Start building the product
4. Test it on users and others (evaluate)
5. Refine your design
6. Repeat the process until the product works as required

While this approach is practical, it still follows the same phases of the ADDIE model – just more quickly. In this model, the needs assessment is often limited, and a summative assessment may not occur. This model focuses heavily on the design and development phases. What this model tends to lack is a systematic evaluation of the theory and principles that support the design, which is not uncommon in other models as well.

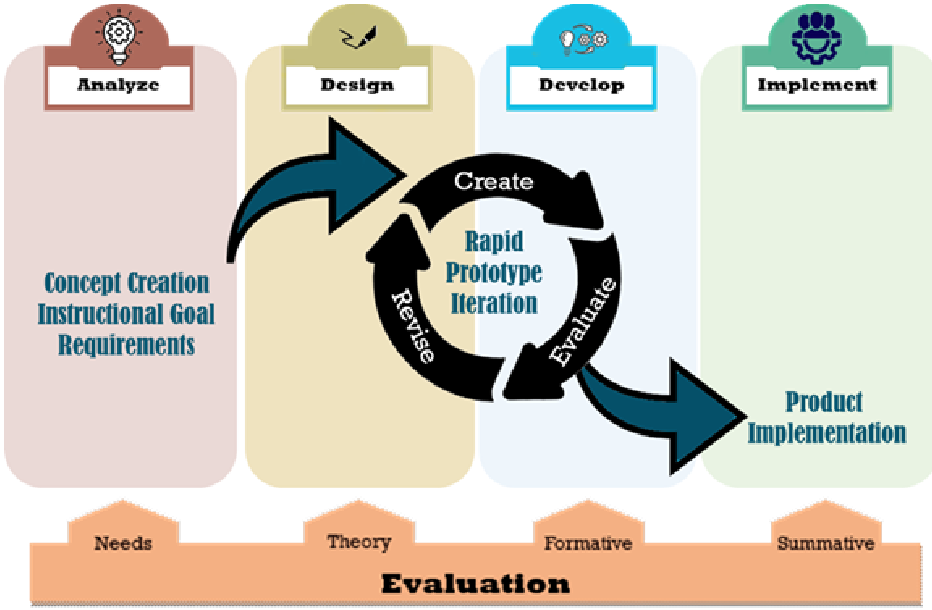

Figure 4: Evaluation Integration within a Rapid Prototyping Instructional Design Model.

Design Based Research (DBR) and ADDIE

McKenny and Reeves (2012) outlined three core processes of DBR: (a) analysis and exploration, (b) design and construction, and (c) evaluation and reflection. A hallmark of the DBR approach is its iterative nature, but you will note that the DBR approach represents another adaptation of the ADDIE model. This approach to design is similar to rapid prototyping but a bit more systematic. Each design iteration is formative in that the designer refines and reworks the product based on understandings obtained in the evaluation and reflection phase of each iteration. How a designer conducts each cycle will depend on the evaluation finding of the previous iteration, and a designer may perform different analyses and use different evaluation methods to complete a cycle. While the core processes identified by McKenny and Reeves do not explicitly state this, we can assume that, in addition to the analysis & exploration that occurs during development, a needs analysis would occur before designers initiate the development process. In addition, we can reasonably assume that a summative evaluation of the final product would occur.

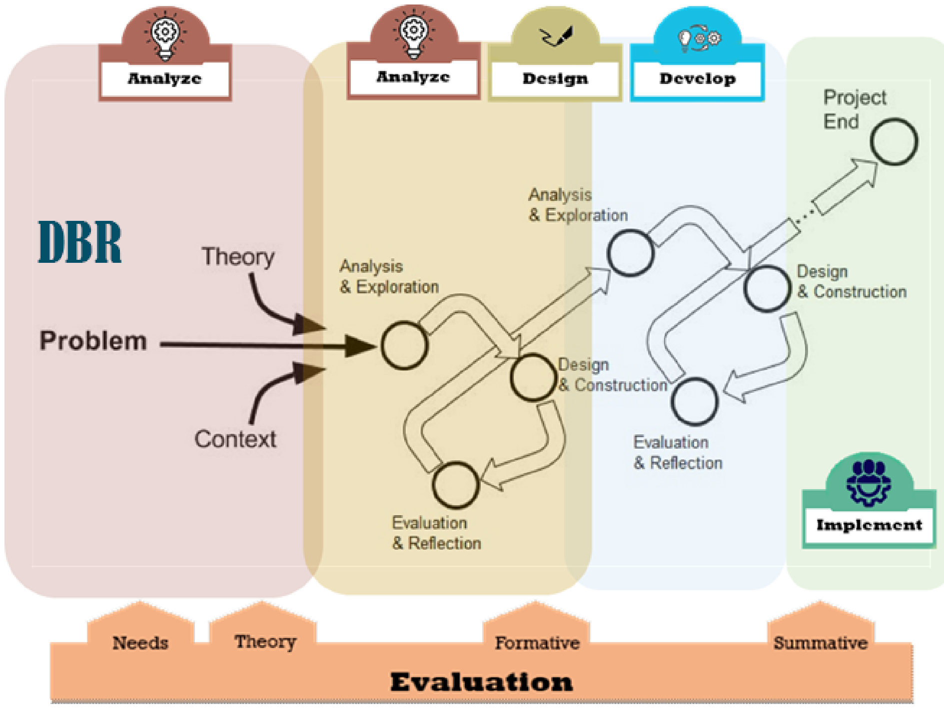

Figure 5: Evaluation Integration within a Design Based Research Model.

The Role of Evaluation in the Design Process

Evaluation is an integral part of the design and development process. Evaluation makes our designs better and helps improve the products we produce. We use evaluation throughout this process. Evaluation is an activity carried out before, during, and after a product has been designed and developed. The following graphic illustrates the various roles evaluation can play within specific stages of the instructional design process.

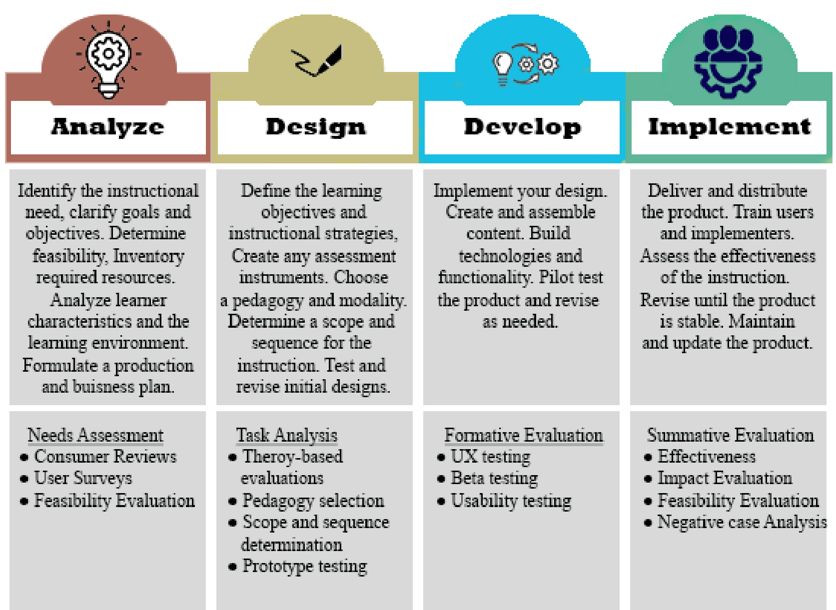

Figure 6: Role of Evaluation in the Design Process.

Evaluation by Design Phase

Designers use different types of evaluation at each phase of the design process; this is because they need to answer different design questions throughout the process. When referring to "an evaluation type," you will note that we refer to an evaluation with a specific focus or purpose. All evaluations follow a fairly standard structure; the purpose, methods, and scale of the evaluation are the things that tend to change.

While the previous chart seems to imply that we designate specific types of evaluation to a specific phase of the process, this is not the case in practice. While a specific type of evaluation may be particularly appropriate for a specific stage, smaller, more focused versions of a specific evaluation may need to be conducted in other phases of the process. For example, a designer may need to conduct a theory-based evaluation in both the design and development phases to help them make decisions. Likewise, designers may conduct consumer reviews as part of a needs analysis evaluation in the analysis and implementation stages, albeit in a modified form and for slightly different purposes.

The following discussion of evaluation roles does not represent a mandate for where evaluation must occur; it simply explores possibilities. We will discuss details of various evaluation approaches and types of evaluation in the next chapters.

Evaluation in the Analysis Phase

The analysis phase of the design process is mainly conceptual. In this phase, the designer analyzes their learners (the target audience and their needs) and attempts to understand any learning requirements and context restrictions (goals and constraints). The main evaluation activity for this phase revolves around needs analysis. A vital component of a needs analysis requires that the evaluator identify any gap that might exist between what is and what we want (need) things to be. For example, the designer may identify a gap between what students know and what they need to know (or be able to do). They then might identify a gap between the quality, effectiveness, or functionality of existing instructional resources and what is needed to facilitate the learning students are expected to accomplish. The designer might conduct a consumer review as part of the needs analysis. A consumer review evaluation will involve surveying users and reviewing and comparing existing products. It may also involve a theory-based evaluation of the product. Results from gap analysis and consumer reviews inform the designer's decision of whether to create a new product or utilize existing solutions. After identifying a need, the designer might conduct another needs analysis to determine the resources needed to produce a new product and the viability of such a project.

You will recall that a planning phase was added to the ADDIE training development framework to meet a specific need that wasn't being met in the original model. Planning focuses primarily on determining the project goals (objectives), requirements, constraints, budget, and schedules (i.e., project management stuff). Planning of this type is needed once the decision-maker decides there is a need for a product to be created or revised—project management benefits from a different set of evaluation activities.

Often designers work for a corporation or an academic institution as part of a design team (e.g., teachers or corporate trainers). In these situations, the client may not expect the products they produce to be sold for profit; they create them to serve a purpose (meet an instructional need within the organization). However, a designer often creates an instructional product to be sold. In these cases, the planning phase may also require the developer to create a business plan to evaluate the viability and cost of product development and whether there is a market for the product.

Unfortunately, too often, very little time is allowed for the planning and analysis phase. At times, clients and designers make quick decisions without carefully considering the need for a product. Cognitive biases that affect decisions made here include action bias, availability heuristic, planning fallacy, survivor bias, and the bandwagon effect. We may perceive a need simply because our personality compels us to act, or we see others developing products and feel compelled to do likewise. We may identify a genuine need but underestimate the cost and risks (viability) of developing the product. Likewise, a genuine need may exist, but designers are reluctant to revise instruction or develop new products out of fear or denial. In the analysis phase, designers should carefully evaluate needs and make informed decisions.

Evaluation in the Design Phase

The design stage focuses on the design of the learning experience and the resources needed to support the experience. When designing an educational product, this phase requires a designer to consider the functionality of the product and how the product's design will accomplish its purpose and goals.The purpose of the design phase was initially conceived as a task analysis of the training a designer was hired to develop. A task analysis requires the designer to identify essential components of the learning and problems users experience when learning. Designers then make several decisions regarding the product's design (see Gibbon's layers). A designer must choose which content (information, exercises, activities, features) to include. Designers must also judge the best ways to present the content (i.e., the message) and how a student will interact with the product (modality). Evaluation activities in this phase often involve theory-based evaluation of the pedagogical ideas and principles that might best facilitate the learning and ways an instructional product can mitigate challenges students experience. Theory-based evaluations involve a review of research, and for existing products, an evaluation designed to judge the degree to which a product adequately applies pedagogical theory and principles. Prototype testing is also conducted in this phase to evaluate the viability of a design.

Evaluation in the design phase is essential because if the overall product fails, it is most likely due to a flaw in the design. Designs often fail because the designer neglects to consider existing research and theory related to the product. Even when theory is considered, the teaching and learning process is complicated. People have diverse needs, abilities, and challenges. They also have agency. Rarely will a single instructional design work for all learners. As a result, there is no certainty that all students participating in a learning experience will accomplish the expected learning objective. Likewise, experts often disagree on the best ways to teach. Designers need to judge for themselves which designs are best.

Evaluation in the Development Phase

The purpose of the development stage is straightforward. In this phase, developers implement the designer’s vision for the instructional product – they create and build the learning assets outlined in the design phase. This might include the creation of assessments (tests and quizzes), assignments, practice exercises, lesson plans, instructor guides, textbooks, and learning aids. Developers may need to create graphics, videos, animations, simulations, computer programs, apps, and other technologies. They will also need to test and refine each of these assets based on formative feedback from experts, implementers, and the intended end-users.

As noted, the evaluations conducted in this phase are formative. The purpose of a formative evaluation is to identify problems. Formative evaluation can involve usability and user experience (UX) testing, both of which identify issues learners and providers might experience when using a product. It also utilizes beta testing to see whether products can be used and intended or as the designer envisioned (commonly called usability testing). The evaluator might use durability, usability, efficacy, safety, or satisfaction as criteria for their judgments. The methods used in these evaluations might include observations, interviews, surveys, and personal experience (trying it out for yourself).

Evaluation in the Implementation and Maintenance Phases

The implementation phase begins once the product is stable and ready to be used by consumers (e.g., instructors and students). Being stable does not mean the product is perfect – it just means it is functional. The product will likely need to be revised and improved through this and the maintenance phase based on additional testing.

Evaluation activities in this phase can be extensive if the developers decide to employ them. Effectiveness evaluation judges the degree to which learners can use the product to accomplish the intended learning outcomes.
Impact evaluation considers what long-term and sustained changes have occurred in the behaviors and abilities of learners — does the learning last, and does it make a difference? Implementation fidelity evaluations judge whether

consumers of this product can and are using the product as intended. Often beta testing is conducted under ideal conditions; implementation fidelity testing considers suboptimal conditions and unexpected circumstances (use in the wild). Testing in the development phase may suggest that users like everything about the product and indicate they would use the product. However, during implementation testing, you may find consumers only use some of the product features (they find some features beneficial but not others). Continued UX testing can also occur during this phase. Testing in this phase may also involve negative case analysis. Rarely will a product work well for all learners. A negative case analysis tells us who uses the product and who does not; it tells us which learners benefit from using the product and which do not.

The Navy added the maintenance phase to their ADDIE design model in recognition of the fact that products age. The maintenance phase is a commitment to continuous improvement of the product through its life cycle and requires ongoing product evaluations similar to those conducted in the development and implementation phase.

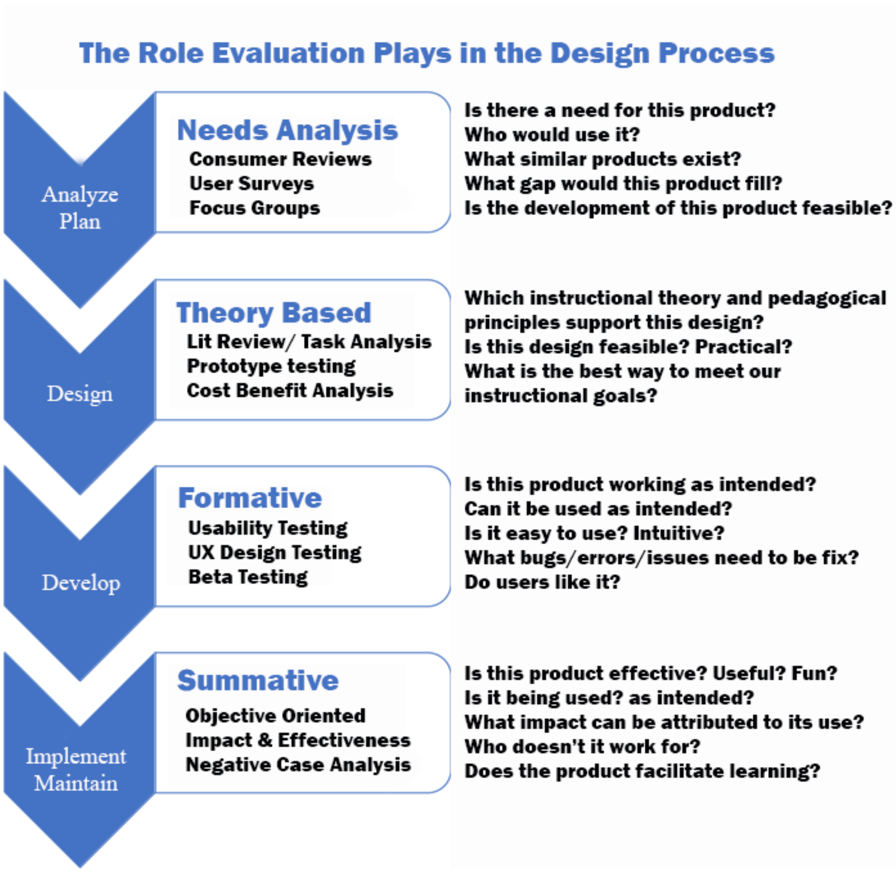

Figure 7: Role of Evaluation and Potential Guiding Questions

Chapter Summary

- An instructional product might include any educational resource that facilitates or supports learning regardless of the setting or context.
- Evaluation occurs throughout the design process.
- Most design models are adaptations of the ADDIE model.
- Four design phases occur in all design models: Analyze, Design, Develop and Implement.
- Specific types of evaluation are used in each phase of the design process.
- Evaluation is essential to improving the design decisions we make.

Discussion Questions

1. Consider an educational product that you use. What do you like about it? How does it compare to other similar products? Describe something the product lacks that would be nice to have. Describe something missing in the product that users might consider essential. Give reasons why the designer may have decided not to include the missing feature in the product's design.
2. Think about an instructional product people use. Describe the type of person (a persona) who tends to use this product. Think of a label you might use to describe the type of person who uses the product. Suggest reasons why some groups of consumers might use the product and not others?
3. Think about a learning activity instructors use when teaching their class. Why would a teacher believe it's a good learning activity? What pedagogical theory supports its use? Is the activity always effective? If not, why not?

References

Mckenney, S., & Reeves, T.C. (2012) Conducting Educational Design Research. New York, NY: Routledge.

Previous Citation(s)

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Evaluation in the Development Phase

Randall S. Davies

While instructional designers commonly conduct **formative evaluations** in the development phase, formative evaluations are also common in the other phases when creating instructional products. For example, in design-based research (DBR), formative evaluation is prominent in both the design and development phases but also can occur in the analysis phase (see figure 1). It can be part of prototype testing in the design phase or a beta testing process in the development phase. In practice, designers continually evaluate a design's effectiveness, efficiency, and appeal throughout these stages; it is good practice to begin user testing early in the design and development process.

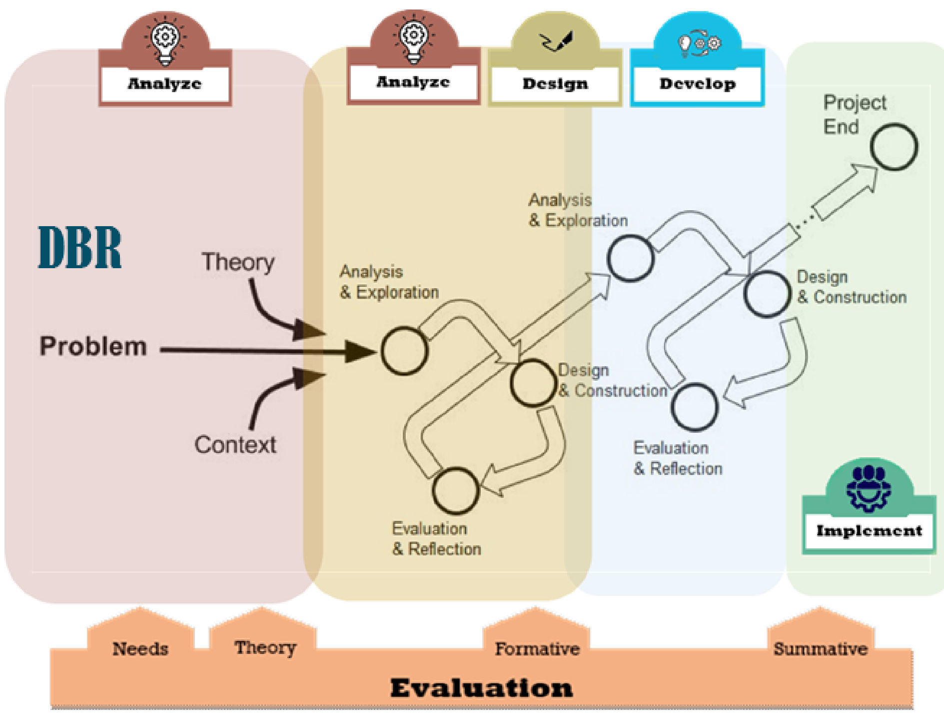

Figure 1: Evaluation Integration within a Design Based Research Model.

The evaluations carried out in the development phase are often short but numerous as hundreds of design decisions need to be made. The products we evaluate are typically beta versions; the final version may become something entirely different. Evaluation in this phase helps refine the product to the point that it is good enough to implement, even if it is not perfect. The implemented product needs to be an adequate solution to the instructional problem (i.e., gap or need), not a perfect solution. Although, even if a product works, it also needs to appeal to the user.

User Testing (formative evaluation)

User testing involves getting information from actual users (view video). We are not testing the users; we are testing the product's design and how users interact with the product. We want to know what they need and want the product to do. This is why many call this usability testing. The concept of user testing is based on human-centered design principles and the idea that products are designed for people to use. Human-centered design requires product developers to empathize with the end-user, understand their needs, and build products they want and enjoy using. To do this, designers need user input and formative evaluation.

We use many labels to describe the evaluation activities performed in this stage of production; all are related and often represent distinctions without a lot of difference. For example, user experience (UX) testing and usability testing both fall into a broad category of User Testing.

UX testing vs Usability testing

Often people use the terms usability and UX testing interchangeably. User testing was the original term, followed by usability testing. UX design testing is the more recent term and is debatably more widely used.

Some definitions suggest usability is concerned only with functionality, ease-of-use, and learnability (i.e., how intuitive the product is to use). They define UX design (and testing) more broadly to include usability, but also additional aspects of the end-users experience associated with marketing, branding, findability, support, accessibility, and overall appeal (see Figure 2, adapted from).

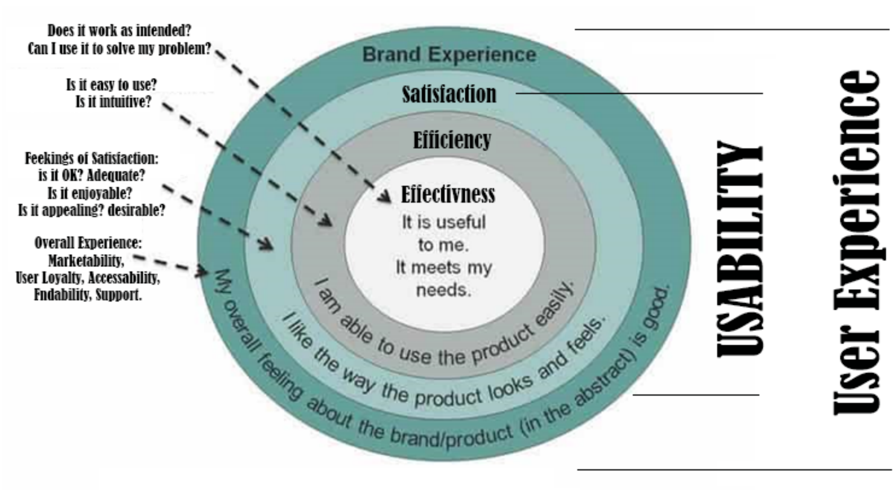

Figure 2: Usability and UX Design Testing.

However, the International Standards Organization (ISO) defines usability in terms of effectiveness, efficiency, and satisfaction (ISO 9241-11, see video). Some suggest that a product can be desirable and not be useful or usable—making UX design a subset of usability or perhaps just overlapping constructs (see Figure 3). The difference is framed as a contrast between science (i.e., usability) and art (i.e, user experience). Those purporting that usability and user experience are different describe usability as analytical, while user experience is subjective; They suggest usability focuses on users' goals, but user experience focuses on how it makes the user feel.

So the main distinction seems to be how you interpret the term satisfaction. Satisfaction meaning "good enough" (i.e., it's functional, I am pleased with how it works), or satisfaction meaning "desirable and appealing" (it works well, AND I love how it looks and how it makes me feel).

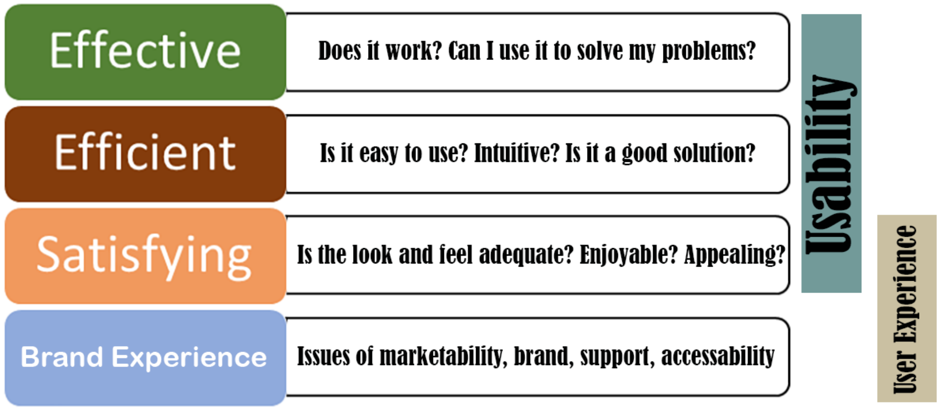

Figure 3: Usability and UX Design Testing.

You can decide for yourself the degree to which these terms are similar or different and what you want to call the evaluation activities you perform in this phase of a product's development. In terms of how formative evaluation benefits the design and development process, we need to consider several issues.

Evaluation Criteria and Purpose

The purpose for usability and UX testing vary, but the evaluator's goal usually is to:

- **Identify problems** in the design of the product or service,
- **Improve the functionality or quality** of the product to enhance the product's performance and increase user satisfaction,
- **Uncovering opportunities** to add features or deal with users' un-met needs,
- **Learn about the target user's** behavior and preferences, or
- **Determine how satisfied** users are with the product.

UX experience and usability testing both use three general factors or criteria to judge the product's value, merit, or worth.

1. **Effectiveness** – The primary criteria for determining effectiveness are utility and usefulness. Judging effectiveness requires that you answer questions like: Does the product work? Does it do what it was designed to do? Can I use it to solve my problem? Is it useful?

   To capture this information, you will need to observe how well users utilize the product to solve a specific problem or complete a task.

2. **Efficiency** – The primary criteria for determining efficiency are ease of use or usability. Can the product be used as intended? Is the design elegant? Intuitive? Fast?

   To capture this information, you will need to observe how users interact with the product.

3. **Satisfaction** – The essential criteria used to evaluate satisfaction are varied. Satisfaction is subjective and depends on one's values (i.e., what is most important to the individual). Basic satisfaction might be determined by the product's usefulness and utility; however, deeper levels of satisfaction might consider the product's safety, cost, support, presentation, and overall appeal. Evaluation efforts primarily focus on the users' experience. How do users feel about the product? Do they like using the product? Is it safe, cost-effective, and enjoyable?

   To get this information, you listen to what users say (e.g., interviews) or document how willingly they use the product (i.e., frequency of use and reuse).

Much of the information you will find about user testing (both UX testing and usability testing) will be targeted at software development (e.g., websites and online courses) and how people interact with technology (e.g., Human Computer Interaction or HCI). However, UX and usability testing can be applied to any instructional product or service, not just technology or physical products. In addition, much of the information sources for this topic focus on guidelines for designing and developing technology-enabled resources rather than how these products are evaluated. Still, design guidelines and principles can be used as specific criteria by which products might be evaluated (for example, see rules1, rules2).

When Is it appropriate to conduct user testing?

As mentioned earlier, formative evaluation should be started as soon as possible. Gathering information from users can be part of a needs analysis, a consumer review, prototype testing in the design phase, effectiveness testing in the implementation phase, but it is essential during the development phase.

Test Subjects

UX stands for user experience; as such, UX testing cannot be done without users. Both usability and UX testing gather information from users to learn how *they* experience a product. However, some of the evaluation data obtained in a usability study can be acquired from experts (e.g., usability heuristics analysis).

While the designer and experts will need to make some evaluative judgments, formative evaluation of an instructional product needs to get data from those who will actually be using the product. This may include those hoping to benefit from the instructional product's use (i.e., the learner) and those providing or facilitating the expected learning (e.g., teachers, parents, instructors). Both groups are considered primary stakeholders as they will be directly involved with the product's delivery and use. Therefore, both should be asked to provide information about the product's utility, effectiveness, and appeal.

The Typical User

When testing a product, you need to recruit study participants that are representative of your target audience (see video). As your intended users will be diverse, so should the group of individuals you choose to test the product. And while it may be best to select novice users (i.e., those who have never used the product), you can also gain insights from proficient users as well (i.e., those who regularly use the product or have expert knowledge).

Personas and the Intended User

Personas are fictional characters that describe your intended user. Several publically available resources exist that explain the process of developing a persona (video, resource, resource1, resource2, resource3). You may need to develop several personas as there will likely be various groups of individuals who might benefit from using your product. Each persona represents a homogeneous group of potential users with similar characteristics, behaviors, needs, and goals. Creating personas helps the designer understand users' reasons for using a product and what they need the product to do. Identifying a persona can also help select an appropriate group of people to test the product.

Sample Size (and the Rule of 5)

With the exception of a consumer review of existing products, the goal of a user test is to improve a product's design, not just to document its weaknesses. In the development phase, when a product's design is revised based on user feedback, you will want to run additional tests of the product. In each iteration, your test group need not include large numbers of people. If you have a representative sample of key informants, each test iteration can use a small testing cohort (3-5 participants, see source. video). This is called qualatative sampling. Using a limited number of users, you can often identify the majority of issues you will need to address. However, in your initial testing iterations, you may only need a single user to uncover severe flaws in the design. If this happens, you may wish to suspend testing to fix these issues before resuming your analysis with additional testers. This will definitely be the case if the issue is a safety concern. However, you may need a larger group to conduct a summative assessment of effectiveness once the product is implemented and distributed in its final form (see Sampling Basics).

Test Session Basics

Before you start testing, a few decisions you need to make include:

Moderated vs. Unmoderated - Moderated sessions allow for a back and forth discussion between the participant and facilitator. Facilitators can ask questions for clarification or dive into issues during or after the user completes tasks. The participant completes unmoderated usability sessions with no interaction from a facilitator. They are asked to explore using the product independently and report back.

As a general rule of thumb, moderated testing is more costly (i.e., facilities, time, and setup) but allows the facilitator to get detailed responses and understand the reasoning behind user behavior. Unmoderated testing is less expensive and is more authentic. However, unmoderated user sessions can provide superficial or incomplete feedback. The facilitator may need to conduct a detailed interview or have the user complete a survey once they have finished testing the product.

Remote vs. In-person – Remote testing is typically unmoderated and, as the name suggests, is done outside a structured laboratory setting in the participant's home or workplace. Remote unmoderated testing doesn't go as deep into a participant's reasoning, but it allows many people to be tested in different areas using fewer resources. In-person testing is usually done in a lab setting and is typically moderated. However, an unmoderated session can be conducted in a lab setting. The evaluator may record or observe the user interacting with the product in an unmoderated session, but they analyze body language, facial expression, behavior without interacting with the user.

Gorilla Testing – is testing in the wild. Instead of recruiting a specific targeted audience, participants are approached in public places and asked to perform a quick usability test. The sessions should last no more than 10 to 15 minutes and cover only a few tasks. It is best to do gorilla testing in the early stages of the product development—when you have a tangible design (wireframes or lo-fi prototypes) and what to know whether you're moving in the right direction. This method is beneficial for gathering quick feedback to validate assumptions, identify core usability issues, and gauge interest in the product.

Lab testing – The term laboratory may be misunderstood when describing a setting in which products are tested. Indeed, participants may be invited to a location where specialized apparatus or materials will be used (e.g., eye tracking equipment), but whenever you invite someone to test a product in an environment of your choosing, it might be considered a laboratory test. A lab setting is testing done in unique environments under specific conditions and supervised by a moderator. In contrast, field studies are defined as observations of users in their own environment as they perform their own tasks. Any time you test in a controlled setting, you run the risk of getting skewed results to some extent. Lab testing is essential; however, you will also need to test in a more authentic setting once the product is ready to implement.

Testing in a Lab vs. Field Studies Example

When testing the design of a new asynchronous online course, designers conducted several remote unmoderated evaluations of the product with a diverse group of participants from the target population. Users testing the product were given access to the course and asked to work through the material and give their impressions. One aspect of the design included external links to supplemental information. Under laboratory conditions, those testing this feature of the course indicated they loved the opportunity to search and review these optional materials. Some of the reviewers reported spending hours working through the elective content. However, summative evaluation results conducted once the product was implemented revealed that students enrolled in the course never used this feature, not once. Students working in an uncontrolled authentic setting determined that accessing this information had no impact on their grades; as a result, they didn't. So while user testing under laboratory conditions confirmed the potential benefits of external links, testing in the classroom exposed this as an unrealized potential (i.e., a theory-to-practice issue). You cannot always control for all the confounding variables that affect actual use. (source Davies, 1999)

A few testing methods you might consider include:

Expert Evaluation (usability heuristics analysis) - Expert Evaluation (or heuristic evaluation) is different from a typical usability study in that those providing data are not typical users. Experts evaluate a product's interface against established criteria and judge its compliance with recognized usability principles (the heuristics). Heuristic analysis is a process where experts use rules of thumb to measure the usability of a product's design. Expert evaluation helps design teams enhance product usability early in the design and development process. Depending on the instructional product, different design principles will apply. Identifying appropriate heuristic principles can be the focus of a theory-based evaluation. (video, steps, example of website heuristics)

A/B testing - A/B testing (or A/B split testing) refers to an experimental process where people are shown two or more versions of something and asked to decide which is best. A refers to the 'control' or the original design. And B refers to the 'variation' or a new version of the design. An A/B split test takes half of your participants and presents them with version A and presents version B to the other half. You then collect data to see which works best. A/B testing is often used to optimize website performance or improve how users experience the product. (see primer, steps)

Card Sorting - Card sorting is a technique that involves asking users to organize information into logical groups. Users are given a series of labeled cards and asked to sort them into groups that they think are appropriate. It is used to figure out the best way to organize information. Often the designer is has a biased view of the organization based on their experience. Card sorting exercises can help designers figure out an organization scheme that best matches users' mental model of potential users rather than what the designer thinks is most logical. This can also be used to organize the scope and sequence of instructional content and is an excellent method for prioritizing content. Card sorting is great for optimizing a product's information architecture before building a prototype, lo-fi mockup, or wireframe. (see examples)

Cognitive Think-aloud Interviews – this technique goes by different names (e.g., context inquiries), but the basic technique asks test participants to perform a number of tasks while explaining what they are doing and why. This is an unmoderated testing approach where the evaluator tries to capture what users think as they perform the task without intervention. The evaluator does not interact with the user; they record the user's actions, their explanations, and note any problems. Several publically available resources exist that cover this topic (see Intro).

Cooperative evaluation is a moderated variant of a think-aloud interview. In addition to getting the user to think aloud, the evaluator can ask the user to elaborate or consider "What if ?" situations; likewise, the user is encouraged to provide suggestions and actively criticize the product's design. Think-aloud interviews can provide useful insights into the issues a user might have with a product. However, the value of the information provided depends on the task chosen and how well the person conducts the interview.

Before you begin, you will also need to consider the following:

Creating Scenarios

A scenario is a very short story describing a user's need for specific information or a desire to complete a specific task. There are various types of scenarios you might create, depending on the purpose of your test. You can also ask users for their own scenarios then watch and listen as they accomplish the task. A scenario should represent a realistic and typical task the product was designed to accomplish. The facilitator should encourage users to interact with the interface on their own without guidance. Scenarios should not include any information about how to accomplish a task or give away the answer. Several publically available resources describe this process. Several publically available resources exist that cover this topic (see video explanation, resource1, resource2).

Moderator guidelines

An essential aspect of any moderated user test is the person facilitating the evaluation. An inexperienced moderator may inadvertently thwart the interview process. This can be done by failing to establish rapport, asking leading questions, failing to probe sufficiently, and neglecting to observe carefully. Usability testing can yield valuable insights, but user testing requires carefully crafted task scenarios and questions.

A few basic rules for interacting with evaluation participants include:

- Given the purpose of the test, determine the best way to conduct the test and how to interact with the participant.
- Respect the test participants' rights and time.
- Consider the test participants as experts but remain in charge.
- Focus on the goal of the evaluation. Use carefully crafted scenarios.
- Be professional but genuine and gracious. Be open, unbiased, not offended, surprised, or overly emotional.
- Listen, let the test participants do most of the talking!
- Don't give away information inadvertently, explain how to do a task, or ask leading questions.
- Seek to fully understand. Use probing questions effectively.

An excellent resource on this topic is provided by Molich et al. (2020) [alt link]. Several additional free resources that describe this process are available online. (see video explanation, common mistakes)

When User Testing Fails

When deciding on which educational psychology textbook to use in a course, the instructor decided to ask several students to give their opinion. He provided them with three options and asked which would be best. This was an unmoderated remote evaluation of the textbooks using a simple A/B testing option. The student tended to agree on one textbook. When asked why, students indicated they liked the design and colors on the front of the book. Aesthetics are important—but the unmoderated format and lack of a carefully created guiding scenario resulted in a failed evaluation. The usability of the textbook should have been determined using a set of scenarios devised to evaluate the usefulness and efficiency of the design and not just the appeal. A more thorough evaluation might also have included an expert review of the content (i.e., correctness) and the design principles used.

Session overview

A typical usability test session should not last too long (less than an hour) and might include the following:

- **Introduction** - Make the participant comfortable, explain what will happen, and ask a few questions about the person to understand their relevant experience.
- **Present the scenario**(s) - Then watch and listen as they attempt to complete the task proposed in the scenario. Prompt only to gain understanding or encourage the user to explain what they are thinking or feeling. If relevant, ask participants for their own scenarios. What would they like to accomplish with the product?
- **Debriefing** - At the end, you can ask questions about the experience and follow up on any information provided about the product that needs further explanation. You might ask the user for suggestions or a critique of the product. If appropriate, ask the user how satisfied they are with the product's functionality, esthetics, appeal, and desirability.

Triangulation

One last thing to remember is to trust but verify. Not everything the user says will be accurate or reasonable, and opinions about how to proceed can be diverse. Use multiple sources and look at the problem from multiple points of view. Combine multiple types of data and obtain information using several methods. Recommendations should be reasonable, ethical, plausible, and for the most part, required. Remember, not all changes can or should be done (even if deemed necessary), and not all nonessential changes should be ignored if they improve the product and are reasonable.

Chapter Summary

- Formative evaluation is typically conducted in the design phase.
- User Testing is a fundamental aspect of formative evaluation.
- By User Testing, we mean having the intended end-users test the product's design to determine how users interact with the product.
- Both UX testing and Usability testing focus on human-centered design principles and the idea that products are designed for people to use.
- The ISO defines usability in terms of effectiveness, efficiency, and satisfaction.
- Formative evaluation should begin early in the design and development process.
- Typical users and subject matter experts should be used to evaluate the product.
- Personas can be developed to describe the typical intended users of a product.
- Formative evaluation test groups need not be large (Rule of 5).
- Qualitative sampling should be used to identify key informants.
- User testing can be moderated or unmoderated, remote or in-person, conducted in a laboratory setting or as a field study.
- Various types of testing can be employed, including expert evaluations (heuristic analysis), A/B testing, card sorting, and cognitive interview (context inquiries).
- The value of the information obtained from a user test depends on the task scenario used and how well the moderator conducts the interview.
- Triangulation is needed to verify data and fully understand issues.
- Recommendation for modifying a product should be reasonable, ethical, plausible, and for the most part, required.

Discussion Questions

1. Consider a product you would like to evaluate. Describe the best way to test the product's usability in terms of conducting a moderated vs. unmoderated, remote vs. in-person, and laboratory vs. field study. What would you recommend and why?
2. Consider an educational product you are familiar with. Describe a persona (a user group) that typically would use this product.

References

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