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The Role of Needs Assessment to Validate Contextual Factors Related to User Experience Design Practices

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This chapter will address how instructional designers can validate user needs and contextual factors influencing performance within their user experience design to ensure the transfer of learning to real-world contexts. It will also demonstrate how information gathered from needs assessments can be leveraged to identify and develop the necessary scaffolds to optimize the user experience. While contextual analysis aims at understanding the user's work practice, needs assessment delves into identifying, classifying, and validating the needs of users as they pertain to their work practice. It is imperative that an instructional designer fully understands the intricacies and nuances of the application setting/environment to design a prototype that addresses specific contextual factors that may support or inhibit the transfer of learning into that environment. Instructional designers trained to engage in needs assessment that incorporates context into the design of the user experience will be better positioned to facilitate transfer from the learning space to the work practice space. The chapter proposes a framework to assist designers with leveraging outputs of the needs assessment to the user experience design so that contextual factors can inform the entire experience from project conception to transfer of knowledge to real-world applications.

1. Introduction

Instructional designers are called to make decisions at various times throughout a project. These decisions may include, but are not limited to, selecting the type of instructional delivery system, identifying evaluative metrics to assess learning, and the types of instructional strategies warranted for teaching the subject matter (Kenny et al., 2005; Sugar, 2014). One can thus argue that the goal of any instructional design project, regardless of its scope, is to facilitate learning and improve

performance. To achieve these two overarching goals using technology, instructional designers must address the user experience. User experience design is the process of designing products that are relevant to the everyday experiences of users or learners (Goodman et al., 2012; Lallemand et al., 2015).

Emphasis is placed on the user throughout the entire design process to address issues with relevancy, fidelity, usability, and functionality (Norman, 2013; Sanders, 2002). User experience design encompasses the ability for a designer to address all the ways a learner (hereinafter referred to as the user) will interact with the product (intervention) being developed. This mindset goes beyond addressing the instructional environment and extends to include how the user will transfer their learning to a real-world environment (Lallemand et al., 2015; MacDonald, 2019; Rosenzweig, 2015). This requires the instructional designer to dissect the user experience into a variety of layers to ensure a successful transfer. To be successful, instructional designers must expand their design practices to include the instructional products they will design as well as acknowledging and taking into consideration the factors that may support or hinder the delivery of their intervention. Instructional designers can leverage a lot of useful information that will inform their decisions related to user experience design that can be yielded from completing a needs assessment to identify an appropriate infrastructure.

2. Background

The instructional design process requires instructional designers to undertake a number of different analyses in order to gather sufficient data that will inform their designs. These analyses often include needs assessment and needs analysis; contextual analysis; and learner analysis. The purpose of a needs assessment is to identify the gap between the current state of performance and the desired state of performance (Altschuld & Kumar, 2010; Kaufman & Christensen, 2019). Needs analysis is the process of further investigating the performance gap and determining what is contributing to the gap. It is important that an individual facilitating a needs assessment also integrates analysis to better understand the situated environment (Watkins & Guerra, 2002; Watkins & Kaufman, 1996). This puts them in a position to validate the needs that have been presented by their organization or clients. While these are mutually exclusive, a comprehensive needs assessment will include contextual and learner (or audience) analysis.

A needs assessment is recognized as being an important component of the instructional design process (Branch & Dousay, 2015; Dick et al., 2009; Morrison et al., 2012; Smith & Ragan, 2005); however, it often tends to be minimized to focus more on learner analysis. The goal of every needs assessment is to successfully identify the performance gap and propose viable solutions, either instructional or non-instructional, to achieve the desired performance results. Conducting a needs assessment helps the instructional designer illuminate contextual factors that need to be considered while bridging the gap between current and desired results (Burton & Merrill, 1991; Watkins et al., 1998; Witkin & Altschuld, 1995). These factors may include organizational politics, other training interventions that are being implemented simultaneously, employees' perceptions, and resources available to support new learning initiatives.

Most instructional designers find themselves being presented with the needs of a project when they initially meet with their clients (Stefaniak, 2018). Oftentimes, they are expected to address these

needs at face value and begin designing their solutions. Typically, these needs are more aligned with what the instructional design field would refer to as a learner analysis. Learner analysis is focused on gathering a sufficient amount of data on a learning audience to design effective instruction. While this information is important, it is also necessary for the instructional designer to gather data on other elements within the system that may be contributing to or hindering learner performance. Needs assessment extends a further reach on assessing the environment that comprises learner analysis and user analysis data, as well as capturing data about other elements or factors within a system that may impact the learner (Tessmer, 1991).

Contextual analysis is the process of analyzing factors that may contribute to or inhibit knowledge acquisition and transfer of learning (Tessmer & Richey, 1997). While several seminal papers have been written in the instructional design field recognizing the impact that contextual analysis poses for the learning experience (Tessmer, 1991; Tessmer & Harris, 1990; Tessmer & Richey, 1997), very few studies have been conducted exploring this reach on the instructional design process. Baaki and Tracey (2019) noted that their survey of instructional design studies that focused on context yielded a total of 31 studies; many of which relied on different interpretations of the term "context". A majority of these studies were focused on the learner context (e.g., Giamellaro, 2014; Son & Goldstone, 2009). Other studies focused on design contexts (Gibbons, 2011) or learning activities and experiences in context (Rivet & Krajcik, 2008; Robinson & Dearmon, 2013).

In general, the studies published on context report one aspect of letting setting as it relates to the instructional experience, as opposed to exploring how instructional designers leverage contextual factors from the beginning of a project to the end. Tessmer and Wedman (1995) attributed this to the limitation that the instructional design models commonly referenced in our field are not contextually-sensitive. While this criticism is 25 years old, this continues to be a concern raised by scholars in the field (Gibbons et al., 2014; Kinuthia, 2009). This may be due, in part, because the majority of instructional design research is focused on the instructional processes and products. While needs assessment is mentioned in a number of the instructional models referenced by the field (Branch & Dousay, 2015), there is a lack of emphasis on the use of needs assessment to examine systemic nuances of the environment that impacts instruction. Contextual factors need to be examined more deeply in a needs assessment and then aligned throughout the instructional design process.

This chapter will emphasize the role of needs assessment as instructional designers validate contextual factors in their user experience design practices. When trained to engage in needs assessment, instructional designers will be better positioned to facilitate transfer from the learning space to the work practice space by taking a systems view of their design practices. Needs assessment expands beyond the scope of the immediate instructional unit or event being designed and can be leveraged to enhance what the instructional designer knows about their learning audience.

We begin this chapter by exploring the application and interpretation of user experiences in design practices. We then present a systems approach to user experience (UX) design practices, differentiate between needs assessment and contextual analysis as they relate to UX design, and discuss the intersection between instructional design decisions and UX practices to facilitate the transfer of learning. We conclude this chapter by offering a framework to help instructional designers utilize needs assessment techniques to validate contextual factors that may implicate their user experience design practices.

3. Applying and Interpreting User Experience in Design Practices

While the term UX design has only recently been adopted in the instructional design field, it has been used for quite some time in areas such as human factors and human-computer interaction. Similar to terms such as design thinking or evaluative thinking, the concept of UX design can (and should be) treated like more of a mindset rather than a specific method (Gray, 2016). Battarbee and Koskinen (2005) contend that there are three traditional approaches to applying and interpreting user experience in design: measurement, empathetic, and pragmatism. The approach that relies on measurement is primarily involved with testing the emotional reactions of users and improving the experience as a result. The empathetic approach, on the other hand, is centered on providing an experience that addresses the perceived needs or aspirations of the user. The third approach involving pragmatism takes a more cognitive view of user experience, as the meaning of the experience itself is continually constructed by the user while interacting with the environment. The authors contend that these three approaches rely too heavily on emotions and the individual user experience, and they propose an approach involving co-experience whereby the emphasis is placed upon user experience as it emerges through social interaction.

A needs assessment can provide a mechanism to validate contextual factors, especially the social aspects of the instructional and transfer environments, and provide supporting data to better understand how the situated creation of meaning is leveraged in user design practices. The field of instructional design is experiencing a shift in placing greater emphasis on better understanding the learner. In recent years, we have begun to see a transition in instructional design research to focus more on empathetic design (Parrish, 2006; Tracey & Hutchinson, 2019; Vann, 2017). This attention to employing a more empathetic approach to instructional design tasks instructional designers with taking a more learner-centered approach to the design process by gathering information that provides a more personal and holistic overview of the learner as a person (Matthews et al., 2017; Parrish, 2006; Rapanta & Catoni, 2013).

This approach therefore places more emphasis on UX strategies early in the design process. Additional time is allocated at the beginning of a project to develop a comprehensive understanding of the learner (user) audience. Designers spend time gathering data from multiple sources to better understand how their audience will interact with the design, how they will interpret information presented by the design, and how the design is used in real-world settings. The use of personas is an example of a strategy that has been used and reported in the instructional design literature to capture a more thorough depiction of learning audiences (Johnston, 2011).

4. A Systems Approach to UX Design

Instructional design as a field has been greatly influenced by general systems theory, which considers learning environments to be both systematic and systemic (Churchman, 1965). The learning system is thus dependent upon the interaction of its parts, as well as the broader context in which that system exists. Hall and Fagen (1975) defined a system as consisting of "a set of objects together with relationships between the objects and between their attributes" (p. 52). Systems theory in education was initially influenced by the study of biological systems and then relating those processes to machines (von Bertalanffy, 1972). Closed systems are those whose components are isolated from others within the larger system, while open systems involve components that interact with each

other.

Along with situated learning theory (Brown et al., 1989), general systems theory has led instructional designers to consider problem-solving within the context of broader social environments. Within an open learning system, the interaction between components will likely result in changes within the individual components (including the learners themselves). While it may be tempting to categorize a particular learning environment as "closed" to avoid the challenges arising from the complexity of open systems, von Bertalanffy (1972) warned that a failure to address the interactivity of components presents an unrealistic view of the true environment. For this reason, instructional designers must conduct a true contextual analysis to uncover the interactivity that exists within the larger system to create instructional solutions that are situated within the larger environment.

To implement the co-experience approach to user experience design proposed by Battarbee and Koskinen (2005), instructional designers must understand the learning system and larger environment in which users socially interact to create meaning from their experiences. Forlizzi and Ford (2000) proposed that user experiences are an ever-changing product of the interaction that takes place between the user, objects, other individuals, and the environment as a whole. The instructional designer must acknowledge the interactivity taking place within the learning and transfer systems to design solutions that are situated in the social environment of the user. While this necessarily poses challenges related to the continuous emerging behaviors affecting interactivity within the environment, instructional designers need to strategically bind their system to constrain the design space and make it more manageable for a particular project. This process begins during the needs analysis through the collection of relevant contextual information, and it continues as the designer builds upon prior experience and offloads cognitive demand through the use of decision-making strategies to address those contextual factors within the newly bound system.

5. Needs Analysis and Contextual Analysis in User Experience Design

Contextual design is referenced in UX design and human-computer interaction literature. It provides a means to collect data about users in the field, interpret that data, and use it to create prototype products and concepts that will be used by users (Holtzblatt & Beyer, 2013). "In Contextual Design, the term *work practice* refers to the complex and detailed set of behaviors, attitudes, goals, and intents that characterize a set of users in a particular environment" (Holtzblatt & Beyer, 2013, 8.1.1 Principle section). It is imperative that a designer fully understands the intricacies and nuances of the work practice environment so that they can design a prototype that addresses particular contextual factors that may support or inhibit the transfer of learning into the work practice environment.

Holtzblatt and Beyer (2013) characterize contextual analysis in user design as adhering to the following principles: a) systematic design must support and extend users' work practice, b) people are experts at what they do- but are unable to articulate their work practice, c) good design requires partnership and participation with users, d) good design is systemic, and e) design depends on explicit representations.

While contextual analysis aims at understanding the user's work practice, needs assessment further delves into identifying, classifying, and validating the needs of users as they pertain to their work practice. Training instructional designers on aligning needs assessment with UX design practitioners offers several advantages to the design process. It positions the instructional designer to approach a

situation with a systems view (Stefaniak, 2018, 2019). If performed correctly, data derived from a needs assessment can serve as benchmark data for evaluating performance outcomes associated with design prototypes.

Data derived from a needs assessment can guide the instructional designer on how to impose boundaries on their design practices (Stefaniak, 2019). The instructional designer can narrow the scope of their design by fixating on specific contextual factors that have an immediate impact on the system. Recognizing gaps existing between the current state and desired state of affairs can inform the design of instructional scaffolding needed to support the transfer of knowledge from the learning space to the work practice. Lastly, it provides a mechanism to assist the designer with validating the needs of the users; thus contributing to a smoother and more accurate transition to the desired learning and performance state.

6. Decisions to Facilitate Transfer From the Learning Environment to Real-World Setting

According to Jonassen (2000), the type of decision-making that takes place within activities such as design is inherently connected to ill-structured, complex problem-solving. These types of problems involve a large number of decisions throughout a series of design project phases (Jonassen, 2008). Some processes of decision-making can be classified as normative, whereby an instructional designer would choose an optimal solution for a particular situation based on theoretical reasoning and the application of best practices within the field. On the other hand, naturalistic decision-making involves the designer being influenced by emotions or interests they may not even be aware of during the process. Jonassen (2012) explains that decisions are not only affected by previous experience but are also “often made or influenced by unconscious drives and emotions” (p. 343). Much as user experience design acknowledges that users are influenced by their emotions, aspirations, and interactions with the environment, instructional design identifies these factors as influencing designers while they engage in decision-making. Because research shows decision-making within the instructional design to be an iterative process (Jonassen, 2008, 2012), instructional designers must continually rely on the contextual factors examined during the needs assessment to take into account the needs and motivations of both themselves and the users within the learning environment.

In his foundational study of strategies to promote the transfer of statistics problem-solving, Paas (1992) found that cognitive load was reduced and transfer performance was enhanced through the use of worked example problems during the learning phase. He concluded that the use of this strategy directed the learner’s attention to tasks most relevant to the goals of the problem and prevented the learner from generating, and later remembering, erroneous solutions to a problem. When the instructional designer considers the contextual factors likely encountered in the transfer environment through a needs assessment, the task-related goals (and also the likely distractions) within the transfer context will be represented optimally within the instructional context. This results in both increased effectiveness and efficiency of learning through user experience design approaches that emphasize increased opportunities for problem-solving practice and enhancement of practice through problem variability representative of the transfer context.

Concerning variability during the learning phase, Paas and van Merriënboer (1994) discovered that users who encountered high variability of worked examples experienced less cognitive load and superior transfer performance within the domain of problem-solving in geometry. The users spent less time during the learning phase working with the material, and they experienced less mental

demand during transfer as a result of this user experience design approach. To generate a realistic set of worked examples that can be used to present a high degree of problem variability to the learner, the instructional designer must first validate the contextual factors that lead to variability within the work practice space. Through a needs analysis, the instructional designer can determine the optimal structuring of worked examples to reduce extraneous load, anticipate how learners will reference the examples during problem-solving, and identify the contextual factors that will motivate the user to transfer their learning to the work environment.

Jelsma and van Merriënboer (1989) found that, in their study of learners performing cursor movement tasks, those who trained using a randomized practice schedule improved their task completion time and made significantly fewer errors during transfer performance than those who trained using a blocked practice schedule with problems containing similar surface characteristics. They observed that learners perform better when presented with a series of randomized tasks that contain high contextual interference, which fosters their ability to work with variations of the task likely to be encountered in the work environment. During the needs analysis, examination of the transfer context is crucial to identify the various environmental factors that are likely to fluctuate and change the surface characteristics of problems that the user will need to solve during transfer. As with other aspects of user experience design, these ever-changing contextual factors can be related to various objects, other users, the environment as a whole, and even the users themselves as they interact with the system.

7. A Framework to Validate Contextual Factors in User Experience Design Practices

To help instructional designers fully consider contextual factors that may influence the whole user design experience from the conception of a project to application and transfer of knowledge in the real-world setting, we offer a framework to assist with leveraging needs assessment outcomes to the UX design space (Figure 1). Similar to the bookends of a needs assessment, our framework depicts the current user state and the desired user state.

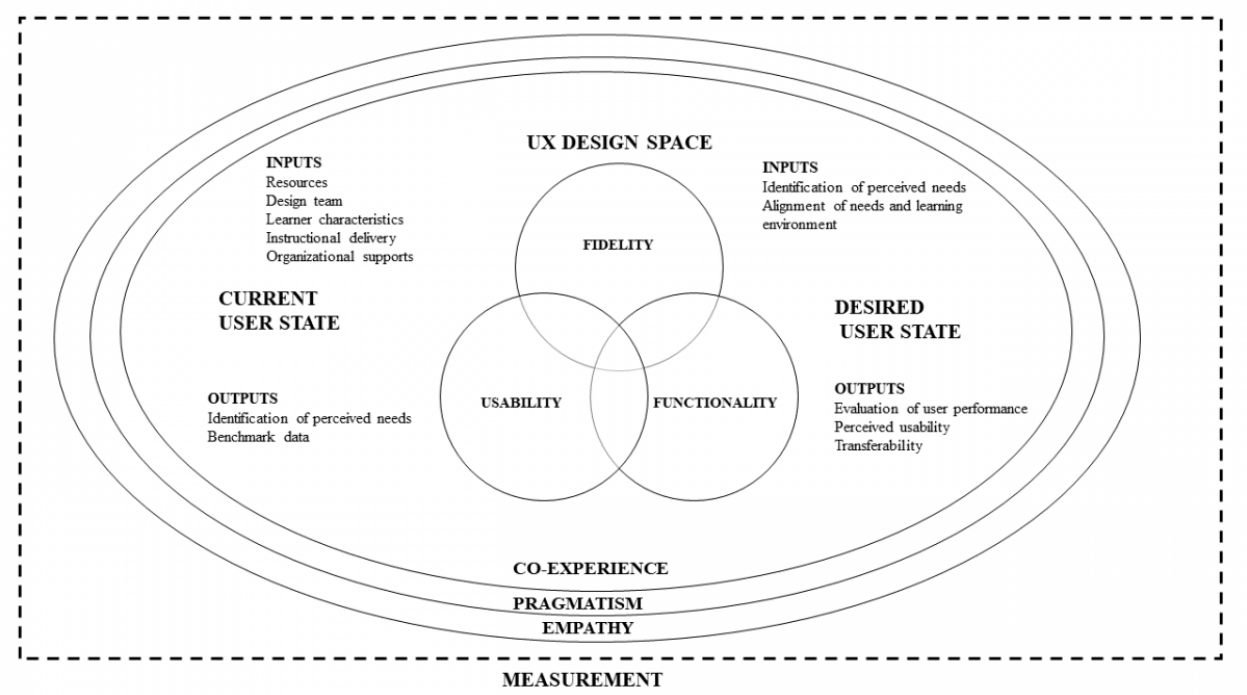

Figure 1

A Framework to Validate Contextual Factors in User Experience Design Practices

The current user state identifies inputs that contribute to the needs assessment process. Examples of these inputs include resources allocated to the project, design team personnel, known learner characteristics, available instructional delivery mechanisms, and organizational supports that are currently present. A direct output of the current user state is the identification of perceived needs. Throughout the needs assessment process, the instructional designer is responsible for gathering sufficient data to validate that the identified needs are actual needs (Stefaniak, 2018). The data gathered during the needs assessment can be referred to later in the project life cycle to benchmark the results in the desired state against data collected during the current state.

To bridge the gap between the current and desired states, the instructional designer must consider the perceived needs, actual needs, and desired needs. The solutions in the UX design space must demonstrate alignment between these needs. The designer needs to refer to data yielded from the initial gathering of data to inform their design decisions. All UX design solutions must take into consideration the fidelity, usability, and functionality (Norman, 2013) of the intervention (solution) to ensure the transfer of learning to the application setting to meet the desired user state.

To determine whether the desired user state has been met, the needs identified during the initial phase of the needs assessment must be supported by sufficient data and aligned with the learning environment designed in the UX design space. The outputs identified in the desired user state include evaluating the user's performance and ability to transfer knowledge in the application setting. This transference is assessed according to the (a) perceived utility of the UX intervention as it relates to the real-world environment, (b) the degree of fidelity as it relates to transferring skills acquired through the presentation of the UX intervention, and (c) the identified supports to promote the sustained application in the environment. The outputs of the desired user state are then

benchmarked against the results gathered during the current user state to determine the validation of the needs and success of the transfer.

The entire process in Figure 1 is enclosed by three bands: empathy, pragmatism, and co-existence to demonstrate that they are applied to the entire life cycle of the project. These bands represent two of the three approaches to applying and interpreting user experience in design identified by Battarbee and Koskinen (2005). The empathic band comprises the need for demonstrating empathy of the user throughout all phases of the project. During this time, the instructional designer needs to be considering the perceived, identified, and anticipated needs of the user to design a solution that can be transferred to the application setting. This empathetic approach is ubiquitous in the UX design workspace as the instructional designer (a) tests for functionality of their design, (b) conducts assessments to measure usability, and (c) works to create high fidelity interventions that minimize challenges when applied to the real-world setting.

The pragmatic band recognizes cognitive aspects related to the user's experience transferring knowledge from the learning environment to the application setting. This approach encompasses the user's ability to understand the intervention, apply it, and perceive its usefulness. This band recognizes the importance of the instructional designer to provide an opportunity for the user to make meaning of the experience by directly interacting with the environment. This aligns with the need to address functionality and fidelity in the UX design space and supports the need for a systems approach to UX design.

Building upon Battarbee and Koskinen's (2005) suggestion that UX design practices need to facilitate a co-experience whereby the emphasis is placed upon the user experience as it emerges through social interaction, our third band involves co-existence. By integrating opportunities that promote social experience within the UX design space and learning environment, the instructional designer is better equipped to ensure a seamless transfer to the application setting as well as validate user needs pertaining to the project.

One of the three traditional approaches to UX design noted by Battarbee and Koskinen (2005) includes measurement. This approach is focused on gathering data to measure the reactions of the user to improve the experience. Our framework has placed greater emphasis on measurement throughout the entire project lifecycle by demonstrating that it oversees and guides the entire needs assessment, UX design, learning, and transfer processes. Throughout the entire lifecycle of a project, the instructional designer should gather data to (a) verify and validate needs; (b) anticipate user needs that may present in the application setting; and (c) evaluate the successful transfer in terms of fidelity, functionality, and usability.

To best implement this framework, we offer the following heuristics to guide instructional designers as they utilize this framework to validate contextual factors in user experience design practices through a needs assessment.

1. *Verify the users' needs*. While almost every instructional design project will begin with a client presenting their perceived needs for the project, the instructional designer must verify those needs to design an effective user experience. To address functionality, usability, and fidelity of the UX experience, it is important that these constructs are aligned with the users' actual and anticipated needs and not solely on the perceived needs. This can be accomplished by developing a better understanding of the users' current experiences and identifying their desired state of performance.

2. *Gather data from multiple sources*. When verifying the users' needs, the instructional designer must gather data from multiple sources to sufficiently verify the need. Gathering data from multiple sources to verify each need enables the instructional designer to triangulate data and strengthen their argument for their proposed design interventions. The use of multiple data sources also assists with identifying patterns of performance and any factors that may enhance or hinder the design experience, both in the learning environment and the application setting.

3. *Gain an understanding of how the user will apply knowledge in the application or transfer setting*. The UX experience involves the instructional designer testing their intervention in terms of functionality, usability, and fidelity (Norman, 2013). Gathering data to help form an understanding of how the user will apply knowledge in the application setting will assist the instructional designer with achieving positive metrics in terms of these three constructs, as well as gaining a clear understanding of the user's desired state of performance. Information gathered during this phase of a project will help the instructional designer minimize the gap between the learning experience and the application setting.

4. *Determine gaps that may exist between the learning experience and the application setting*. The instructional designer needs to determine any gaps that may exist between the learning experience and the application setting. Addressing these gaps helps the instructional designer contend with the realities of the project and the users' experiences, which enables them to design an intervention that is realistic and accurate. During the design phase of the project, the instructional designer should practice an iterative approach to user design, carefully aligning and checking that each instructional strategy and decision aligns with meeting the needs of the users. These gaps can be mitigated by employing an empathetic and pragmatic design philosophy to support the users' construction of meaning through social interactions and experiences with the actual environment.

5. *Identify what infrastructure is needed to support the transfer of knowledge*. The process of needs assessment tasks the instructional designer with dissecting the environment (or situation) from a variety of levels. Oftentimes, data is gathered to understand the user's responsibilities and needs, processes related to performance, and organizational mechanisms that have been put in place to support performance. Identifying the non-instructional interventions needed to support performance is just as important as designing the learning interventions. These interventions may include (a) designing learning management systems, (b) developing job aids to support performance in-situ, (c) establishing protocols for implementing training and monitoring completion, and (d) addressing organizational development such as job descriptions, departmental functions, and responsibilities. These non-instructional interventions must be identified, explained, and established when the learning intervention is presented to the user in order to support transfer to the application setting.

6. *Mitigate challenges with transferability by providing just-in-time supports*. By validating the contextual factors that may impact UX design practices, the instructional designer is better equipped to (a) measure the degree that the desired user state of performance has been reached, (b) ascertain the non-instructional interventions needed to sustain the transfer of knowledge, and (c) identify users' specific challenges and anticipated needs regarding transferability. This data can be leveraged to assist the instructional designer with mitigating challenges associated with transferability by providing just-in-time supports. These supports may include just-in-time training, job aids, organizational processes, and repositories of

information to assist users upon completion of learning activities.

8. Conclusion

The topics of UX and needs assessment can significantly benefit the instructional design experience by helping instructional designers take a data-driven, empathetic, and pragmatic approach to aligning instructional interventions to users' actual and anticipated performance needs. Our field continues to talk about challenges associated with ensuring the transfer of learning and what that means for design practices. The goal of this chapter is to explore how the validation of needs and contextual factors influencing performance can be accounted for in user design to ensure the transference of learning in real-world contexts. It also demonstrates how information gathered from needs assessment can be leveraged to identify and develop the necessary scaffolds to manage the user (learner) experience.

As the instructional design field focuses on ways that UX design practices can (and should) be woven throughout the instructional process to gain a deeper perspective of the learner and the utility of their designs (Earnshaw et al., 2018), additional research is needed about the impact of contextual factors and UX design. Furthermore, there is a need for the field to share examples of how this can be employed in different contexts. Also needed is the use of design cases that dissect how particular UX design strategies are utilized to gather learner data and thus inform the entire design process.

This chapter offers a framework for using needs assessment to validate contextual factors in user experience design practices. We intend to help instructional designers leverage data gathered during needs assessments to employ empathy and pragmatism in user-centered learning interventions. By embracing a systems view of the users' environment, the instructional designer is better positioned to mitigate the gap between the users' current state and desired state of performance. It also provides initial data to measure the degree to which improvement performance has been achieved, and the identification of the necessary organizational resources warranted to support application in the transfer setting.

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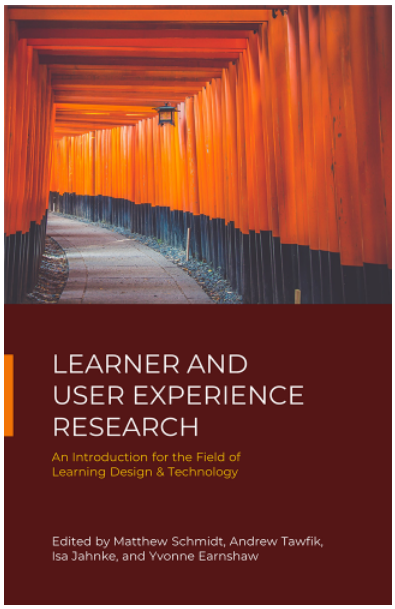

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