The Development of Equitable Edtech through the Lens of Learning Experience Design

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Abstract

Developments in digital technology have opened the doors to countless opportunities for educational technology but have also mirrored and magnified many social harms and inequalities. Researchers in the fields of education, technology, and social justice have attempted to build on past theories to create more relevant methods for addressing these challenges. This has led to an increased need for more intentional design methods and practices. Frameworks such as Learning Experience Design (LXD) have been developed and expanded upon to provide edtech practitioners with pragmatic and practical approaches for creating inclusive and equitable products. The research in this study attempts to analyze current methods and practices being employed by practitioners in the field along with how those methods can be used in the design of socially responsible edtech. Examples from professionals in the edtech industry are shared and discussions of culturally responsive and human-centered approaches are analyzed through the lens of LXD to provide a vision for pragmatic and equitable design approaches in the future development of educational technology. Four categories of methods and practices for developing edtech are explored, including methods that are human-centric, theoretically grounded, informed by user experience design methods, and socio-culturally sensitive. Key findings are analyzed through an external and internal lens - from the perspective of both the developers and the users of edtech. Implications for practice are discussed and recommendations for future research are proposed.

Keywords: Learning Experience Design, Universal Design for Learning, User Experience Design, Instructional Design

Contents

Introduction

With the increasing presence of digital technology in the world, education has undergone significant developments. Society itself is in a state of social change with countless voices calling for greater justice and equity. In the midst of this, educational technology is being produced and implemented en masse. However, how is this technology being developed and who does it benefit? Often, technology is portrayed as a solution to inequality and injustice; yet, these problems are often embedded in greater historical and structural inequalities (Macgilchrist, 2019). Researchers argue that technology should not be merely viewed as a neutral tool (Oliver, 2011; Emejulu & McGregor, 2016). Rather, developments in technology may have unintended consequences by exacerbating inequalities and reinforcing power structures (Costanza-Chock, 2020; Weller, 2022; Sutherland, 2013; Sparviero & Ragnedda, 2021). These consequences may be due to limited resources and time. Or unfortunately, corporations may place greater value in their own monetary gains rather than the users of their products (D'Ignazio & Klein, 2023). Obstacles may also come in the form of tokenistic efforts to promote equality and inclusivity without any true altruistic intentions. So, it is apparent that though there are many benefits, there are also many harms that can come with the development of educational technology (edtech). This study seeks to explore pragmatic methods and practices that designers can implement to address these challenges in the creation of equitable edtech.

I argue that due to the developments in digital technology and the social atmosphere, creators of edtech need to be increasingly intentional and deliberate in their methods and practices as they consider the relationship between digital technology and social justice. Industry professionals involved in the design process of edtech are in a position to influence the future of education (Weller, 2022). With this position comes a responsibility to recognize cultural implications, social considerations, and political features of technology (Oliver, 2011; Emejulu & McGregor, 2016). All three are very influential in the creation of new technology. The rapid developments in technology along with its implementation throughout society have led to what has been described as a “long and tumultuous history” for human computer interaction (HCI) (Gray, 2020). New narratives have normalized problematic practices such as data surveillance and the continuation of structural inequality through algorithmic bias (D’Ignazio & Klein, 2023; Perrotta, 2022; Dencik et al., 2018). Companies and organizations face the economic pressure to develop products for groups who will be most profitable to them, which leaves those in marginalized groups at a disadvantage. Issues of race, class, and gender are prevalent in many design processes along with countless other industries. And even when organizations acknowledge these challenges, practitioners in the technology industry still must “wrestle with the fundamental tension that structural problems identified during design justice research cannot be easily designed away.” (Costanza-Chock, 2020, p. 190). This is seen as a tension between attempting to overcome long-term structural inequalities in society while also making something sustainable and valuable for existing users in the present moment.

There are many examples of deeper issues in digital technologies. When technology is designed for the most highly profitable groups of people, this can produce “a spiral of exclusion as design industries center the most socially and economically powerful users, while other users are systematically excluded on multiple levels.” (Costanza-Chock, 2020, p. 77). There are many cases of unintentional harm, especially through the use of biased data sets which are used in machine learning techniques (Costanza-Chock, 2020). Even inclusive approaches such as involving users in the design process can become “extractive” at their worst (Costanza-Chock, 2020, p. 87). In some cases, when data or ideas are collected from users, the majority of the benefits - “products, patents, processes, credit, visibility, fame” - end up back in the hands of the design firms or organizations (Costanza-Chock, 2020, p. 90). It can also be easy for developers and designers to come into a community with a techno-solutionist perspective. In other words, technology can be seen as a quick fix to deeper problems. Incoming tech start-ups get to decide “what tools are considered “cool,” without much consideration for community context or the broader implications of their preferred approach.” (Costanza-Chock, 2020, p. 98).

However, as with many other fields in the United States, people are coming together to fight for change. As one advocate for social justice in design says, “there is a long history of politically engaged scientists, technologists, and designers” (Costanza-Chock, 2020, p. 215). Especially in light of recent developments in the field of AI, institutions have begun to offer an increasing amount of technical ethics classes (Costanza-Chock, 2020). Studies show the importance of transparency of the design process along with diverse perspectives within an organization. Including new voices in the design process and encouraging new thought processes can be beneficial to organizations. In fact, some studies even show that, “Racial and gender diversity are linked to increased sales revenue, more customers, and greater relative profits.” (Costanza-Chock, 2020, p. 75). However, greater acknowledgement of social injustices is just the first step. How can professionals in the edtech industry address these challenges?

Due to the many rapid advancements in technology, researchers from many fields have created theories through which to conceptualize the implications of these technologies. In the fields of social justice, technology, and education, there are many key theorists who have been working for years to address the complicated relationship between these interconnected disciplines. Some influential concepts and theories include those of Design Justice, a movement focused on “liberatory experiences, practices, and tools” in the design process (Design Justice Network, 2024); Data Justice highlights the “relationship between data and social justice” (Dencik et al., 2018, p. 9); Participatory Action Design is an approach that emphasizes “ the inclusion of end users throughout the product development process.” (Costanza-Chock, 2020, p. 182); Critical Community Technology Pedagogy “demystifies systemic power inequalities [and] results in transferable skills” (Costanza-Chock, 2020, p. 181); Data Feminism proposes “an intersectional feminist approach to the pedagogy of data science, grounded in values of equity and co- liberation.” (Costanza-Chock, 2020, p. 182); Radical Digital Citizenship is an approach in which “critical social relations with technology are made visible and emancipatory technological practices for social justice are developed.” (Emejulu & McGregor, 2016); Digital Degrowth is an approach that “reimagine[s] sustainable forms of education technology" (Selwyn, 2023, p. 4). These are only a few of many theoretical foundations in the field of edtech.

Some practitioners argue that these theories are not practical or realistic. A design justice advocate answers this question saying, "if resource constraints become an excuse to avoid examining the root of the problem area, then designers will almost always end up, at best, providing Band- Aids for deep wounds and, at worst, actively serving existing power structures." (Costanza-Chock, 2020, p. 220). Researchers share another approach which is "to engage in parallel pragmatics/utopics" (Costanza-Chock, 2020, p. 220). This would involve "systematically and explicitly develop[ing] radical, or utopian, design solutions within the context of each design project, either at an early stage (during ideation) or alongside and in parallel with the pragmatic design product." (Costanza-Chock, 2020, p. 220). I advocate for this approach as it acknowledges the importance of theoretical foundations and realistic processes. There is a need for both theoretical underpinnings of social justice within the development of educational technology, along with a pragmatic approach for the here and now. There is space for both large-scale and long-term theories of change along with practical methods and practices that can be used by practitioners. While I acknowledge the importance of both approaches, this study will focus on pragmatic day-to-day approaches that can be applied in the creation of technology.

I propose that there is a need for additional guidelines and practical methods for designers and developers of edtech. Reeves (2005) argued that rather than focusing solely on theoretical knowledge, "our paramount goal of research should be solving teaching, learning, and performance problems, and deriving design principles that can inform future decisions." (p. 50). Though guidelines have been developed in the past, there is a continuing need for updated approaches that are flexible and responsive to the cultural, social, and political environment. Many past and present practices have led to current standards for designing and developing technology today. Theories of Human-Computer Interaction (HCI) first rose with the daily use of personal computers (Gray, 2020). This field was solidified through the "shared interest among cognitive psychologists, computer scientists, and human factors engineers.” (Gray, 2020, para. 6). The field of Learning Design and Technology (LDT) also has a long history in relation to edtech (Gray, 2020). The shift to human centered design (HCD) and user experience design (UXD) has prompted a shift from the more traditional approach of instructional design, which is focused on the effectiveness of content, to more user-centered approaches such as learning experience design. It is important to note that there is not one approach that is superior to the others. However, it is critical for practitioners to be familiar with a variety of frameworks. Industry professionals must have “an adequate repertoire of strategies available, and possess the knowledge of when and why to employ each.” (Ertmer & Newby, 2013, p. 44). Some design standards have already made significant advances in supporting social justice, such as the Americans with Disabilities Act in the United States, which focused on the implementation of accessible design (Costanza-Chock, 2020). Creating additional tools and guidelines gives designers an opportunity to evaluate their products and see them through an intersectional lens.

Many researchers and consumers have called for more “socially-sympathetic” and “user-respectful” approaches in the creation of edtech (Selwyn, 2019, p. 16). Education is increasingly focused on the wellbeing of the student. Rincón-Gallardo (2020) shared, “the new paradigm of education is about igniting the innate capacity of every human being to learn and change the world.” (p. 475). Though it can be easy for organizations to claim the use of equitable and just practices, these practices cannot be seen simply as a “cure-all” (Busch & Palmås, 2023, p. 114). This study seeks to go beyond performative measures of inclusivity and equity to find realistic approaches for developers and designers to apply in the responsible creation of edtech. Though some organizations may use performative measures, there are still many methods that have the potential to lead to more intentional and responsible educational technologies. Researchers echo this argument saying, “Although design practices today too often systematically reproduce the matrix of domination” or in other words, oppressive and structural inequalities, “there is a growing community of design justice practitioners: people and organizations who work on a daily basis to leverage the power of design for collective liberation and ecological sustainability." (Costanza-Chock, 2020, p. 236). Rather than merely taking a top-down approach, it is important to listen to these practitioners and experts in the field to learn from their experiences. This study draws on these ideas to provide a deeper understanding of the design process of edtech through the lived-experience and perspective of professionals in the field.

In this study, I will analyze methods and practices used in the creation and implementation of educational technology using relevant theories and frameworks with an emphasis on Learning Experience Design (LXD). LXD is an approach that builds on previous frameworks such as human-centered design, user experience design, and instructional design (Learning Experience Design, 2024). In my research, it is applied as a set of overarching concepts to bring together several methods and practices. LXD can be used as a "roadmap to guide the development, analysis, and refinement of learning designs." (Bowen et al., 2020, p. 69). It has been described as a way to "bridge the gap between creative design disciplines and the field of learning. It offers a refreshing view on how to shape the way we learn by applying the perspective, methods, skills, and tools of a designer." (Learning Experience Design, 2024). It is important to acknowledge that methods such as LXD alone do not guarantee a successful outcome. The intent and, more significantly, the approach are equally as important as the method itself. The term 'success' can be ambiguous. In this study, I focus on success as any development process intentionally applying inclusive and responsible approaches focused on diverse groups of users. It should also be seen as an iterative process that is constantly adjusted and improved upon rather than merely a perfect outcome. Because of the diverse needs of users which are constantly shifting due to social and cultural influences, I argue that rather than focusing on creating a universally 'successful' outcome, edtech developers should have a strong understanding of effective frameworks to guide them in successful approaches and inclusive practices within their own context and for their own specific users. I chose to focus on LXD in this study as it is an overarching concept that encompasses many current approaches used in the development of educational technology. While LXD should not be seen as an exclusive or singularly effective approach, it can be used as a beginning framework to guide in the design and development of edtech. It remains flexible and can be adapted according to the needs of the developers and their users. There are many examples of the harm of believing too-fully in a single method or practice. LXD encourages an interdisciplinary approach that pulls from many theories and frameworks from multiple areas such as those of Instructional Design and UXD mentioned above.

I argue that applying frameworks such as LXD can help responsible designers avoid pitfalls and common mistakes made in the development of edtech. For example, it can be easy for organizations to claim to use these methods without any true intentions to create inclusive products. While the practice of corporate social responsibility (CSR), or a commitment to addressing social and environmental issues, is increasingly popular in the United States and in other countries, there are many complaints about these practices (Wu et al., 2020). These criticisms often center on the industry's "focus on salient aspects of CSR and negligence of the unobservable aspects." (Wu et al., 2020, p. 3095). In other words, it can be common for organizations to claim socially just or sustainable practices as a way to maximize profits. In the edtech industry it can be easy to check off a box without really making a difference. In other cases, a designer might have positive intentions but may overlook deeper issues. Applying methods and concepts such as those related to LXD can provide designers with realistic approaches and practices to help them reach their goals.

Operationalizing equitable and just approaches can be a challenging and complex process. Researchers argue that this is "a key part of the nature of design." (Costanza-Chock, 2020, p. 202). There will always be barriers obstructing the way to an ideal vision of what technology can do. However, despite the challenges, many approaches are successfully being developed and applied every day in the creation of more socially responsible products. My research seeks to examine current approaches to designing edtech and how these approaches can be used responsibly in the development of equitable and inclusive edtech. I answer these questions by gaining insights from professionals in the edtech industry through the process of interviews. All participants were from an edtech organization based in the United States. It is a non-profit organization centered around an early-childhood literacy program. My research focused mainly on the internal roles associated with the program's development and design practices. Departments interviewed included participants involved in or with a knowledge of the following teams: software development, research, academic and curriculum, art, UX design, product management, equity and inclusion, philanthropy and strategic growth, events and training operations, government relations, community engagement and outreach, and family services.

The participants explained a variety of methods that they use in their daily work at the organization. They discussed details of the goals and aims behind their work, along with their own personal training and relevant background experience that informs their work in the field. Due to the diversity of positions and roles within the organization, a unique interdisciplinary perspective emerged. The participants shared multiple approaches used from the design to the implementation of the final product. These practices were then analyzed and organized by theme. The findings of the research are broken into four main categories of focus. Methods and practices that are: human-centric, theoretically grounded, informed by UX design methods, and socio-culturally sensitive. Each of these areas will be discussed further and analyzed in detail along with a variety of examples shared by the participants. Finally, while interviewing participants, several key approaches stood out from the others. Participants shared the importance of viewing equitable design through two lenses – that of the end user and that of the person building the product. These approaches are especially relevant in answering the question of how these methods can be used in the development of equitable edtech. These key findings will be shared in greater depth throughout this study. This work draws largely from the framework of Learning Experience Design (LXD) and other current theories related to the development and design of edtech which will be discussed more fully in the following section.

Literature Review

Overview

As educational technologies have continued to advance, methods for developing, designing, and implementing those technologies have also evolved. This chapter will explore the evolution of human-centered design by examining the recent shift from Instructional Design to the newer, and perhaps more relevant, concept of Learning Experience Design. McMahon & Walker argue, "If we are going to effectively leverage new technologies to design an inclusive future, we must start by being more inclusive educational designers. It is important that we gather a diverse group of developers, teachers, administrators and students to create meaningful learning experiences together." (2019, p. 86). Learning Experience Design (LXD) goes beyond the traditional Instructional Design methods of optimizing learning strategies and focuses instead on interdisciplinary methods and theories with the goal of creating empathetic, inclusive, and equitable design models for educational technology. The framework of LXD takes into account current concerns of inequality and injustice in the creation of edtech and attempts to provide methods and practices to address those challenges. There are many other approaches and frameworks with similar goals, such as Universal Design for Learning, User Experience Design, and Design Justice. However, I chose to focus on LXD as it is an interdisciplinary model that encompasses many elements of these frameworks while remaining flexible in its interpretation. It remains especially flexible, as its full definition is still being explored and adapted. It encourages developers and designers to pull best-practices from current frameworks and industry fields such as those mentioned above.

The aim of this study is to address the gaps in literature on the perspectives and application of learning experience design (LXD) elements in the context of educational technology. This study was designed in hopes of expanding on current research of the implementation of pragmatic approaches in the creation of equitable and inclusive digital educational programs and platforms. LXD is still a relatively new concept and there is ample room for further exploration in the field. This section will begin with a history of Instructional Design and an examination of the emergence of Learning Experience Design (LXD) in recent literature. Elements of LXD will be explored more fully, including Universal Design for Learning, User Experience Design, and the Design Thinking Process. Finally, recent literature exploring the future of LXD will be studied and discussed in more detail. My analysis will focus on the potential benefits of using the Learning Experience Design framework when developing and designing new educational technology.

Instructional Design

Korkmaz defines instructional design as the “careful planning, regulation, and assessment of learning activities” (2018, p. 2). Instructional design dates back to the 1940’s and is grounded on theories of learning and human behavior (Korkmaz, 2018). Instructional designers were given the task of “translating principles of learning and instruction into specifications for instructional materials and activities.” (Smith & Ragan, 1993, p. 12). Over time it has evolved with the introduction of new theories and ideas. For example, the paradigm of constructivism focused on active participation in knowledge construction. Constructivism has often been a prominent concept in literature on Instructional Design (Ertmer & Newby, 2013). Theorists such as Piaget and Vygotsky have played influential roles in shaping contemporary theories of learning (Korkmaz, 2018; Saleem et al., 2021). For example, Vygotsky’s Zone of Proximal Development has impacted the way instructors design curriculum. He believed that with additional support (adults, peers, or from a current perspective, computers) learners could complete tasks they could not have done on their own (Saleem et al., 2021). Instructional design has also been impacted by the development of digital technology. Online learning environments and distance learning have become commonplace. Now, instructional designers are expected to create interactive, personalized learning environments for students through online learning platforms (Korkmaz, 2018). Researchers claim that in recent years, the term “instructional designer is usually connected with e-learning authoring.” (Korkmaz, 2018, p. 2). E-learning has opened up the world of learning.

There are now countless educational tools available which has led to a shift in instructional design. In the world of online learning many instructional designers are now expected to create quality learning materials while also presenting it in an effective way through technology.

With the introduction of so many new digital technologies there are also many new pitfalls. While some have described the current field of instructional design as "Imagine the possibilities!" researchers claim there is now an even greater need for empathy in the design process (Korkmaz, 2018, p. 4). With the rapid increase in technology there has emerged a greater need for human-centered design (Schmidt et al., 2020). Designers are beginning to recognize the importance of understanding the learner and the learner's needs rather than just making assumptions (Schmidt et al., 2020). In the past, instructional design was centered on the content rather than the user. However, technology has changed the learning landscape by offering options for individualized and self-paced forms of learning. With the rise of personal devices such as laptops and cellphones, there has been a greater push for more user-centered design. This has also translated into the field of education. Schmidt et al. state, "knowledge of needs alone is insufficient to design highly usable and pleasing learning environments." (2020, p. 25). Because of this greater emphasis on human-centered and user experience design, the field of learning design has begun to move away from the term instructional design (Mor & Craft, 2012). Researchers argue that "educational technology must be of secondary concern to the people" (Garcia & Lee, 2020, p. 257). Rather than focusing on the materiality of learning and educational content, there is now a push for recognizing the impact of human and computer interactions (Schmidt et al., 2020). Individuals are encouraged to question "what equity-centered approaches to educational technology could look like." (Garcia & Lee, 2020, p. 247, p. 247).

Institutions worldwide are giving priority to inclusion and equity (Ferguson et al., 2019). Many recognize the opportunities and challenges presented with the advancement of technology. With this, there is greater recognition that new, inclusive strategies must be implemented, especially with advancements of tools such as, "robotisation, automatisation, artificial intelligence and immersive learning." (Mcmahon & Walker, 2019, p. 75). There is a growing awareness of the pitfalls and issues with educational technology. For example, the socio-cultural disparities and the potential exacerbation of inequalities through the use of biased data sets or techno-solutionist perspectives. Many researchers and individuals are now advocating for more inclusive and equitable uses of technology. They advocate for social justice in the collection and use of data, fight against exclusionary design, and call for more sustainability in the process of creating technology (Emejulu & McGregor, 2016; Taylor, 2017; Dencik et al., 2018; Perrotta, 2022; Davies et al., 2023; Selwyn, 2023). There is a stronger focus on supporting students with differing needs, backgrounds, and disabilities (Ferguson et al., 2019). New design approaches aim to "provide learners with pleasing and effective digital learning tools that are easy to use and that efficiently propel them towards their learning goals (Schmidt & Huang, 2021, p. 141). However, a desire to be inclusive is only the first step. Ferguson et al. state, "In the USA, the challenges of racial, ethnic and disability-related discrimination continue to emerge and impact the educational systems, even with more than 40 years having passed since the passage of the *Rehab Act of 1973,* which first required equal access to education facilities and programmes for students with disabilities." (2019). In order to make a positive change, more equitable methods and frameworks must be adopted to create new educational technology. Institutions and organizations need support from educators, designers, policy makers and others to make these changes (Ferguson et al., 2019). More human centered approaches are needed. This push for a change has led to a shift in the field of instructional design to the more nuanced concept of Learning Experience Design.

Learning Experience Design

Learning experience design (LXD) "lies heavily on personalization/customization of learning and empathy." (Korkmaz, 2018, p. 4). The concept of LXD was first introduced by Niels Floor in 2007. He described it as "the process of creating learning experiences that enable the learner to achieve the desired learning outcome in a human centered and goal-oriented way." (Korkmaz, 2018, p. 5). In response to the cultural and economic concerns referenced above, Instructional Design is shifting to the more socially responsive framework of Learning Experience Design. LXD attempts to address current challenges by including practices that are more human centered, culturally responsible, and empathetic. This is encouraged through the use of methods involving user participation and feedback in the design process. It is important to acknowledge that there is currently no single comprehensive model defining LXD (Tawfik et al., 2022). However, in recent years, more effort has been put into creating a usable framework. Notably, in 2021 Schmidt and Huang attempted to provide a concrete definition of LXD in order to "guide the conceptualization and practice of learning design." (p. 149). In their research they found that the use of the term learner experience design "shows a steadily increasing trend in citations and publications, with a 17% increase in 2019 over the previous year." (Schmidt & Huang, 2021, p. 142). They also stated that there has also been a substantial increase in publications using related terms starting in 2015 (Schmidt & Huang, 2021).

In her work on the Rise of Learner Experience Design Kilgore (2016) states, "Courseware is enabling the development of new modalities and pedagogical shifts. An abundance of data now enables instructional designers to decode learning patterns. As a result, we are witnessing the growth of a new field: Learner Experience Design." (para. 3). It is important to recognize that the call for more socially responsible educational technology has also played a role in the growth of LXD (Selwyn, 2019). While traditionally instructional designers conveyed content through tools and platforms, learning experience designers "merge design-thinking principles with curriculum development and the application of emerging technologies to help faculty tailor content to student behaviors and preferences." (Kilgore, 2016, para. 5). LXD is focused more on the learner rather than the source of knowledge (Kilgore, 2016). Based on their research, Schmidt and Huang characterize Learning Experience Design (LXD) into four themes:

1. Human-centric: design centered on the experience of the learner.
2. Theoretically grounded: inspired and guided by theoretical perspectives.

3. Informed by UXD (User Experience Design) Methods: informed by UXD methods.
4. Socio-culturally sensitive: promotes an empathetic understanding of the socio-cultural context of the learner.

Korkmaz (2018) emphasizes that the core of LXD is empathy. Designers seek to explore challenges from multiple angles while prioritizing the emotional needs of the learners (Korkmaz, 2018). Chew et al. clarify that "learning technology users may include not only learners but also teachers, designers, system administrators, etc." (Chew et al., 2018, p. 153). LXD focuses on purposefully integrating many voices and perspectives. For example, collecting feedback and sharing the iteration process with the end users. Schmidt and Huang expand on the various applications by listing the following common approaches of Learning Experience Design such as co-design, participatory design, emotional design, universal design for learning, and contextual design (2021, p. 153). These approaches can be used to create more human-centered technology. For example, technology companies have applied methods of participatory design to create more inclusive products. These are methods that include participants in the design and development process. Other design approaches include intuitive design, pedagogical design, learner-centered design, user-centered design, and even color design (Schmidt & Huang, 2021).

However, it is important to approach these methods cautiously and thoughtfully. Some researchers warn, "designers must be careful how they utilize processes of participation, social innovation, and co-design. Processes of user engagement are not a panacea for producing socially beneficial outcomes." (Busch & Palmås, 2023, p. 111). They go on to share the risks of placing too high of expectations in social processes, warning that this type of focus often "masks the fact that such processes often fail to deliver equitable results." (Busch & Palmås, 2023, p. 111). It can be easy for companies to list equitable methods while failing to deliver beneficial outcomes. Regardless of the cause of these failures, some advocates state that this is an "urgent problem for developing more effective and equitable forms of public design processes." (Busch &

Palmås, 2023, p. 111). When writing about the pitfalls of performative participatory design, Sloane (2020) calls it “participation-washing”, a practice that could become a dangerous fad (p. 1). She emphasizes that methods such as participatory and co-design need to be more than just performative (Sloane, 2020). This calls for a thoughtful process where all groups involved in the creation of edtech continuously evaluate their practices and the way they collaborate with each other.

Elements of Learning Experience Design

LXD is considered to be heavily interdisciplinary (as shown in Figure 1). As noted in the introduction, it is informed by multiple perspectives and disciplines such as elements of instructional design, UX design, and even graphic design (Kilgore, 2016). Researchers argue, “The most successful LX designers today are delivering content that brings in outside influences to cultivate engagement.” (Kilgore, 2016, p. 3). This leads to a further discussion of influential elements and concepts impacting the framework of Learning Experience Design. These elements include Universal Design for Learning, User Experience Design, and Socio-Cultural-Sensitivity. Each will be discussed in more detail in the following sections.

Figure 1

The Interdisciplinarity of Learning Experience Design Model

Universal Design for Learning

The concept of Universal Design was introduced by architect Ron Mace in the 1970s (Connell & Sanford, 1999; King-Sears, 2009; Korkmaz, 2018; Varonis, 2015). The term was used to describe "the design of products and environments to be usable by all people." (Varonis, 2015, p. 151). The concept was originally applied in the fields of architecture and interior design to make physical spaces accessible to as many people as possible. While the term accessibility more generally applies to making accommodations for those with disabilities, universal design focuses on creating more usable environments for everyone, whatever their individual needs. For example, an automatic door can be helpful for a person with a disability, a parent holding a child, or even a customer carrying shopping bags. The goal of universal design is to "decrease the need for individual accommodations" and in the process make the space more user-friendly overall (Varonis, 2015, p. 151).

While the concept of Universal Design was initially used in the field of architecture, it has since been applied to other fields, including education (Korkmaz, 2018; Novak, 2022). In the 1990s Rose and Meyer extended the concept to that of Universal Design for Learning (Meyer et al., 2014). They relied on similar techniques with the goal of "encouraging educators to design learning environments that will accommodate all students and maximize their opportunities for success, as much as possible without the need for individual accommodations." (Varonis, 2015, p. 151). Rather than focusing just on physical environments, universal design for learning (UDL) recognizes the significance of a learner's interactions with educational methods and materials. Ferguson et al. (2019) describe it as a framework "used to address the diversity of student learning needs." (p. 4).

An example of UDL could be providing learners digital access to learning materials. With digital materials, they can then access countless tools such as text-to-speech, translation tools, and more. Though UDL may seem to make the learning less personalized, Korkmaz (2018) argues that the experience can still be customized to the learner. In fact, removing as many barriers as possible means that more time and detail can then be spent addressing any additional personal needs. UDL helps to create a flexible learning environment by providing "multiple means of presentation so learners can access content in a variety of ways, multiple means of demonstration of mastery, and multiple means of encouraging engagement." (Varonis, 2015, p. 152). The framework can be used to scaffold instructional practices, in reference to Vygotsky's pedagogical theory of learning (Mcmahon & Walker, 2019). UDL can be used as an effective framework for building inclusiveness into education (Ferguson et al., 2019). Achieving equal rights is seen as a priority in the United States and "the practice of inclusion is now widely supported throughout public education systems and beyond." (Ferguson et al., 2019, p. 2). In the 1990s CAST, Inc. developed the UDL framework for instructional design which has been increasingly influential on educational policies in the United States and internationally (Ferguson et al., 2019).

User Experience Design

Another important aspect of LXD is User Experience Design (or UX Design), a term coined in the 1990s by former Apple vice president of advanced technology, Dan Norman (Kilgore, 2016). He was an advocate for putting the needs of the user first when developing technology. User Experience can best be described as “the relationship between a product and a human.” (Kilgore, 2016, p. 1). Others add to this definition by describing UX as “the meanings, behaviors, perceptions, affects, insights, and social sensibilities that arise in the context of interaction and its outcomes” (Bardzell, 2011, p. 606). As new technologies continue to emerge, the focus has shifted from the content and information online to the experience and needs of the user. User Experience Design is now one of the fastest growing fields in the United States (Kilgore, 2016).

When creating new technology, many companies and organizations underestimate the importance of user experience. However, the way a user interacts with technology is key to the success of the platform or program. Schmidt et al. state that “highly usable user interfaces are easy for users to become familiar with, support users achieving their goals, and are easy to remember” (2020, p. 22). So how does this relate to learning design and educational technology? Schmidt et al. go on to claim that “there is a need to more intentionally bridge learning design and user-centered design approaches to support positive learner experience in digital environments.” (2020, p. 25). Learning design should use principles based on user-centered design methodologies, that are informed by pedagogical and human-centered design theories. They recommend starting with basic UX principles, such as “identifying learning needs, ideation and prototyping, rapid prototyping” (Schmidt et al., 2020, p. 25). Many UX methods are used to influence LXD practice such as co-design, cognitive walkthrough, think-aloud, and participatory design (Schmidt & Huang, 2021).

Though UX is relevant in many fields, it is important to know how to appropriately apply the principles. Quintana et al. (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” (para. 6). In other words, UX Design principles must be adapted to fit into the context of learning design. Jahnke et al. (2020) use the term *sociotechnical-pedagogical usability* to argue that educational technology should be evaluated based on (a) social dimension, (b) technological dimension, and (c) pedagogical dimension (p. 2). This requires a new thought process and framework for viewing technology. This leads to the concept of Design Thinking. Closely related to UX, Design Thinking is a model and mindset focused on Human Centered Design. The concept became more popular when Tim Brown, chair of the global design company IDEO, published the book *Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation* in 2009 (Korkmaz, 2018). Design thinking is about “being aware of the world around you, believing that you play a role in shaping that world and taking action toward a more desirable future. It is human-centered, collaborative, experimental, and optimistic.” (Riverdale Country School & IDEO, 2012).

Socio-Cultural Sensitivity

Woven into UX Design and LXD is the foundation of socio-cultural sensitivity. There is a growing push for more empathetic understanding of the context of the learner. One LXD theorist 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” (Gray, 2020, p. 10). This type of approach is critical since it is unlikely that a learning design team will ever have a broad enough socio-cultural perspective to truly understand every learner’s experience (Schmidt & Huang, 2021, p. 150). In their work on LXD Schmidt and Huang emphasize the central role of empathetic understanding to questions of equity (2021, p. 150). Methods have been developed to help designers in “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" (Raza et al., 2020, p. 5). Some common methods used in the UX process include (a) development of personas, (b) participatory design, and (c) co-design (Schmidt & Huang, 2021, p. 150).

Conclusion

Learning Experience Design is an interdisciplinary concept that encompasses elements such as Universal Design for Learning, User Experience Design, and Socio-Cultural Sensitivity. According to recent literature, there is an increasing interest in LXD, however, "terms and concepts related to LXD have not been clearly defined [...] Rapid evolution is common in the field of LDT [Learning Design Technology] but can present challenges in establishing common definitions and terminology" (Schmidt & Huang, 2021, p. 142). Tawfik et al. state that "To date, no single comprehensive model has empirically defined the critical elements of learning experience design. Furthermore, research has yet to explore how design decisions for these technologies may facilitate or inhibit learning." (2022, p. 310). In their work, Schmidt and Huang have attempted to establish precedent for LX designers related to "terminology, specific methods, design approaches, theories, and perspectives on learning." (2021, p. 153). They have laid down a foundation for others to build frameworks and guides for practitioners. They state that there are still many opportunities for others to continue contributing to the field and they encourage further exploration and clarification to the practice of LXD (Schmidt & Huang, 2021). Schmidt and Huang state that their research should serve as a "signpost for future researchers seeking further clarity in terms and concepts related to the emerging focus area of LXD." (2021, p. 153).

Based on the rapid progression of educational technology, Korkmaz (2018) claims that LXD will continue to be increasingly relevant. Though the concept of LXD is still emerging, its underlying elements are critical in the growing field of learning design. There are rich fields of research in the areas of instructional design, universal design for learning, user experience design, and socio-cultural responsibility. LXD should not be simply seen as a "patchwork of borrowed influences but instead as a distinct, cohesive expression of learning design." (Schmidt & Huang, 2021, p. 153). LXD is "greater than the sum of its parts." (Schmidt & Huang, 2021, p. 153). As such, there is still work to be done in further exploring the application of LXD in learning technology today. Kilgore states that as the jobs of LX designers become more complex, they must be ready to "rise to the challenge." (2016, p. 4). With this foundational understanding of Learning Experience Design, my research will use the frameworks and elements provided above to further understand the application of LXD in the development and design of educational technology. The findings presented in this study are focused on the following research questions:

- What methods and practices are being used to create equitable and inclusive edtech through the lens of Learning Experience Design (LXD)?
    - What additional methods and practices are being used *aside from* elements of LXD?
- How can these methods be used to improve the development of inclusive and equitable edtech?

Methodology

Overview

In order to gain a deeper understanding of the elements and application of LXD, responses were collected from professionals in the educational technology (edtech) industry through the qualitative method of interviewing. Data from participants' answers was analyzed in relation to multiple elements of LXD discussed previously (e.g., universal design for learning, user experience design, socio-cultural sensitivity, etc.). The data was then coded to examine reoccurring themes and to develop a detailed understanding of common methods used to create equitable educational technology. The following sections will discuss the theoretical foundations of the methods used in this study, the sample, process, and analysis of the research. Limitations to the study will also be addressed.

Grounded Theory and Constructivism

The research methods utilized in this study are based on the foundation of grounded theory and constructivism. These theoretical underpinnings were employed as a foundation for both the interview process as well as the process of coding and analyzing the data. Charmaz describes grounded theory as, “a systematic way to support theory development, especially for qualitative data. This approach calls for the development of unique categories based on the data. I chose this approach because there is very little theory previously established for LXD. Roulston emphasizes the importance of “remaining open to what is in the data, rather than simply applying concepts imported from the literature.” (2013, p. 14). Applying this advice allowed me to remain flexible in my approach and search for additional elements and concepts that I had not previously considered. I also applied principles learned from the concept of constructivism. First introduced in the 1960s, the theory of constructivism is described as the notion that learning comes through experiencing the world and then reflecting on those experiences (Saleem et al., 2021, p. 405). Or in other words, “content is not pre-specified; information from many sources is essential.” (Ertmer & Newby, 2013, p. 1993). Using these principles, I was able to learn and develop new ideas while discussing methods and practices with participants involved in the study.

Semi-Structured Interviews

Observing and interviewing have become fundamental activities for understanding society (Edwards & Holland, 2013; Atkinson & Silverman, 1997). Interviews are often used to provide insight into “social processes, practices, and events.” (Edwards & Holland, 2013, p. 90). This makes interviewing especially relevant for researchers, policy makers, and practitioners in the edtech industry. Based on this knowledge, I chose to conduct semi-structured interviews. I used a deductive approach to structure the interview questions because it allowed for further exploration of known elements of edtech design while also allowing for the emergence of new ideas and methods. Current elements of LXD were discussed in the interview, however, the questions remained open-ended and gave room for further exploration of new perspectives and ideas from participants. The interview questions were used to gain a greater contextual understanding of the participants' roles in the organization and their perspective of overall goals of the company. This was to provide a more holistic view of their motivations and expertise in the process of designing and implementing educational products. Finally, the majority of the interview was spent discussing methods and practices used in the development and design of edtech. Elements of LXD were used to guide the conversation but the questions were left semi-structured to encourage reflection on additional insights from participants' own experiences.

Edwards and Holland describe interviews as "a social and potentially a learning event for both participants." (2013, p. 3). The questions were open-ended for the purpose of gaining a better understanding of methods and practices that are realistically being applied in the edtech industry. Some of the methods and frameworks participants described were unfamiliar to me as the researcher, so the interviews provided many opportunities to learn and gain further insights into the development of edtech. My main goal as the research was to develop a deeper understanding of the procedures and choices imbedded in the day-to-day design process. As discussed above, literature has shown that interviews are an effective qualitative tool for understanding the perspectives of participants. Participants were specifically asked to share experiences and insights from their own role within the organization. The goal was to produce an overarching, interdisciplinary view of the development of edtech.

The Sample

All participants involved in this study were from a non-profit edtech organization based out of the United States. This was a purposeful sampling, or, in other words, the sample selection in this study was made on "the basis of relevance for [my] theory in order to produce a sample that will enable [me] to develop theoretical ideas that will be emerging in an iterative process between [my] theory and [my] data" (Edwards & Holland, 2013, p. 6). Seven participants were interviewed over the course of the study. The sample size was purposefully kept small to ensure the richness and depth of data. Researchers suggest that the number of participants in a study must be carefully considered, so as not to be overwhelmed by too much data (Edwards & Holland, 2013). I had a previous contact in the organization and all other participants were recruited through a snowballing method within the organization. Snowballing is the process in which one participant introduces the researcher to other participants with relevant characteristics for the study (Edwards & Holland, 2013, p. 6).

The choice of the organization was very intentional. As researchers state, "probability samples are very rarely achieved (or achievable) in social science […] whom you research and interview is totally dependent on the nature and design of your study." (Seale, 2004, p. 406). With this mindset, I chose an organization with goals aligning with the nature of my project. I was previously aware that it was a non-profit organization with the goal of creating equity in education. I reached out with the aim of connecting with as many teams and disciplines within the company as possible. I wanted to interview participants from an organization with clear goals and established frameworks. This was done to provide a solid foundation for my research. The aim of the study was to examine elements of LXD that were already being used in the development of edtech as well as additional elements and concepts that might prove beneficial for the future of equitable edtech.

Because the sample size was kept small, each participant played a vital role in the process. Every participant came from a different position and discipline within the organization (e.g., development teams, design, research, academic and curriculum, directors, product management, equity officers, etc.), with each holding unique responsibilities and working on different teams. This was done in order to build a diverse understanding of the sample group being interviewed. The variety of the sample group also added validity to the study by offering multiple, interdisciplinary perspectives. Because of their positions the participants each had a very comprehensive understanding of the practices and methods used by their teams within the organization, or in the words of Patton (2002), they each offered an “information-rich perspective” (p. 3).

Talking to participants from so many disciplines gave me a very well-rounded understanding of the process of developing and designing edtech within the organization. It is relevant to note that I refer to the interviewees as ‘participants’ rather than ‘subjects’ (Edwards & Holland, 2013). This is intentional, as the participants in my research were meant to take an active part in teaching and informing me of methods and practices I had not previously considered or studied. This is in line with the goals of this study, which seeks to offer insights into the correlation between the elements of LXD and the real-life implementation and creation of educational programs.

The Process

The interview began with a brief description of the study and participants were encouraged to share as much as they could from their own personal perspective (or team perspective) within the organization. They were also encouraged to share any examples from other teams in the organization if they felt it was relevant. Due to the location, the interviews were hosted virtually using Microsoft Teams. With participant consent, all interviews were recorded and transcribed automatically through the Teams platform. The interviews were typically no longer than 30 minutes. Pilot questions were developed to be tested on other researchers and students in the field. One pilot interview was conducted on a professional working in the edtech industry. This was to ensure the timing and clarity of the interview. Questions were designed to keep the interview on-topic while also giving participants the flexibility to share their own perspectives and ideas. The intent was to first discover best-practices and frameworks that were already in place and then explore how they might relate to additional elements of LXD listed below.

Table 1

Interview Questions and Purpose of Questions

Participants were asked the following questions:

INTERVIEW QUESTION	PURPOSE OF QUESTION
1. GIVE A BRIEF SUMMARY OF YOUR POSITION/ ROLE IN YOUR ORGANIZATION. DESCRIBE ANY RELEVANT BACKGROUND TRAINING OR EXPERIENCE THAT LED TO THE POSITION.	THIS QUESTION WAS CHOSEN TO GIVE CONTEXT TO BACKGROUND OF EACH PARTICIPANT. IT PROVIDES DETAILS ON EXPERIENCE, TRAINING, AND EDUCATION THAT MAY HAVE LED THEM TO USE SPECIFIC FRAMEWORKS AND METHODS IN THEIR CURRENT WORK.
2. WHAT DO YOU SEE AS THE OVERALL GOALS OF YOUR ORGANIZATION?	THIS QUESTION PROVIDES CONTEXT AND A DEEPER UNDERSTANDING OF *WHY* PARTICIPANTS MAY CHOOSE TO USE SPECIFIC METHODS AND PRACTICES IN THEIR WORK.
3. WHAT ARE THE METHODS/PRACTICES USED IN YOUR ORGANIZATION TO CREATE EDUCATIONAL TECHNOLOGY THAT IS INCLUSIVE, EQUITABLE, AND USER-FRIENDLY FOR ALL USERS/PARTICIPANTS?	THIS QUESTION WAS DESIGNED SPECIFICALLY TO ANSWER THE RESEARCH QUESTIONS IN THIS STUDY. THE BULK OF THE INTERVIEW WAS FOCUSED ON DISCUSSING THIS QUESTION. IT ALLOWED FOR AN OPEN CONVERSATION ABOUT COMMON METHODS AND PRACTICES USED IN THE ORGANIZATION ALONG WITH DETAILED DESCRIPTIONS OF HOW EACH METHOD WAS IMPLEMENTED.

The first two questions were kept short and used to provide context for the remainder of the interview. The third question was then covered in more depth. As a follow-up to the third question, if the topics below weren’t covered in their initial answer, participants were then asked if they used any methods related to the following:

Table 2

Descriptions of terms related to LXD approaches adapted from the work of Schmidt and Huang (2021, p. 148).

Method or Practice	Description
1. User research and feedback	User surveys, feedback from the parents and children on the success of the program, informal conversations, focus groups, etc.
2. Co-design or participatory design	Involving participants in the design of the program by working with users throughout the development process to best meet their needs.
3. Collecting user data	Using participant's personal data to inform the development of the program. This also includes the data collected throughout the use of the program to create a more personalized learning experience.
4. Theory and research-based methods	Awareness of best practices in the field by keeping up with current research. Understanding of relevant frameworks, pedagogies, theories, recent studies, etc.
5. Inclusive, universal, or accessible design	Using frameworks as guidelines for development and design. Examples include standards for web accessibility, universal design for learning, and inclusive design. This is also related to User Experience Design (UXD).
6. Design thinking	This is an iterative design process with set steps and guidelines for developers to follow.
7. Employee training (on any of the above topics, etc.)	Employee trainings can focus on anything from content specific, company-wide ethical trainings, onboarding, training in current trends and theory, conferences, trainings from outside organizations, or personalized professional learning.
8. Other	Any other methods or practices you have used (or seen others in your organization use).

This list provided in Table 2 was created based on frameworks of LXD. The elements were adapted from the work of Schmidt and Huang's where they describe common LXD approaches and characterizations (Schmidt & Huang, 2021). Each element was described to participants more fully as needed. Before offering these examples, I made it very clear that these were only examples. Participants were first asked to elaborate on their own methods and experiences. The interview process was very open-ended, and I often asked follow-up and clarifying questions.

Coding and Thematic Analysis

Upon completion of the interviews, each transcription was reviewed thoroughly to ensure accuracy. The data was then coded using the software NVivo. Coding is a method used for analyzing qualitative data (Saldaña, 2021). Researchers describe a code as "a researcher-generated interpretation that symbolizes or "translates" data." (Saldaña, 2021, p. 6). Coding can be used to create meaning and find main themes in the data. I began the coding process first by analyzing the data according to the three interview questions but then used an iterative process to continue reviewing the data. I chose to complete a thematic analysis by searching for patterns and connections between ideas and analyzing how they developed into overarching themes. I found common underlying motivators for methods, such as empathetic design and socio-cultural responsiveness. These shared factors led to the emergence of several themes. A thematic analysis can be used to "capture both manifest (explicit) and latent (underlying) meaning." (Clarke & Braun, 2017, p. 1). I chose this method because it is a flexible approach that can develop through the coding process. It allowed for new information to easily surface and expand as it was related to learning experience design. Throughout the analysis, I avoided "forcing data into preconceived categories" (Roulston, 2013, p. 15). Instead, I looked for methods relating to LXD but also looked for new emerging practices and methods that I had not previously considered.

Throughout the interviewing and analyzing process, I remained reflexive in my work by considering my own biases and positionality in relation to the study and the participants. I remained aware that my own experiences could influence and affect my observations (Saldaña, 2021). Because of my history working professionally in the field of education, I recognized that I more easily connected with and understood the viewpoints of participants with similar backgrounds. We used common terms and language of the profession, and I had a more foundational understanding of the methods and frameworks that they used. For example, when the academic team members discussed elements of Universal Design for Learning, I had a solid understanding of the methods they shared. In comparison, when members of the product and development teams shared frameworks and guidelines that influence their work, I often had to ask more questions and do more research into the methods they described. My experience working in education was beneficial at times but was also a potential drawback as it led me to make assumptions about their perspectives and methods. To overcome this challenge, I attempted to gain a clear understanding of the position and role of each participant within the organization, regardless of their background. I asked each to clearly explain their methods and practices and asked clarifying questions when necessary.

Another element that needed consideration was my personal connection to the edtech organization being studied, which impacted my overall view of the success or failure of the methods used. Due to my previous interactions with the organization and its employees, I have a very positive view on the beneficial impact of their program and the honesty of their intentions to create an equitable product. However, my previous experiences with the organization were all from the front-facing, or customer side rather than the inner-workings of the various product and development teams. Due to these potential biases, I tried to remain aware that "a reflexive research practice does not end with the conclusion of interviews, but continues throughout the analysis process and writing-up of research findings." (Roulston, 2013, p. 16). Because of this, I attempted to keep the interviews as transparent as possible. Participants were sent an overview of the project ahead of time. I started each interview with an introduction to myself, the study, and a brief overview of what to expect during the interview. I made it very clear that I valued their personal experiences and wanted to learn what I could from their perspective and role within the organization.

Limitations and Opportunities for Future Research

It is important to note the limitations of my research and how I attempted to address any challenges. One limitation is the generalizability of the study. Due to the small sample size and lack of multiple organizations being involved in the study, it is impossible to make assumptions that the results can be applied universally. Ideally, for future studies, additional participants could be interviewed to gain additional insights from other edtech organizations with similar goals and roles. However, due to time constraints and participant responses, I chose to focus my research on one organization. Despite this, the rich perspectives from multiple disciplines and positions within the company were sufficient to offer valuable insights into common methods and practices used in the development of edtech. It is also necessary to consider the reliability of the participants' accounts. Many of the participants shared facts and statistics about the organization that were based on memory. Others shared frameworks and methods that they were less familiar with. Roulston (2013) pointed out that an "analysis of interview data is never really complete […] Thus any analysis is a partial representation of the data set." (p. 18). Based on this, it is important to note that my findings are only one interpretation of the data. However, I recommend that future researchers conduct further interviews in the edtech industry which may offer additional insights into follow-up questions for participants.

Conclusion

The methods and methodologies used in my research were all carefully considered in light of the aims of this study, which is to discover common methods used in the development of edtech along with how those methods can be used to improve the creation of equitable and inclusive edtech. Based on similar research published in recent years I found conducting interviews to be a relevant method for gaining insights and in-depth perspectives on the development of edtech (Schmidt & Huang, 2021; Tawfik et al., 2022). The underlying methodologies of grounded theory and constructivism along with a thematic analysis of the data allowed for construction of new knowledge and ideas through interactions with participants, as well as building upon the existing framework of Learning Experience Design (LXD). The semi-structured interviews created an open conversation about common methods and practices used in the development of equitable edtech. The interdisciplinary nature of the sample provided a rich depth of perspectives from multiple roles within an edtech organization.

Findings and Discussion

Overview

This section provides an overview of the findings of this study in addition to a discussion of each element. The aim is to answer the research questions presented previously by examining methods and practices described by participants through the lens of Learning Experience Design (LXD) and exploring how these methods can be used to improve the development of inclusive and equitable edtech (educational technology). Methods and practices used in the development of edtech are influenced by many factors, from the interests of edtech companies to economic benefits to political motivations. We are currently living in a "learning economy" where individual learning and economic growth are highly valued in society (Biesta, 2006, p. 177). However, voices calling for more equity and justice in educational technology have questioned whether these motivations are serving the "interests of particular nations, groups, classes, or companies" at the expense of others (Biesta, 2006, p. 177). Due to these concerns, researchers and activists advocate for design justice and "a richer socio-cultural view" of how edtech can be designed and implemented (Brown & Duguid, 1991; Willems & Hafermalz, 2021; Costanza-Chock, 2020). These perspectives and external influences have led to the development of new frameworks and methods such as the approaches that will be discussed in this section. These factors are all highly connected to elements of LXD which were discussed by the participants.

During the interview process, many approaches came to light that were used in the development of edtech. After completing the interviews, the data was categorized using a thematic analysis approach. The main themes emerged and were categorized into different methods and practices related to LXD. Using a deductive approach, the elements were condensed into four overarching categories influenced by previous research in the field of LXD: (1) Human-centric; (2) Theoretically grounded; (3) Informed by User Experience Design methods; and (4) Socio-culturally sensitive (Schmidt & Huang, 2021). These categories were used as they are relevant for answering the research questions presented in this paper. Schmidt and Huang present these four elements as foundational to the concept of LXD (2021). The following sections will first present the participants' perspectives on the goals of creating edtech and then discuss the four categories of design methods introduced above.

Participants' Perspectives on the Organization's Goals for Creating Edtech

Participants were first asked to share their perspectives on the organization's goal of equity in education, along with any other objectives from their particular roles within the company. The goals discussed by participants centered on empowerment, organization culture, lifetime equity, and educational value. These goals are examples of the focus on equity within the organization. They make apparent the underlying motivations of the participants and the goals that influence the approaches used within the organization. They provide context for the methods and practices applied in the development of edtech and will be discussed throughout the following sections in relation to specific approaches.

Methods and Practices Used for Developing EdTech

Participants were then asked to describe methods and practices they used within the organization to guide in the creation of educational technology. The following sections will examine the approaches described by participants and will go on to explore how they can be used to improve the development of inclusive and equitable edtech. Participants discussed a wide range of methods, some related to elements of LXD and others unrelated. After interviewing participants, key elements for developing edtech were identified and organized into the four categories introduced previously which are described in more detail below:

Table 3

Key Approaches for Developing Edtech

CATEGORY	DESCRIPTION	METHODS AND PRACTICES
1. HUMAN-CENTRIC	THE DESIGN IS CENTERED ON THE EXPERIENCE OF THE LEARNER.	EMPATHY, USER FEEDBACK, EMPLOYEE TRAINING
2. THEORETICALLY GROUNDED	DEVELOPMENT IS INSPIRED AND GUIDED BY THEORETICAL PERSPECTIVES.	THEORY-BASED METHODS; INCLUSIVE, UNIVERSAL, OR ACCESSIBLE DESIGN; UNIVERSAL DESIGN FOR LEARNING; EMPLOYEE TRAINING
3. INFORMED BY USER EXPERIENCE DESIGN METHODS	UXD METHODS ARE USED TO INFORM THE DESIGN AND ARE ADAPTED WITHIN THE LEARNING CONTEXT.	USER EXPERIENCE RESEARCH, DESIGN THINKING, UX DESIGN
4. SOCIO-CULTURALLY SENSITIVE	THE DESIGN PROMOTES AN EMPATHETIC UNDERSTANDING OF THE SOCIO-CULTURAL CONTEXT OF THE LEARNER.	PARTICIPATORY DESIGN, CO-DESIGN, EMPLOYEE TRAINING, INTERDISCIPLINARY COLLABORATION

Each of the categories above contains a variety of methods and practices. These methods can be used as guidelines for ethical approaches for developing edtech. The four main categories were chosen as they can be applied by practitioners in a variety of roles, such as design, development, content creation, product implementation, and more. In line with the grounded theory approach, this model remains flexible, as new elements and methods can easily emerge from further research and be added to each category. The subcategories of methods and practices evolved from the participants' answers and were influenced by several frameworks of LXD (Korkmaz, 2018; Tawfik et al., 2022; Schmidt & Huang, 2021; Kilgore, 2016; Floor, 2018; Floor, 2023). The approaches shared during the interviews will be described below along with examples and quotes from the participants.

Human-Centric

Human-centric designs are design approaches that are centered on the experience of the learner (Schmidt & Huang, 2021). Methods and practices related to this approach include empathetic design, community partnerships, and collecting user feedback. Multiple interview participants discussed the importance of human-centric design. This was also a common theme in their perspectives of the organization’s goals. Multiple participants discussed the organization’s goal to set both the students and caregivers up for success through family empowerment and engagement. The director of guided family services said, “We're all really passionate about trying to help each and every family ... so that they feel empowered, and they can move forward after [this program] and communicate effectively with their teachers moving forward...”. These participants were focused on giving children independence and confidence through the use of the literacy program. Their work aimed to provide parents with skills needed to help their child throughout their entire school experience.

Participant connected to the development team said that they attempt to recognize the needs of different groups in their communities by partnering with refugee agencies and the family services teams. They have partnered with the IRC (International Rescue Committee), because their centers are a place where many of their users who are refugees feel safe and comfortable. Partnering with organizations such as this provides them with the knowledge they need to better empathize with the participants and understand their situation. When needed, coaches will go to the homes of participants to help them troubleshoot and start the program. They will sit down with participants individually to set up their computers and teach them how to use the software. The director of guided family services said they really try to accommodate for families who don’t know the language, culture, or customs, “we try to just integrate ourselves and try to be inclusive in every way we can and make sure that they have the same opportunities as the kid down the road.”

Before hosting orientations and trainings for families, the events team will first talk to their contacts in the community to learn more about the needs of their users in that area. They will frequently adjust their trainings based on the needs of the community. The director of operations shared a simple example from one community they entered, “They told us that they have church on Wednesdays…so we don't do events on Wednesdays in that city because a lot of people aren't available”. They consider other factors, such as whether families have transportation to the venue and if there are certain locations they are more familiar with. They form connections and partnerships with other organizations in each area to better understand the needs of their users. The director of operations said, “That right there is us, bridging or leveling the playing field.” They provide equipment to families who don’t have it such as laptops, internet, and even in rare cases, they have installed solar panels onto trailers and homes to give the families electricity. Depending on their needs, each family has their own coach who checks in with them regularly or a support group with family engagement events.

Some participants mentioned using forms of user-feedback to inform their practices. This could be anything from user surveys to informal conversations. The coaching teams are in constant contact with parents and teachers about the program. One participant said, “[the coaches] have phone calls regularly with these families... and they've taught us things, because they've noticed patterns, or things with the families that they've worked with. So, it's kind of like it's a big team effort, right?” The curriculum and research teams analyze the end of year surveys from the families to see what changes they can make. The research team then shares the feedback with all of the teams. The product and development teams also receive input through an ideas portal where they get suggestions from the field. They meet monthly to discuss the feedback coming in. The organization as a whole introduced a set of guidelines they created based on parent feedback. It’s built from the feedback of hundreds of families telling them what they wanted in the program. The teams came together to analyze the results and create the model. The curriculum team and others use it as a guide or rubric when they are designing new content. The director of operations said that the events team also collects feedback directly from the families. She said it’s not a formal process, but "more organic conversations or things that I work in tandem with our community engagement team." After the events they will do an official satisfaction survey as well to provide more detailed feedback.

These examples all show a variety of ways in which an organization can apply human-centric design in their process. The methods focus on the needs of individuals and their communities. Based on my research into LXD and similar theories, human-centered design should be a foundational element of all edtech development. Without the human, the design of the edtech has no purpose. It is not enough to know the needs of the users. The designer must understand the user on a deeper level. This shifts the focus from instruction to "learner-driven construction of a human experience that is meaningful, engaging, and satisfying" (Chang & Kuwata, 2020, para. 9). In other words, they must have a more comprehensive understanding of the context of the learner, the tasks the technology is needed for, and the environment of the learners (Schmidt et al., 2020). Based on the findings of this study, these practices seem to be even more beneficial when combining multiple approaches and teams within the organization at once. For example, the combination of partnering with community groups and assigning users with personal coaches or engagement groups within the organization provides the user with a strong foundation of support both within the program and within their daily lives in the community. The interdisciplinary nature of the teams creates opportunities for designers and developers to gain insights from other teams into additional considerations for the product. And finally, collecting user-feedback provides the teams with a direct line of communication to the users themselves and allows more opportunities to hear the voices of those involved on both sides of the program. Overall, human-centric design can be used as an effective approach for creating edtech as it focuses on empathizing with the user and centering the product on their needs.

Theoretically Grounded and Research-Based Methods

Theoretically grounded and research-based methods are inspired and guided by theoretical perspectives and current research in the field (Schmidt & Huang, 2021). The participants mentioned multiple theoretical frameworks used by the various teams in the organization. The vice presidents and other leaders in the organization have the responsibility to keep track of current trends and research in their respective areas. The curriculum team and the equity and inclusion teams have created libraries of content and research repositories that are available for other teams to access and use as resources in their work. They also have a correlation team that ensures that they are meeting all the state and national standards for learning. Overall, there are many checks and balances to confirm their content has a solid foundation. The organization also partners with external advisor organizations to help oversee their program and verify their practices.

Most notably, each team uses theoretical and practical sets of guidelines or standards in their work. Those involved in the curriculum team emphasized, “all of our content … is based on the Science of Reading … So, it’s all designed based on actual research into how children learn to read. It’s incredibly research-based and then we do an incredible amount of research into the efficacy of the program.” The product team uses a product management and development framework called the Pragmatic Framework, a set of guidelines for building products from strategy to execution (Pragmatic Institute, 2024). The development team uses Agile Practices which promotes effective teamwork and management (Atlassian, 2024). The academic team references the Cultural Proficiency Continuum when reviewing old content and creating new activities. This framework focuses on moving beyond simply “tolerating diversity” to “transformative action for equity” (The Center for Culturally Proficient Educational Practice, 2024). They also use web content accessibility guidelines (WCAG) which provides practical recommendations for making products more accessible for users with disabilities. Participants say, this can be “anything from color contrast ratio” or “as deep as like the code base of your product.” Participants described it as a rigorous process that they apply when building their product.

One theoretical framework discussed in detail by multiple participants is that of Universal Design for Learning (UDL) which focuses on creating products that are accessible and inclusive to as many people as possible. Many participants referenced the organization’s goal of universal literacy. The senior director of product management discussed the following, “Our overall goals are universal literacy of course, because a child who can't read is more likely to have a poorer life experience, a lower income, more likely to be involved in criminal activity.” Other participants mentioned similar research about illiteracy, “Your likelihood of or your potential for lifetime earning decreases, and your likelihood of negatively encountering the criminal justice system increases.” These participants stated that based on these facts, they believed that their organization’s overall goal was universal literacy and creating content that is accessible and inclusive. In an attempt to reach these goals, the organization partnered with an external organization that came in and trained employees on basic UDL principles and gave them resources to use in the development process. The curriculum team uses a book series about UDL to guide their decisions. Everything they do is based on effectiveness, engagement, and efficiency. They gave examples, saying each activity should be proven effective for children’s learning and all content should meet best academic instructional standards. They’ve created an inventory of guidelines that they use to analyze the material they have created.

The organization also has its own research team. They have two roles, to support the work of other researchers in the field and to also do an analysis of their own program. They also keep an up-to-date inventory of the efficacy of the program. They have the role of researching best practices and communicating those with the other teams within the organization. They publish their own peer-reviewed research and conduct their own internal studies. One participant said, “We’re engaging in, I think it’s our fifth or sixth random control trial study.” They collect data from how the users interact with the program, as well as meeting with focus groups to see what they would like changed in the software.

These examples from interview participants demonstrate the value of using theoretically grounded and researched-based methods in the design process. I argue that it is essential for developers of edtech to base their creations on current research and theory. If they create new products based only on their own expertise and perspective, they will miss out on a rich depth of research that is built on years of experience by professionals and academics in multiple fields. If they choose to overlook the theoretical and research-based foundations they risk the mistake of creating a shallow product which, I argue, will be less-likely to produce equitable and sustainable results. The variety of theoretical frameworks the participants used within the organization provide a solid foundation and a promising future for equitable products. This should be an ongoing process. Researchers describe this saying, “New technologies naturally prompt changes to existing work and/or learning processes, structures, and cultures. Correspondingly, introducing new technologies into learning contexts necessarily influences learning processes; it is an interwoven, co-evolutionary manifestation of complex social, technical, and pedagogical interactions” (Jahnke et al., 2020, para. 5). Many theories and frameworks have been developed through years of experience and research and have been simplified to make the guidelines accessible and realistic for organizations to apply in their daily practices. One key takeaway is the importance of keeping up-to date with current research in the field and seeking to incorporate it into the daily practices of the designers. An in-house research team also provides extremely relevant information for the teams to analyze their own work and gain additional resources tailor-made for the situation.

Informed by User Experience Design Methods

Many User Experience Design methods were used by the organization in their development of edtech. UX Design methods involve applying design thinking perspectives to assess the usability of a product (Schmidt & Huang, 2021). The UX team is a breakoff of the product and development team and guides them in the design process. One participant said, “Accessibility falls a lot into the range of the UX team, so they use different tools and guides. You know, as far as what colors can be used on a screen […] How big buttons should be, where you can use text and shouldn't use text” The UX team helps with storyboarding when the development team is building a new activity. One participant described this saying, “We first do a prototype of it in a software called Prototype. There are other tools out there that do similar things like Figma. So, it looks and works almost exactly like the real game will.” The prototype is just the front-end template and doesn’t have all the plumbing behind it yet, so it looks and feels like it’s working and it’s easy to make changes and then build the actual program.

The researchers are testing activities regularly. They submit the feedback and reports to the products and development team. One participant said, “So, we literally get that direct feedback and try to incorporate it as soon as we can before we actually build it.” UX also works with the art and game architect to determine which of their ideas are feasible. For example, an idea for a new activity might take three months to develop, and another might only take the developers one week. One participant talked about the balance between wild new ideas and actually having the tools and time to make it happen. The teams work together to decide what’s achievable. The UX team analyzes data collected by the software to inform the design of the product. It helps them learn things such as, “where children are clicking on the screen, are the buttons too small? Do kids frequently click near it but not on it? It might indicate the buttons are too small for them.” They also test for other things such as color contrast. One participant mentioned using specific tools to ensure the contrast on the screen is high enough so that those with any visual difficulties, such as color blindness, can easily see what is being communicated.

A big part of UX design is understanding a diverse group of users. To do this, they will often develop for a specific persona. A UX persona is “a fictional user whose characteristics represent a specific user group.” (Schmidt et al., 2020, para. 14). When defining a problem, the designers use personas to gain insightful perspectives and avoid bias. In this case, developing for a specific young age group. The director of product management addressed this by saying, “So you define the problem, and you take it from the persona’s perspective. So, as an early learner I want to, you know, earn rewards and be motivated so that I finish my daily session in [the program]. So that's a problem that we want to solve. We want kids to be motivated.” With this in mind, the product team partners with the research team and UX team to do a lot of usability testing and assessing individual test questions to be sure the cognitive load is appropriate for the age of the children. Meeting with the children and caregivers along with developing personas in the design process helps them to recognize unseen issues with the product. The director of product management discussed this saying, when trying to solve the problem of how to motivate early learners, it can be easy for designers to stereotype the families using the program and make assumptions about why they aren't participating fully. However, she stressed the importance of taking a step back to fully understand the underlying reasons why different families might interact differently with the program. She points out that many differences between families are related to social justice. These are conversations that she often has with new employees to help them gain a new perspective of inclusive excellence in their design process.

The product management team hosts family listening tours or focus groups where they involve a range of families and educators across different demographic groups and discuss what resources and services are needed. They take input from these sessions to do two types of testing. They test for useability on the front end. For example, does the program work on an iPad as well as a laptop? And then they test for usability of the content. Does the activity effectively teach the content to the user? They use a primary persona to guide the development of the product. They pay attention to the motor skills of the children. "All of these are considerations that need to go into developing a product that is accessible for children ages 3-8. You know, oftentimes that requires talking directly to little kids. So, our research team does a lot of user validation, meeting with child caregivers and their child, asking them questions, making sure they understand the cognitive load." The development team will often make changes to the software based on feedback from these focus groups. For example, the characters in the program have recently been redesigned to be more engaging for children based on user research. The organization used feedback families to create five overarching guidelines for their development process: communication, academic content, relationships, expectations, and support.

Many of the participants referred to the organization's goal of lifetime equity. Implementing methods that focus on the experience of the user and their specific needs is one way to accomplish that goal. The organization is attempting to meet the needs of young children by providing them with access to educational resources and ensuring that the program is accessible for their age group and various backgrounds. Multiple participants mentioned research in the field by stating, "We know that the later you start to learn to read, the harder it is to learn to read, and the less likely you are to become a fluent reader. ... so, if you're not on track to read at grade level by third grade, your likelihood to graduate high school decreases.” They believe that their organization is playing a role in overcoming the gap between opportunities that children in the preschool years have access to with regards to high quality learning. The director of operations said, “We want all children to enter school prepared and ready to learn.” They are very focused on serving families that wouldn’t otherwise have access to early childhood education. The focus on UX design helps them to see the needs of these diverse groups of users. Incorporating a UX team into the organization can also be beneficial to the other teams and disciplines. They are a key part of the organization and can work with other teams to make their products more user-friendly and human centered.

These examples show potential benefits that can come through the proper application of user experience design methods. With the rapid advancements of technology, I argue that UX design will continue to play a key role in the development of all digital technology. It is critical that developers and designers understand the intricate entanglements between the user and the technology. Researchers emphasize that “understanding how educators and learners interact with learning technologies is key to avoiding and remediating design flaws.” (Schmidt et al., 2020, para. 2). User experience design methods can provide a solid backbone for developers as they attempt to consider the many aspects of human and computer interaction. Researchers warn, “designers that approach the interface from only a learning theory perspective may encounter unforeseen obstacles due to user experience (UX) challenges.” (Vann & Tawfik, 2020, para. 2). Practices such as creating personas help the designers think outside of their own experience and consider the possible backgrounds of their users. The use of focus groups and UX research also provides valuable information needed to create a more usable product. This research gives developers a glimpse into the users' experience interacting with the interface of the product to see what possible challenges they may face.

Socio-Culturally Sensitive

Finally, socio-culturally sensitive design approaches promote an empathetic understanding of the socio-cultural context of the learner (Schmidt & Huang, 2021). Methods related to socio-cultural sensitivity were discussed by every interview participant in this study. The senior director of product management shared that the curriculum and content team have rigorous guidelines to review for bias, sensitivity, diversity, equity and inclusion. She emphasized that, “You also have to remember that bias and sensitivity change based on what’s happening in the world.” The teams attempt to remain aware of current events and how that might impact the sensitivity of their product. As mentioned in previous sections, the organization partners with refugee agencies and other organizations in the communities to gain a better understanding of the families enrolled in the program. The family coaches are bilingual and also have a partnership with a translation company to accommodate for as many families as possible. The software itself provides instructions in both English and Spanish. The teams within the organization listen to user feedback on cultural and sensitive concerns. One participant shared an example, when they received feedback on the religious significance of an animal they were using in some of the activities. He went on to say, “so it's interesting, some of the things you get exposure to and some things you can make adjustments for but sometimes you can’t, and you just need to then have better communication, better awareness to teachers and administrators.”

More than one participant shared the concept of “Windows and Mirrors” or, as the director of operations described it, “children should be able to recognize themselves and see themselves in our content, but also on the other side, people should be able to learn and see other cultures and be exposed to others in the content as well.” Another participant expanded on this idea by talking about “sliding glass doors”. She said, “sometimes there are opportunities that are granted to these children to open the door and become a part of that story because they’ve been invited to learn more about and appreciate cultures and identities different from their own.” This is a goal at an organizational level. The participants said that a lot of the content was recently updated to make it more culturally appropriate. There was a big focus on rehauling the lessons and songs that were outdated and less culturally sensitive. The program itself consists of hundreds of books for the children to read, and the curriculum team evaluates each one using a set of guidelines they have built based on existing frameworks. For example, they reference the Cultural Proficiency Continuum. The curriculum team did a full audit of the stories, monitored representation across the content, and made sure they had wide representation in the curriculum. They've called in experts to help them review content as well. One of the participants said they are trying to mirror the population of students in the US under the age of five.

Multiple participants discussed the importance of the company culture and work environment. Participants emphasized that the organization's goals of equity are not "fluff" and are taken very seriously. They stated that the organization was dedicated to building a space for authentic belonging for the employees or "a community where the experiences we have are legitimately celebrated." One participant said, "It's a space where I know that I will be received, and I will be seen and heard fully" and they believed that an important part of this approach was getting the company leadership on board with the equity and inclusion goals of the organization. Another participant explained the shift in the culture of the organization. She said that, though the organization always had good intentions, several years ago they created a task force and brought in a third-party consulting firm to help the organization become more intentional in their cultural responsiveness and inclusivity. In 2021 they founded the office of equity and inclusion. The participant said, "And that was really where we saw a shift in the organization in terms of authentic integration of inclusive excellence, core competencies and a plan where it's not just OK, we're all saying that we're doing the equitable thing and we're checking it off at the end of the process."

The participants feel that the organization is now much more strategic and focused in their efforts to create an inclusive working environment. They started an inclusive leadership program, they host monthly brunch-and-learns focused on deep dives into diversity, equity, and inclusion topics, they run an inclusive excellence book club, they regularly bring in external thought partners and leaders to host trainings, and they've been developing employee resource groups at the organization. All of these changes to the work environment have created what participants called a “space for authentic belonging”. A community where they feel they will be seen and heard fully. Participants mentioned that it makes a big difference to be part of a community and to be able to build natural relationships with coworkers. In this space, employees can learn from each other and recognize their own biases, which both trickle down to influence the product they are building. Participants believe this environment is only possible because of buy-in form leadership.

Other culturally sensitive methods mentioned by participants are related to co-design or participatory design. These are approaches that involve participants by working with users throughout the development process to best meet their needs. The director of product management gave an example, “recently we're trying to get some child motivation things out there so that kids in theory will earn a postcard. So, for every five sessions they have [using the program] at a minimum of 12 minutes, they will earn a part of a picture. So, but then by the fifth session, they uncover the whole picture, which is a postcard.” The teams leading the research (often the research or UX teams) measure cognitive load and functioning. They consider whether the children understand the activity versus do they just love the activity. “So, the UX team has been meeting with families and their children to show them the postcards and talk about it. It's interesting to see what they say. They've all liked the postcards. They wanna see more dinosaurs. … another one’s like, ‘could you have some mermaids in there?’ ... So that's what we call MVP. Like, what's the minimum thing we can get out and then we can add on to it? It's great to talk to like 3-4 or five-year-olds for validations.” During the feedback sessions, they use a script to guide the conversations. Whoever is leading the call will say, “Mom, Dad, Grandma, Auntie, we want to hear what you think too. But right now, we're just talking to ‘Johnny’, because we're building this product for four-year-olds, and the most important opinion is Johnny’s and then we'll talk with you about any other ideas you have.” Another participant shared a similar example from the development perspective. When creating a new activity, “[the research team] will set up appoints and they actually sit in Zoom sessions with kids watching them and they just ask them questions, trying not to lead them, see if they’re able to play these things and figure it out. …They do that for a two-to-three-week period of time, write up a report of their findings, and then they find things like, 'this button really isn't working here. They're struggling with this.' We're [the development team] able to easily adjust the prototype and if we need to, we can do some retesting, or if it's pretty minor, we can just make those changes now that we have them."

Almost all the participants discussed the importance of using interdisciplinary methods by connecting and working with other teams. One participant mentioned, when they are working on a new activity for the program, it's a process that involves multiple key stakeholder teams. This could include the user experience team, the research team, and curriculum team among others. Another participant in a development role shared, that they each bring their expertise to the table and work together towards a common goal. He went on to say, "This is a pretty cool process. Curriculum will come to us with 'this is what we need to be able to teach with the learning objective' and they might have some ideas but then UX will use their expertise from designing things and say 'alright, this is how we could do it.' So, it's a neat process and how it comes together." The director of product management mentioned that she often collaborates with other teams to pilot activities and test questions to check for biases. When the product or curriculum teams are unsure about how the content will be viewed by the users, they meet with other teams, including the equity and inclusion staff, to talk through the challenges and gain new perspectives on the matter. They have a lot of collegial dialogue which helps them see things through different lenses while making important decisions about the program. One participant said, "And that's a unique thing I think about [this organization] is that you also need to build an organization where people feel comfortable having those discussions. I can say that I've worked in other organizations where I wouldn't even have been allowed to bring that up as a discussion."

These examples show the potential benefits that can be gained while working from a socio-culturally sensitive lens. Based on my research and my discussions with the participants. I believe that this is a key element of equitable and inclusive design. Socio-culturally sensitive design processes can be woven into each of the elements discussed above. It is also very focused on the training and understanding of the designers themselves. It presents the importance of the designer being aware of larger, diverse social and cultural settings outside of their own experience. Cavignaux-Bros describes this as a shift from "*learning about* design" to "*learning to be* a designer" (2020, para. 40). Researchers argue that this "requires deep reflection and questioning on their own assumptions, beliefs, attitudes, and values about learning and design. These personal positions determine the methods designers use and ultimately develop into design skills." (Chang & Kuwata, 2020, para. 40). When developers and designers are aware of their own positionality, as well as current events and underlying socio-cultural dynamics, they will be better equipped to meet the needs of their users. The concept of 'Windows and Mirrors' can be used as a method for respectfully representing diverse groups of people and cultures. Finally, a key element of creating equitable edtech is the workplace environment created by the leadership and teams involved in the organization itself. Participants show the potential benefits of a workplace culture that encourages dialogue and interdisciplinary connections. However, from the examples above, it is apparent that successfully creating an inclusive workplace takes commitment and buy-in from both leadership and teams within an organization.

Key Findings through Two Lenses

After analyzing the four categories of design approaches above, a few key elements and takeaways stood out from the others. These elements will be categorized into both external and internal methods based on the insightful perspective of one participant who shared, that when analyzing the development of edtech, "there are actually two lenses with which to view. That from the lens of the primary persona that we're building for … and then the lens of the people building the product." On one hand, the organization can focus on the end user by checking for usability and inclusiveness of the content. On the other hand, the organization can also focus on creating an inclusive workplace that allows for more effective communication about diversity and equity in the products they create. The lens of the primary end user and the lens of those building the product are both equally significant. Viewing the key takeaways through these two elements provides a clear picture of how these methods and practices are unique and relevant to the research aims of this study. So, through the lens of these two viewpoints, the following guidelines and practices have emerged as key aspects of an equitable and inclusive process:

Internal Lens (Company Culture)

The internal lens can be seen as the company culture. Key aspects of creating an equitable company culture include creating an organization that allows for reflexivity, supporting interdisciplinary collaboration, promoting effective professional development and employee trainings, partnering with external organizations, and leadership buy-in.

Creating an organization that allows for reflexivity. Some participants mentioned creating a workplace where employees feel comfortable in their diversity and creating a space where they can learn from each other. Or, in other words, employees are able to have natural organic conversations that lead them to learn more about other perspectives. In turn those new perspectives and ideas can help them to understand the methods and practices they use in their own work. This can lead to employees constantly reflecting on their own practices and positionality to find ways to improve as they continue to learn. This type of reflexivity can be encouraged through professional development and employee training, such as the regular equity and inclusion trainings hosted by the organization as discussed previously. And for any of this to be possible, a key element is leadership buy-in. Participants emphasized that it would be impossible to create a truly equitable product without support from leadership. The leaders in this case made an effort to bring in external advisors and reshape the company goals and processes. They purposefully created new teams and developed frameworks based on the needs of the families enrolled in the program. Legitimate support is needed from administrators to create conditions that are sustainable, right, and equitable.

Interdisciplinary collaboration. Interdisciplinary collaboration is a foundational element of learning experience design (LXD) introduced by Floor, the originator of the framework (Korkmaz, 2018; Floor, 2023). Based on the participant's responses, interdisciplinary collaboration is a key theme for creating diverse and equitable edtech. The teams often worked together, either officially or just through day-to-day conversations to get advice on the development process. One participant mentioned meeting regularly with the equity and inclusion officers to discuss the wording of test questions. The product team stated that they communicate regularly with the research team so they can update their products according to the most current user research. Participants also noted the importance of external partners or organizations who were brought in to help with the efficacy of their program. Some included leaders in the area of equity and inclusion who hosted trainings for employees. Some included organizations who helped them recognize how to create a more inclusive work environment. Other partners worked regularly with the teams to ensure they were following best practices and meeting state and national standards for learning.

External Lens (User Experience and Needs)

The external lens is focused on the experience and needs of the users. One key element of creating equitable edtech products is being responsive to the socio-cultural atmosphere and recognizing the needs of the users accordingly. Another key takeaway is the critical nature of the implementation process itself. Both are critical for the success of any educational technology that attempts to be inclusive and socially responsible.

Socio-cultural responsiveness. The Windows and Mirrors learning framework was brought up by multiple participants (Style, 1988; Maparyan, 2018; Kawi, 2020; Avery, 2013; Waterford, 2022). This is an organization-wide push to develop content which allows children to see a reflection of themselves while also learning about the cultures and experiences of others. The organization has provided resources for families explaining, "Our Curriculum and Instruction Department follows guidelines and recommendations for culturally responsive teaching practices (Ladson-Billings, 1995, 2014; Hammon, 2015) to create content that is both asset-based and culturally affirming." There is a difference between the knowledge to develop a product and the knowledge to develop a product that is accessible and equitable in addition, and employees are encouraged to remain culturally aware in the work environment as well to learn from each other and gain new perspectives.

The importance of implementing the product. Many of the participants discussed methods relating to the implementation of the product. Though unrelated to the initial development and design process of edtech, implementation of the final product is a key element. For example, my conversations with the director of operations and the director of guided family services often focused on methods related to connecting with families, hosting training sessions, and distributing laptops. At the beginning of my research, I was focused on the internal workings of the development, content, and design teams through the lens of LXD. However, throughout the interview process I realized that the implementation of the program is just as important as the content itself. The external-facing teams played just as vital a role in creating an inclusive edtech experience as the other teams.

Conclusion

While considering the findings, it is important to note that this study does not seek to prove how effective each method and practice is in the development of edtech. It does, however, explore common methods that are used in the creation of edtech and the perspectives of those involved in the process with an emphasis on elements related to learning experience design. Designers have the responsibility to "identify, define, and design opportunities to engage learners in meaningful and varied learning experiences." (Chang & Kuwata, 2020, para. 25). Though my work does not empirically analyze the effectiveness of each method discussed in this paper, the approaches described by the participants demonstrate that developers can use an iterative process to analyze the effectiveness of their own products. This can be done through a combination of front-end analysis, prototyping, focus groups, and other forms of user research (Schmidt et al., 2020, para. 29). Many current researchers also argue for the effectiveness of practices related to LXD and those discussed by the participants of this study (Schmidt & Huang, 2021; Vann & Tawfik, 2020; Jahnke et al., 2020; Chang & Kuwata, 2020). However, designers must remember that they will never have full control over the end learning experience, "Rather, they design, prepare and integrate appropriate resources and design elements that support diverse but equally effective learning experiences."(Chang & Kuwata, 2020, para. 16). Though not discussed in these interviews, it is necessary to acknowledge the potential harms of performative approaches to inclusive and equitable design. Some participants touched on this briefly, mentioning previous employment where equity training was seen merely as a yearly HR requirement. Another participant warned that nonprofit work can often be exploitative and play on the sympathy of individuals while doing very little to benefit society. With that in mind, it should be noted that this study attempts to focus on moving past harmful or performative approaches to edtech design. Many participants interviewed for this study held positions of leadership within the organization or their teams, and played an active role in developing the practices that were used within the organization. Because of this, it was apparent through the interview process that they shared these methods with me because they felt, based on their own research and experience, that these were effective practices in the field.

The findings discussed in this study contribute to a deeper understanding of common methods and practices used in the creation of edtech, along with how they may be beneficial to development of more equitable and inclusive products. Schmidt and Huang describe this by saying, "foregrounding the centrality of learning when drawing from external disciplines such as UX [user experience] and HCI [human computer interaction] 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." Researchers have highlighted the importance of using intentional methods and frameworks in the creation of educational technology (Korkmaz, 2018; Tawfik et al., 2022; Schmidt & Huang, 2021). This study has sought to examine what some of these methods might look like in practice. It expands on the work of many researchers who offered frameworks and definitions for learning experience design (Schmidt & Huang, 2021; Tawfik et al., 2022; Korkmaz, 2018; Kilgore, 2016; Floor, 2023). While the framework of LXD was used as a guide, the perspectives and methods used remained open-to interpretation and were adjusted according to the experiences shared by participants and additional frameworks provided by researchers.

Schmidt and Huang stated, “With the scarcity of resources on LXD in the field of LDT [learning design and technology], there are many possibilities for contributing to practice.” (2021, p. 153). Because this is still a loosely defined and relatively new concept, more research is needed into the application of these methods and practices. This work has attempted to contribute to the practice by examining common applications of LXD in the creation of edtech. However, further research is needed to examine the effectiveness of each method. There is also potential for future research into additional methods and practices used for the creation of equitable and inclusive edtech. “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.” (Schmidt & Huang, 2021, p. 153). Further research into how LXD can inform the development of edtech is needed and can contribute to the field of learning experience design.

Based on the findings of this study, I recommend that those involved in edtech leadership positions should view the development of equitable edtech through both the lens of the end user and also the lens of those building the product. This provides a more holistic view of what needs to be changed and what methods can be implemented to aid in overcoming challenges. Using the guidelines and principles of learning experience design presented above, I recommend that future creators of edtech should focus on four main categories: methods and practices that are (1) Human-centric, (2) Theoretically grounded, (3) Informed by user experience design methods, and (4) Socio-culturally sensitive. Using proven frameworks and guidelines has the potential to lead to the more responsible design and development of edtech.

Conclusion

In a world of more human-centered design, Learning Experience Design (LXD), among other frameworks, can be used to provide helpful approaches for professionals in the edtech industry. This study was developed with the aim to explore current equitable approaches that are being implemented in the creation of edtech along with the advantages of using frameworks such as LXD. It is an inescapable fact that there are many prevalent social injustices that can be exacerbated through digital technology. Researchers warn of this saying, "The ideal of how designers *want things to be,* obfuscates the confusion, tensions, and corruption taking place within the "material" of social sculpture." (Busch & Palmås, 2023, p. 111). According to this line of thought, it is not enough for designers to merely have good intentions. It is easy for companies to claim to be equitable and inclusive in their design practices. However, this can often be similar to "greenwashing", when companies gain popularity by claiming to be eco-friendly while doing little to actually benefit the environment (Budinsky & Bryant, 2013). The aim of my research is to examine human-centered methods that go beyond performative measures and offer realistic guidelines for practitioners. The methods analyzed in this study through the lens of LXD serve as pragmatic approaches that designers and developers can look to in their attempts to create socially responsible products.

LXD and other overarching frameworks can help edtech creators analyze the efficacy of their own methods and end products. While some industries may have third-party approval to verify their claims, such as Fair Trade, Certified Organic, and Energy Star, in cases such as edtech, it can often be difficult to recognize elements of good design in comparison to performative measures (though it should be noted that third-party approval is no guarantee that a product isn't harmful). Some standards can be applied to edtech such as those of the National Institute of Standards and Technology (NIST), an organization dedicated to creating and promoting equitable standards across a wide range of both science and technology (National Institute of Standards and Technology, 2024). Another group known as the Internet Engineering Task Force (IETF) creates voluntary standards for those using the internet, including standards for Human Rights Protocol Considerations (Internet Engineering Task Force, 2024). Unfortunately, many industries such as those mentioned above continue to have challenges with companies claiming to be environmentally friendly, sustainable, or socially responsible. Some organizations simply use these tactics to “pretend to care about society by mimicking a socially responsible firms’ CSR investments.” (Wu et al., 2020, p. 3095). In the case with other industries as with that of edtech, it may be true that a method or practice can be useful and beneficial in one circumstance but not another. It is unavoidable that design choices must always focus on the needs of some users ahead of others (Busch & Palmås, 2023). Design and development will be always influenced to some extent by social, political, or economic pressures. Even in cases of co-design or participatory design, the power dynamics are still often in favor of those developing the product and this dynamic is not always evident. Designers still have control over who participates, the structure of the partnership, and the final say in any decisions or outcomes. It is important to acknowledge that these questions of power “will be fundamental to the successful future articulation of design justice in theory and practice.” (Costanza-Chock, 2020, p. 92). Creating equitable edtech is not a simple process with a simple answer.

Social issues are often intertwined with the process of design (Busch & Palmås, 2023). No single approach can be wholly correct. In this study I chose to examine methods used in the development of edtech through the lens of Learning Experience Design. As discussed throughout this paper, LXD is one of many frameworks proposed by researchers and theorists in the development of equitable technology. LXD builds on “both gaps and opportunities” of many disciplines and theories, including learning design and technology (LDT), human computer interaction (HCI), and user experience design (UXD) (Gray, 2020; Floor, 2018). It promotes interdisciplinary and empathetic approaches. It can be applied to the creation and conceptualization of edtech by building on the framework of instructional design (ID). LXD moves beyond simply creating effective content and usable interfaces to a more nuanced, human-centered approach. Gray (2020) describes this important difference between ID and LXD, by saying (in reference to LXD), "the rich array of methods used opportunistically across multiple design "phases" or "stages" also indicates a particular focus on the lived experience and context of everyday users across the design engagement that is not easily captured in a typical ID phase or method" (para. 13). So, while many useful and effective frameworks are currently in practice, I chose to focus on LXD in this study as it is a newer framework that is still flexible and open to interpretation. Many relevant methods and approaches can fit into this framework while still allowing designers to remain reflexive and responsive to the needs of their users. Some of these approaches, as described in previous sections, include participatory design (including users in the design process), universal design for learning (designing products that are accessible and usable to as many people as possible), and theory or research-based methods. The four overarching themes: human-centric, theoretically grounded, informed by UX design, and socio-culturally sensitive, can be adapted to fit the needs and context of the practitioners applying them.

The findings of this study encourage practitioners to view the development of edtech through an internal and external lens – the perspective of those building the product and the perspective of those using the product. This provides a foundation of common approaches and practices that may prove beneficial in the development of equitable edtech, according to the perspectives of the participants in this study and current research in related fields (Schmidt & Huang, 2021; Costanza-Chock, 2020). Some methods can be internally implemented in an organization through the development of a more equitable work environment that allows for reflexivity and interdisciplinary collaboration. Participants in this study strongly emphasized the importance of buy-in from leadership to successfully implement these approaches. Other methods can focus on the external needs of the users by concentrating on socio-cultural considerations and implementation of the product. Designers and developers must intentionally seek to be aware of other perspectives and the context of their users. This can be done through a variety of methods discussed by participants in this study, such as community partnerships or developing personas. Future researchers can build upon this work by examining each element of LXD in greater depth, along with a more focused examination of political and social influences in the field. Additional research can go beyond the practical application of these methods to a more intensive study of the power dynamics between the producer and the user (Busch & Palmås, 2023). Though many larger social and political issues influence the development of edtech, “designers should not abandon a quest for empathy and participation. So just because designers may use a realist lens to view the world and see their practice in relationship to invested interests and power dynamics, does not mean ethics are jettisoned.” (Busch & Palmås, 2023, p. 114).

There are still many potential roadblocks for edtech designers. Designers must recognize underlying factors and acknowledge that the process of creating equitable and inclusive technology will never be simple or straightforward. The challenges won’t disappear merely through the application of a new framework. Frameworks such as LXD simply provide a starting point and success is predicated by the design choices that follow. Those in the edtech industry must create spaces where these challenges can be acknowledged and discussed. Some designers argue that attempting to create ‘just’ or universally accessible products limits the potential of the products they design (Costanza-Chock, 2020). Those in the design justice field answer this concern by acknowledging that even though it’s impossible to create a product that addresses all inequalities, it is still important to try (Costanza-Chock, 2020). There will always be trade-offs in the design process and there is no right answer to every situation. However, researchers have shared their optimism saying, “design justice is an approach that will become easier as it matures, as more people practice it, and as specialized domain-specific tools and practices become available.” (Costanza-Chock, 2020, p. 219). The nature of technology is not fixed, often the impact of the technology can be influenced by the initial design and implementation stages (Selwyn, 2019). Designers can apply new approaches rather than continuing to make the same mistakes that have produced harmful technology in the past (Sloane, 2020).

Professionals in the field of equitable design share that while there will never be a perfect design process or framework for designers to use, “there are many, many designers in various fields who work every day to make our processes more inclusive and more just." (Costanza-Chock, 2020, p. 219). These practitioners are committed to creating a better future for edtech and they have a clear focus on the purpose of learning. Some of these groups include the Design Justice Network focused on building "worlds that are safer, more just, and more sustainable" by centering their practices on those normally excluded or harmed in the design process (Design Justice Network, 2024). And Also Too is a group consisting of designers, artists, organizers, and facilitators who "envision a world in which the practice of design is rooted in justice" (And Also Too, 2024). Research Action Design (RAD) partners with other organizations to help them co-design culturally responsive tools and technology (Research Action Design, 2024). EquityXDesign advocates for the use of frameworks in the creation of equitable design saying, "[frameworks] empower us. They enable us to grow. They make our efforts much more effective." (EquityXDesign, 2024). The Inclusive Design Research Centre is a global community who work together to "proactively ensure that emerging technologies and practices are designed inclusively." (Inclusive Design Research Centre, 2024). These are just some among many examples of practitioners around the world seeking for more responsible and intentional approaches in the design process. LXD and other methods discussed in this study pull from elements of these groups and many others. The findings of this study show the potential benefits of practitioners drawing from the depth of knowledge and research in their own fields as they collaborate together. Many developers and designers in the edtech industry are constantly seeking to apply best practices and adapt their approaches to create socially responsible and inclusive educational technology. The methods and frameworks discussed in this study provide realistic practices that designers can implement as they seek to create equitable products.

Rincon-Gallardo shared, "learning can and should be joyful, intrinsically motivating, and liberating." (2020, p. 475). Inclusive and equitable design approaches play a part in creating this type of learning environment for edtech users. Fighting for more justice and an equitable design process isn't meant to limit designers and their choices, rather, it should be seen as "a prism through which to generate a far wider rainbow of possible choices, each tailored to reflect the needs of a specific group of people." (Costanza-Chock, 2020, p. 230). Creating edtech that is beneficial for all users will continue to be an ever-evolving process and it has the potential to shape the future of education (Weller, 2022). Researchers claim, "taking part in education is an opportunity to consider the world as it is and how it could be." (Emejulu & McGregor, 2016, p. 143). The small steps now to implement equitable practices will have an influence on the future of edtech creation. In the words of Costanza-Chock, "We have to articulate a vision of the world we want, don't we?" (2020, p. 2018).

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Appendix A

CUREC Approval

SOCIAL SCIENCES & HUMANITIES
INTERDIVISIONAL RESEARCH ETHICS COMMITTEE
DEPARTMENTAL RESEARCH ETHICS COMMITTEE

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UNIVERSITY OF OXFORD

[redacted]
Department of Education, Social Sciences Division
University of Oxford

21 April 2024

Dear [redacted],

Research ethics approval

Equity in Educational Technology: Insights into the Process of Development and Design

Research ethics reference: EDUC_C1A_24_105

The above application has been considered on behalf of the Education Departmental Research Ethics Committee (DREC) in accordance with the University's procedures for ethical approval of all research involving human participants.

I am pleased to confirm that, on the basis of the information provided to the DREC, ethics approval has now been granted for this study.

Please note the following:

Personal data: It is the responsibility of the PI to ensure that all personal data collected during the project is managed in accordance with the University's guidance and legal requirements.

In-person activities: Any data collection involving in-person interactions with participants must have an up-to-date fieldwork risk assessment in place; further guidance is available from the Safety Office's website.

Amendments: Please notify the committee if you intend to make any amendments to the information in your ethics application as submitted at date of this approval, as all changes must receive ethical approval prior to implementation. The amendment form is available on the SSH IDREC webpage.

We welcome feedback on your experience of the ethical review process and suggestions for improvement. Please email any comments to staff.curec@education.ox.ac.uk / student.curec@education.ox.ac.uk or ethics@socsci.ox.ac.uk.

Yours sincerely

Xin Xu

DREC member

cc: [redacted] (as Supervisor)

Appendix B

The Development of Equitable EdTech through the Lens of Learning Experience Design

Interview Questions:

1. Give a brief summary of your position and role in the organization. Describe any relevant background training or experience that led to the position (e.g. studied data analytics, user experience design, curriculum design, education, etc.).
2. What do you see as the overall goals of your organization? How do these goals influence your role in the company? Or how do you feel your position contributes to these goals?
3. Part of the organization's mission statement includes equity in education. From your perspective and role in the company, what steps have you taken (or seen others take) to create a more inclusive educational program? (For example, inclusive design, participatory design – involving users in the development process, user feedback, research-based methods, employee training, etc.).
4. Follow-up: Are there any other methods or practices you have used (or seen others in the organization use) to try to create/implement a program that is inclusive and user-friendly for all users/participants?
5. Follow-up: Do you feel these methods are effective in creating a more inclusive program? Please explain in more detail the strengths or room for improvement.