Accessibility as Process: From Inclusive Digital Learning to Inclusive Standards Development

by

Mitch A. Wilson

Submitted to OCAD University in partial fulfillment of the requirements for the degree of

Master of Design

in

Inclusive Design

Toronto, Ontario, Canada, 2026

Abstract

The rapid expansion of accessibility in digital learning, particularly in higher education, has intensified the need for inclusive learning environments. While existing accessibility frameworks often focus on technical compliance, they often overlook the specific learning needs and experiences of neurodivergent learners, including autistic individuals. This research project was initially designed to develop standards for accessible online learning environments tailored to autistic learners in higher education. However, an extensive literature review revealed that the development of comprehensive standards for this domain represents a large and complex undertaking requiring broader collaborative and structural approaches.

Preliminary findings from this research, further refined in Part 1, were presented at the International Social Innovation Research Conference (2025), where early insights highlighted gaps in existing accessibility standards and the need for more inclusive processes in standards development. As the project progressed, an opportunity to contribute to standards development was brought forward. This opportunity, the *All Standards with Us* initiative, outlined in Part 2, allowed the application of elements of Part 1. The second part of this project focuses on inclusive approaches to creating standards themselves.

Through this work, the research focused towards supporting the existing project for the development of meta-standards for standards creation and modification. Contributions included assisting with moving content to the website and more importantly, developing a visual way to navigate the content. This work supports a more participatory and inclusive standards-development process, emphasizing accessibility, lived experience, and inclusive design principles. The project ultimately demonstrates how research on accessibility in online learning can inform broader systemic approaches to inclusive standards development.

Acknowledgments

I want to give my deepest gratitude to everyone involved in this research process. Starting with my advisor, Jutta Treviranus, who gave me the guidance to finish this project and connect me with the *All Standards with Us* team.

I would also like to thank the *All Standards with Us* team, including the Inclusive Design Research Centre team members and all the other various members of the amazing project, who allowed me to contribute to their work.

Dedication

In memory of my grandfather, whose legal blindness taught me long before I had the language for it, that design either includes people or it doesn't. The large-print cards I made for you as a child were my first act of inclusive design.

To my friends, family, and colleagues, I could not have done this without your support. Thank you for giving me strength.

Table of Contents

Tables and Figures

Tables

Figures

Accessibility as Process: From Inclusive Digital Learning to Inclusive Standards Development

Introduction

The expansion of digital learning in higher education has intensified the need for accessible and inclusive learning environments (Al-Azawei et al., 2017). Institutions increasingly rely on online platforms, learning management systems (LMS), and digital resources to deliver education, often positioning accessibility as a technical requirement addressed through compliance with established standards such as the Web Content Accessibility Guidelines (WCAG). While these frameworks play an important role in reducing barriers, they frequently prioritize measurable compliance over the lived experience of learners (Aizpurua et al., 2016; Giraud et al., 2018; Power et al., 2012). As a result, many digital learning environments remain difficult to navigate, overwhelming, or exclusionary for students whose needs fall outside of normative assumptions.

Among these learners, Autistic students offer a particularly important perspective. Autistic learners often engage with digital learning environments in ways that highlight gaps between technical accessibility and meaningful usability. Challenges related to sensory processing, communication, information structure, and predictability can significantly affect how online learning is experienced (Al-Azawei et al., 2017; Andreou & Raxioni, 2024; Reeve et al., 2022). At the same time, research demonstrates that when learning environments are designed with flexibility, clarity, and personalization in mind, these same environments can become more effective not only for autistic learners, but for a broad range of users (Al-Rahmi et al., 2023; Santos et al., 2017). This suggests that accessibility, when approached beyond compliance, has the potential to act as a driver of innovation rather than a constraint.

This research project was initially developed with the goal of identifying barriers faced by autistic learners in online learning environments and translating these insights into a set of practical standards or best practices for educators and instructional designers. Through an extensive review of literature across instructional design, user experience (UX) design, disability studies, and digital accessibility, a set of reoccurring themes emerged. These included the importance of sensory-friendly design, consistent and predictable navigation, personalization and flexibility, and the critical role of co-design with individuals who have lived experience. These themes align with broader findings in the literature that emphasize the need for tailored instructional approaches, multimodal communication, and participatory design practices in supporting neurodiverse learners. (Bossavit & Parsons, 2018; Folostina et al., 2022).

However, as the research progressed, it became clear that the development of comprehensive standards for accessible online learning is a complex and large-scale undertaking. Additionally, it is difficult for standardized approaches to fully account for the diversity and variability of learner needs (Al-Azawei et al., 2017). Barriers that were identified were not limited to interface design or instructional strategies alone, but were deeply connected to broader systems, institutional practices, and the process through which standards themselves are created (Aizpurua et al., 2016; Power et al., 2012). Existing accessibility standards often fail to account for these complexities, particularly in relation to participation, communication, and the integration of lived experience in decision-making processes. This aligns with findings in accessibility research, which show that guideline conformance does not account for many of the barriers encountered by users, highlighting persistent barriers in communication tools, information structures, and participation frameworks within standards development processes (Power et al., 2012).

This realization prompted a shift in the scope of the project. Rather than focusing solely on the development of domain-specific standards for online learning, the research began to explore how inclusive principles could be applied to the process of standards development itself. This shift reflects emerging approaches in inclusive design that emphasize participation, co-design, and the importance of multiple perspectives in shaping systems that affect diverse populations.

Part 1 of this report presents the research that informed this shift. It examines existing literature on digital accessibility, autism and online learning, and inclusive design practices, with the aim of identifying key barriers, opportunities, and gaps in current approaches. It also introduces a set of core themes and principles that form the foundation for an inclusive framework.

Part 2 builds on these findings through a case study involving the *All Standards with Us* initiative, where an opportunity to apply these principles arose in a project dedicated to supporting more inclusive standards development. Notably, the development of a visual navigation system to help break down complex information being presented in the findings.

Together, these two parts demonstrate how research focused on improving digital learning experiences for autistic learners can inform broader, systemic approaches to inclusive standards development and the interconnectedness of digital learning and UX design practices. The project ultimately argues that accessibility is not only a characteristic of products or environments, but a property of the processes used to create them. The following section presents the research foundations that informed this shift.

Part 1: Research Foundations for Inclusive Digital Learning and Standards Development

This section presents the research foundations that informed the direction and evolution of this project. Drawing on literature from digital accessibility, instructional design, UX design, and disability studies, the review examines how current approaches to accessibility function in practice, particularly within online learning environments. A specific focus is placed on the experiences of autistic learners, whose interactions with digital systems often reveal gaps between technical accessibility and meaningful inclusion.

The goal of this section is not only to synthesize existing knowledge, but to identify key tensions and gaps that persist across both digital learning, web content and standards development contexts. These insights for the basis for the framework and perspective developed in this project and establish the rationale for the applied work presented in Part 2.

Framing Accessibility Beyond Compliance

Accessibility in digital environments has long been shaped by technical standards. The Web Content Accessibility Guidelines (WCAG), developed by the World Wide Web Consortium (W3C), have become the dominant framework through which institutions, developers, and designers evaluate whether a digital product is accessible (Henry et al., 2014). These guidelines establish measurable criteria across four principles: perceivable, operable, understandable, and robust. They have been widely adopted into legislation and institutional policy across many countries (Campoverde-Molina et al., 2020). In this sense, WCAG and similar frameworks have made a meaningful contribution to raising baseline expectations for digital inclusion.

However, a substantial and growing body of research challenges the assumption that technical compliance with these guidelines is sufficient to ensure genuine and accessible experiences. Studies evaluating educational websites against WCAG standards consistently find that no institution fully meets even baseline conformance levels, yet some frameworks remain poorly equipped to capture the full range of barriers users encounter in practice (Campoverde-Molina et al., 2020). More critically, conformance to accessibility guidelines has been shown to correlate only weakly with actual user experience. Research exploring the relationship between WCAG compliance and perceived accessibility among Blind users, for instance, found that while users reported strong correlations between perceived accessibility and usability attributes such as clarity, satisfaction, and emotional engagement, these same attributes showed little relationship to whether a site technically met guideline requirements (Aizpurua et al., 2016). In other words, a site can pass an audit and still feel inaccessible to its users.

This disconnect has been described as the compliance-usability gap, the space between what standards measure and what users actually experience (Yesilada et al., 2015). Automated accessibility evaluation tools, which account for the vast majority of assessments conducted on educational websites, are effective at detecting certain categories of technical error but are fundamentally limited in their ability to capture experiential, cognitive, or emotional dimensions of accessibility (Campoverde-Molina et al., 2020). Research has shown that real user involvement in evaluation reveals a category of barriers that automated tools consistently miss, particularly related to navigation clarity, cognitive load, and information structure (Giraud et al., 2018).This suggests that the dominant evaluation paradigm is, by design, better suited to measuring the presence of features than the quality of experiences.

The implications of this gap are significant. When accessibility is framed primarily as a compliance exercise, institutions are incentivized to achieve the maximum measurable threshold rather than to genuinely reflect on how their systems function for users with diverse needs. Inaccessibility, in this framing, becomes a technical failure to be corrected rather than a reflection of systemic assumptions about who a system is designed for (Lazar et al., 2015a)**.** Lazar et al. argue that digital inaccessibility is not a neutral technical limitation, but a form of active discrimination that denies users equal access to the same content, at the same time, and same cost as their peers. Framed this way, accessibility is not simply a feature of a product, it is a property of the relationship between a system and the people that use it.

Accessibility as Experience

Moving beyond compliance requires a shift in how accessibility is conceptualized. Rather than treating it as a binary condition, a system either conforms or it does not, researchers have increasingly proposed understanding accessibility as an experiential and relational quality that is shaped by context, user perception, and the emotional dimensions of interaction (Aizpurua et al., 2016; Sauer et al., 2020). Sauer et al. propose an integrative model that positions usability, user experience, and accessibility not as separate domains, but as overlapping dimensions of a broader concept they term interaction experience, which encompasses performance, subjective perception, and inclusive design simultaneously. This framing resists the tendency to treat accessibility as an add-on or a checklist, instead positions it as a core dimension of how systems are experienced.

The experiential turn in accessibility research has relevance for understanding cognitive accessibility, an area that has historically been underprioritized in both guidelines and practice (Campoverde-Molina et al., 2020; Friedman & Bryen, 2007). A synthesis of accessibility guidance frameworks across multiple countries found that recommendations related to cognitive accessibility were consistently assigned lower priority levels than those addressing visual or motor impairments. The implications are that designers or developers addressing only the highest-priority criteria would systematically overlook the needs of users with cognitive differences (Friedman & Bryen, 2007). This structural de-prioritization has material consequences: digital environments that are technically perceivable and operable, may still be cognitively inaccessible. These platforms may be difficult to navigate, overwhelming in their information density, or structured in ways that assume neurotypical patterns of processing and comprehension (Contreras-Ortiz et al., 2023; Fabri & Andrews, 2016; Meyers & Bagnall, 2015).

The importance of information filtering offers a concrete illustration of this dynamic. Research with blind screen reader users found that filtering redundant and irrelevant content from web pages, reducing the cognitive burden of linear auditory navigation, improved task completion rates reduced abandonment, and nearly halved the time required to complete tasks in naturalistic conditions (Giraud et al., 2018). These findings were not primarily about whether content was technically present and labelled correctly, they were about the cognitive cost of encountering it. This research demonstrates that usability and accessibility cannot be fully separated: the experience of using a system is inseparable from cognitive effort required to do so, and designing for reduced cognitive load is itself an accessibility practice.

Universal Design and its Relationship to Accessibility

The concept of Universal Design (UD) offers one framework for moving accessibility beyond compliance toward a more proactive and inclusive design orientation. In educational contexts, this is more commonly operationalized through Universal Design for Learning (UDL), which provides principles for creating flexible learning environments that accommodate variability in how learners perceive, engage with, and express information (Rao et al., 2014). UDL is built around three core principles: multiple means of representation, multiple means of action and expression, and multiple means of engagement. Together, they aim to reduce barriers before they occur rather than retrofitting accommodations after the fact (Al-Azawei et al., 2016).

Research on UDL implementation in higher education consistently shows positive associations with student engagement, accessibility, and satisfaction (Yang et al., 2024). A large-scale review of UDL studies found that technology-enhanced environments were central to its operationalization, with digital tools enabling the flexibility and personalization that the framework requires (Al-Azawei et al., 2016). Critically, however, the same review identified that most implementations are partial or fragmented, as educators tend to apply one or two UDL principles rather than the entire framework, limiting its transformative potential. This pattern of incomplete adoption mirrors the compliance problem in accessibility more broadly, a framework that is nominally endorsed but unevenly enacted in practice.

An important distinction exists between Universal Design, which targets the widest range of users and contexts. In comparison, accessibility often focuses on the needs of people with disabilities (Henry et al., 2014). Henry et al. argue that these two orientations are complementary but should not be mixed. Broadening the concept of accessibility to encompass all users risk losing the specificity needed to address the most significant barriers faced by people with disabilities. This tension is particularly relevant to the present project, which is concerned with designing systems that are inclusive of autistic users , not merely usable by a generalized population, while recognizing that inclusive design decisions often carry broader benefits. As the literature consistently demonstrates, environments designed with the needs of the most excluded users in mind tend to produce improvements for everyone (Barrera Ciurana & Moliner García, 2024; Henry et al., 2014).

Accessibility as a Systemic Property

Perhaps one of the most significant shifts in accessibility research and practice is the movement from understanding accessibility as a property of individual products or interfaces toward understanding it as a property of systems, including the processes, institutions, and power structures through which the products are designed, evaluated, and distributed (Janse van Rensburg & Liang, 2025; Lazar et al., 2015b)**.** This systemic orientation recognizes that accessibility failures are rarely the result of isolated technical oversights, they are often the product of design processes that do not meaningfully include the people most affected by their outcomes.

The Lazar et al. examination of best practices in educational accessibility demonstrates this point. The most effective institutional approaches to accessibility were not those that responded to individual complaints or performed periodic audits, but those that embedded accessibility into procurement decisions, faculty training, and ongoing design cycles, treating it as a systemic responsibility rather than a one-time deliverable (Lazar et al., 2015b). Similarly, Campoverde-Molina et al. argue that meaningful accessibility evaluation must combine automated tools within human-centered methods, precisely because the experiential dimensions of accessibility can only be assessed through the involvement of real users in real contexts.

This systemic framing sets the stage for the trajectory of the present research. The original focus of this project, developing standards for accessible online learning for autistic learners, was itself shaped by an emerging recognition that accessibility cannot be fully addressed at the level of individual interfaces or instructional strategies. The barriers that post-secondary autistic students encounter in digital learning environments are real and specific, and they are examined in detail in the sections that follow. However, they are also deeply connected to broader questions about how systems are designed, who is included in that process, and what values are encoded in the standards that guide it. Understanding accessibility as systemic is not a retreat from specificity, it is a precondition for addressing it effectively.

Understanding Autism in Digital Learning Contexts

This review operates from a social model of disability orientation. The medical model of disability locates impairment within the individual, framing difference as a deficit, dysfunction, or condition to be treated or overcome (Hendriks et al., 2015). The social model, by contrast, understands disability as the relationship between society and its response to human variation: it is not the individual who is the “problem”, but the barriers (whether structural, environmental, attitudinal, or systemic) that prevent or inhibit participation (Hendriks et al., 2015; Yang et al., 2024). In educational contexts, this distinction has direct consequences for how institutions understand and respond to the needs of autistic learners. Where the medical model prompts institutions to require diagnosis disclosure and manage individual accommodations, the social model prompts a fundamentally different question: what needs to change in the system itself (Barrera Ciurana & Moliner García, 2024; Janse van Rensburg & Liang, 2025)?

The neurodiversity paradigm extends this orientation further. Rather than framing autism as a disorder to be corrected, neurodiversity positions cognitive variation as a natural and valuable dimension of human diversity, one that is constrained not by the individual's neurology but by environments and systems designed around a narrow conception of functioning (Nguyen & Peers, 2025). This project aims to deviate from deficit-based characterizations of autism, focusing instead on the ways in which autistic experiences in digital environments reveal structural gaps in how those environments are designed. The goal is not to describe what autistic users struggle with, but to understand what their experiences expose about the systems they are asked to navigate.

Autism as a Lens for Inclusive Design

Autism Spectrum Disorder (ASD) is a neurodevelopmental condition characterized by differences in social communication, sensory processing, cognitive style, and information processing (Valencia et al., 2019). It is important to note from the outset that autism is not a monolithic category: the spectrum encompasses a wide range of profiles, strengths, and support needs, and autistic individuals are not a homogenous group (Benton et al., 2011; Hendriks et al., 2015). Research and design that treats autism as a single, uniform condition risks reproducing the same reductive assumptions it aims to address.

Autistic learners represent a growing and increasingly visible population in higher education. In the United Kingdom alone, the number of students declaring an autism diagnosis at university has grown substantially in recent decades, with some estimates suggesting increases exceeding 200% across a relatively short period (Chown et al., 2018). Despite this growth, institutional support structures have not kept pace, and research consistently identifies significant mismatches between the supports offered and the needs of autistic learners (Gormley et al., 2024). These mismatches are not incidental, they reflect the degree to which higher education systems, including their digital infrastructure, have been designed around neurotypical assumptions about how students learn, navigate information, and communicate.

The value of centering autistic students in accessibility research extends beyond the population itself. Since autistic individuals tend to encounter barriers at the intersection of cognitive, sensory, and navigational dimensions of digital environments, their experiences function as a revealing diagnostic. Designing with autistic users in mind surfaces challenges that affect a much broader range of learners, including those with ADHD, learning disabilities, anxiety, or simply high cognitive load in demanding contexts (Barrera Ciurana & Moliner García, 2024; Henry et al., 2014). This is consistent with the broader logic of inclusive design: solutions developed for the most excluded users has the potential to improve conditions for other students as well.

Cognitive and Sensory Dimensions of Digital Interaction

Research on how autistic individuals interact with digital environments highlights several consistent patterns that have direct implications for interface and instructional design. One of the most well-documented is a difference in visual attention and visual processing. Eye-tracking studies have found that autistic users tend to exhibit longer fixation durations, more regressions, and greater reliance on visual stimuli, such as icons, images, and spatial cues when compared to neurotypical users when navigating digital interfaces (Andreou & Raxioni, 2024; Rezae et al., 2020).

These patterns do not indicate lower ability, rather they reflect different processing strategies that may require more effort when interfaces are structured around dense text, ambiguous navigation, or inconsistent visual organization.

A particularly significant finding across multiple studies is that autistic learners process visual information, such as icons, images and symbols, faster and more effectively than text, especially when visual and contextual elements are clearly aligned (Andreou & Raxioni, 2024; Rezae et al., 2020).

Conversely, when icons are ambiguous or mismatches with their accompanying labels, cognitive load increases significantly and task performance deteriorates. This has direct implications for interface design: visual supports are not merely aesthetic enhancements but functional accessibility features, and their effectiveness depends heavily on clarity, consistency, and alignment with user expectations.

Sensory sensitivity is another dimension that autistic people experience that shapes engagement with digital environments. Many autistic learners experience heightened or atypical responses to visual stimuli, including reaction to high contrast colour combinations, dense visual layouts, motion, or complex backgrounds (Bozgeyikli et al., 2018; Faruq et al., 2025). Research on virtual reality interfaces found that cluttered visual environments significantly reduced task performance for autistic users , while simplified, lower-fidelity representations improved both accuracy and engagement, even when users themselves expressed a preference for more visually rich environments (Bozgeyikli et al., 2018). This distinction between stated preference and performance outcome is key: it suggests that design decisions cannot rest solely on surface-level user preferences, and that reducing visual complexity is a genuine accessibility need, rather than simply an aesthetic choice.

Cognitive load, the total mental effort required to process and interact with a system, is a central concern across all this research. Autistic learners tend to experience higher cognitive demands in environments characterized by unclear structure, inconsistent navigation, excessive choice, or information that is not chunked or scaffolded effectively (Friedman & Bryen, 2007; Meyers & Bagnall, 2015; Santos et al., 2017). A detailed case study of an adult learner with ASD and ADHD in an online university environment identified three distinct forms of disorientation: navigational, contextual, and procedural, each of which contributed to task abandonment, reduced confidence, and significant inefficiency (Meyers & Bagnall, 2015). The participant described navigating the learning system as moving through a maze, unable to determine relevance, direction, or appropriate next steps. These are not minor inconveniences; they represent structural failures in the relationship between a learner and the environment designed to support them.

Strengths-Based Perspectives on Autistic Learning

A strengths-based orientation emphasizes the cognitive capacities that autistic individuals often demonstrate, including strong attention to detail, pattern recognition, systematic thinking, and a preference for structured, predictable environments (Schmidt et al., 2024; Valencia et al., 2019). Rather than beginning with what autistic learners find difficult, this orientation asks what capacities autistic users bring to their interactions with digital systems, and how those capabilities can be activated and supported through design.

Pattern recognition and spatial reasoning, for instance, are precisely the capacities activated by well-designed visual maps and relational diagrams. Research on knowledge mapping as a navigation and learning tool suggests that visual representations of complex information leverage the same cognitive mechanisms that support systemic and detail-oriented processing, allowing users to perceive relationships, hierarchies, and connections that are difficult to extract from dense linear text (Folostina et al., 2022). Designing navigation systems that draw on these strengths, rather than requiring users to compensate for mismatches between their cognitive style and the format of the information, represents a meaningful and productive shift in design orientation.

A strengths-based perspective also has implications for how autistic users are positioned in relation to the systems they interact with. Rather than treating autistic learners as users who require remediation or special accommodation, this orientation recognizes them as users whose needs and capacities can actively inform better design for all. This is consistent with the neurodiversity framework, which understands cognitive variation as a natural and valuable dimension of human diversity (Nguyen & Peers, 2025; Schmidt et al., 2024). The implications for inclusive design are substantial: when autistic users' way of engaging with information is treated as legitimate and instructive rather than as deviations from a norm, the resulting systems are more likely to be flexible, more navigable, and more inclusive at their core.

Language, Identity, and Representation

Any research engaging with autism must also attend to questions of language and representation. There is no consensus on preferred terminology across autistic communities and professional fields: some individuals and advocates prefer identity-first language (autistic person), while others prefer person-first language (person with autism), and preferences vary by culture, context, and individual preferences (Lei et al., 2021). A large-scale analysis of learner responses in Massive Open Online Course (MOOC) environments found that while no universal preference emerged, participants consistently emphasized that autistic individuals themselves should guide language choices, and that communicating individual needs and strengths is more important than adhering to any single terminological convention (Lei et al., 2021).

This project uses identity-first language (such as autistic learner, autistic student, etc.) as a default, consistent with the preferences expressed by many autistic self-advocates and aligned with the neurodiversity framework that informs this work (Nguyen & Peers, 2025). This choice is not intended to flatten individual preferences, but to signal an orientation towards autism as identity rather than pathology, a position that is coherent with the social model framing established at the opening of this section.

More broadly, questions of representation extend to whose knowledge and experience is centred in research and design. The majority of research on autism in higher education has been conducted *about* autistic people, rather than *with* them. A scoping review of 93 studies found that 72% made no mention of autistic involvement in the research process (Gormley et al., 2024). This absence is not neutral; it reflects and reproduces assumptions about whose expertise counts in understanding and addressing the barriers autistic people face. This project draws on findings from co-design processes embedded in the *All Standards with Us* initiative, recognizing the lived experience of disabled and Deaf participants as a foundational, rather than supplementary, source of knowledge in the development of inclusive standards.

Barriers in Online Learning Environments

Understanding the barriers that autistic learners encounter in digital learning environments requires moving beyond a checklist of interface problems towards a structural analysis of how systems are built, organized, and evaluated. The barriers documented in the literature are not isolated technical failures, they are patterns that emerge repeatedly across different platforms, institutions, and contexts, suggesting that they are products of systemic design assumptions, rather than individual oversights. This section synthesizes the key barriers identified across the literature, organized into thematic categories. Table 1 provides an overview of these categories, followed by a synthesis of the most significant patterns and their implications.

Table 1

Barriers to Accessible Online Learning for Autistic Learners

Barrier Title	Description	Key Example(s) from Literature	Additional Sources	Design Implication
Navigational Disorientation	Complex hyperlinked systems with excessive branching, unclear hierarchy, and too many choices can create confusion and cognitive overwhelm, leading to task abandonment and loss of confidence.	An adult learner with ASD described navigating their university LMS as moving through a "maze of links" with "no idea where I am going", resulting in task abandonment and reduced self-efficacy (Meyers & Bagnall, 2015).	(Fabri & Andrews, 2016; Hatfield et al., 2016; Janse van Rensburg & Liang, 2025)	Systems require clear hierarchical structure, consistent signposting, and reduced branching to support orientation and reduce procedural uncertainty.

Cognitive Overload	Dense information presentation, lack of chunking, and insufficient scaffolding place high demands on working memory, disproportionately affecting users who process information more slowly or through different strategies.	Eye-tracking studies found autistic users exhibit significantly longer fixation durations when navigating text-heavy or cluttered interfaces, indication substantially higher cognitive effort (Andreou & Raxioni, 2024; Rezae et al., 2020)	(Bozgeyikli et al., 2018; Friedman & Bryen, 2007; Santos et al., 2017; Wood et al., 2021)	Information must be chunked, layered, and progressively disclosed rather than presented in dense, undifferentiated blocks.
Sensory and Visual Complexity	High-contrast colours, dense visual layouts, motion, and cluttered backgrounds can overwhelm autistic users whose sensory processing differs from neurotypical norms, reducing both comfort and performance.	Cluttered virtual environments significantly reduced task performance for autistic users, while simplified lower-fidelity representations improved accuracy even when users expressed a preference for richer visuals (Bozgeyikli et al., 2018)	(Fabri & Andrews, 2016; Faruq et al., 2025; Koenig et al., 2009; Schmidt et al., 2024)	Visual design must prioritize clarity and calm over richness, with muted palettes, generous whitespace, and minimal motion.
Ambiguous Visual Communication	Icons, labels, and navigational elements that are unclear, unfamiliar, or mismatched with their textual descriptions increase cognitive load and cause misinterpretation, particularly for users who rely heavily on visual processing.	Autistic users showed significantly increased fixation times and confusion when icons did not clearly correspond to their labels, while well-matched icon-text pairs reduced processing effort (Rezae et al., 2020).	(Andreou & Raxioni, 2024; Bayor et al., 2021; Friedman & Bryen, 2007)	Visual elements must be semantically consistent, culturally familiar, and clearly aligned with accompanying text.

Rigid Information Structure	Linear, one-size-fits-all content structures that do not accommodate different processing speeds, entry points, or levels of prior knowledge create barriers for learners who engage with information non-linearly or require more time and repetition.	Students with ASD reported that receiving information progressively and being able to control their pace was critical to understanding, while rigid linear structures increased anxiety and reduced comprehension (Barrera Ciurana & Moliner García, 2024).	(Al-Azawei et al., 2017; Contreras-Ortiz et al., 2023; Kent, 2015; Meyers & Bagnall, 2015)	Systems should offer multiple entry points, user-controlled pacing, and layered complexity rather than enforcing a single pathway through content.
Compliance-Driven Accessibility	Accessibility evaluated primarily through automated tools and guideline conformance fails to capture experiential, cognitive, and emotional dimensions of usability, producing systems that pass audits but remain functionally inaccessible.	A systemic review of 25 studies found that no educational website fully met WCAG standards, and that automated tools, used in 80% of evaluations, consistently missed experiential and cognitive barriers (Campoverde-Molina et al., 2020).	(Aizpurua et al., 2016; Giraud et al., 2018; Iniesto & Rodrigo, 2024; Yesilada et al., 2015)	Accessibility evaluation must involve real users and attend to lived experience, not only technical conformance metrics.
Inconsistent Institutional Support	Support structures for autistic students in higher education are fragmented, inconsistently implemented, and often reliant on diagnosis disclosure, placing the burden of navigation on students rather than on institutions.	A survey of 99 UK universities found that 40% had no in-house autism specialist, implementation rates of support measures varies from 22% to 72%, and almost no institutions had autism-specific policies (Chown et al., 2018).	(Fabri & Andrews, 2016; Gormley et al., 2024; Janse van Rensburg & Liang, 2025; Lowenthal & Lomellini, 2023)	Language must be plain, direct, and unambiguous with glossaries or contextual definitions provided for technical or specialized terminology.

Inaccessible Language and Terminology	Complex, jargon-heavy, or ambiguous language in instructional materials and interface elements creates comprehension barriers, particularly where plain language and clear labelling are absent.	Students with ASD consistently identified unclear instructions and ambiguous expectations as primary sources of anxiety and disengagement, while clear, explicit language was identified as a critical enabler of participation (Barrera Ciurana & Moliner García, 2025; Fabri & Andrews, 2016).	(Dam et al., 2023; Lei et al., 2021; Terras & Jarrett, 2021; van Calis et al., 2025)	Language must be plain, direct, and unambiguous, with glossaries or contextual definitions provided for technical or specialized terminology.
Lack of Multimodal Representation	Systems that present information in a single format, typically dense text, fail to accommodate learners who process information more effectively through visual, auditory, or spatial modalities.	Multiple studies confirm that autistic users process icons and images faster than text, and that combining visual and textual formats significantly improves comprehension compared to text alone (Andreou & Raxioni, 2024; Friedman & Bryen, 2007).	(Barrera Ciurana & Moliner García, 2025; Contreras-Ortiz et al., 2023; Faruq et al., 2025; Redstone & Luo, 2024)	Content should be represented across multiple modalities, allowing users to engage through the format best suited to their processing style.
Exclusion from Design Process	Most digital learning systems and accessibility standards are designed without meaningful or authentic involvement of autistic users, resulting in systems that reflect neurotypical assumptions and consistently miss the barriers that matter most.	A scoping review of 93 studies on autistic students in higher education found that 72% made no mention of autistic involvement in the research or design process (Gormley et al., 2024).	(Benton et al., 2011; Hendriks et al., 2015; Maun et al., 2024; Peláez et al., 2025)	Co-design and participatory evaluation with autistic users must be embedded in system development, not treated as optional or supplementary.

Compounding Effects and Systemic Patterns

What Table 1 cannot fully convey is the degree to which these barriers compound and reinforce one another in practice. For example, a learner encountering navigational disorientation does not experience that barrier in isolation, they encounter it simultaneously with cognitive overload, ambiguous visual communication, and the absence of institutional support structures that might otherwise help them reorient. The cumulative effect is qualitatively different from the sum of individual barriers, it produces the kind of total disengagement documented by Meyers and Bagnall (2015), where a learner who is capable and motivated simply cannot function within a system that was not designed with their needs in mind.

This compounding dynamic is significant as it reveals the inadequacy of fragmented accessibility interventions. Adding alt-text to images, or ensuring colour contrast, or providing a text transcript of a video, each of these is a meaningful and necessary step to move towards accessibility, but none of them addresses the structural conditions that produce the deeper barriers of navigational disorientation, cognitive overload, or exclusion from design process. As Lazar et al. (2015a) argue, inaccessibility is not a collection of technical errors to be corrected one by one, it is a systemic condition that requires systemic responses.

The literature also reveals a persistent gap between where accessibility efforts are concentrated and where the most significant barriers exist. Research consistently shows that cognitive accessibility, encompassing navigation, information structure, clarity of language, and processing load, is the domain in which autistic learners may experience the most severe barriers, while also being the domain that compliance-based frameworks tend to neglect (Campoverde-Molina et al., 2020; Friedman & Bryen, 2007). This demonstrates not a technical gap, but a values gap, reflecting whose needs are treated as central in the design of accessibility frameworks themselves.

Lastly, the barrier of exclusion from design processes deserves particular emphasis as it is in some of sense, foundational to the others. When autistic users are not involved in the design and evaluation of digital systems, the barriers that result are predictable: systems built on assumptions, evaluated by neurotypical criteria, and judged accessible by metrics that do not capture the experiences of the people they are meant to serve. The solution is not simple to add autistic perspectives at the end of a design process as a form of user testing, it is to restructure the design process itself around the key principle that lived experience is a form of expertise, and that the people most affected by a system's design are the most qualified to identify its failures.

Opportunities and Effective Design Approaches

The barriers outlined in the preceding sections are substantial, but the literature is equally rich in evidence for what works. Across instructional design, UX research, and disability studies, a set of consistent design approaches emerges that meaningfully reduces barriers for autistic learners while improving usability for a broader range of users. This section synthesizes those approaches, organizing them around four interconnected themes: visual and multimodal design, flexibility and user control, structured navigation, and co-design as method.

Visual and Multimodal Design

The evidence for visual design as a functional accessibility strategy, rather than an aesthetic preference, is significant. Where interfaces that are text-heavy increase cognitive load and processing time for autistic users, well-designed visual systems that combine icons, spatial organization, and clear typographic hierarchy have been shown to reduce effort and improve comprehension (Andreou & Raxioni, 2024; Rezae et al., 2020). The key word here is well-designed: the effectiveness of visual elements and their intended meaning. Familiar icons, predictable colour coding, and unambiguous labelling leverage existing visual literacy rather than requiring users to learn new interpretive conventions (Bayor et al., 2021).

Multimodal representation extends this principle beyond the visual. UDL's foundational emphasis on multiple means of representation reflects a growing evidence base demonstrating that providing information across various formats accommodates a wider range of processing styles and reduces the risk that any single format becomes a barrier (Al-Azawei et al., 2017; Redstone & Luo, 2024). Importantly, the goal is not to multiply formats indiscriminately, but to ensure that users can access the same content through what modality best supports their learning. Research on accessible health information design found that combining simplified text with graphics supports significantly improved knowledge transfer for users with cognitive disabilities, while also highlighting the importance of balance, as too much content in any format reduces usability (Dam et al., 2023). This tension between depth and clarity is one that runs throughout inclusive design practice and is returned to in the framework section of this paper.

Knowledge mapping offers a particularly relevant application of visual design principles in complex information environments. Research on visual knowledge maps as navigation and learning tools demonstrates that spatial representations of relationships between concepts support comprehension in ways linear text cannot, allowing users to perceive structure, identify connections, and locate themselves within a system at a glance (Falconer, 2008; Folostina et al., 2022). Falconer's research on metaphor helps users organize complex information by leveraging human spatial cognition, enabling pattern recognition and conceptual mapping that supports non-linear exploration. This finding has direct relevance to the visual navigation work undertaken in Part 2 of this project.

Flexibility and User Control

Across the literature, flexibility consistently emerges as one of the most impactful design principles for autistic learners, encompassing pacing, content access, and the degree to which users can control their own path though a system (Barrera Ciurana & Moliner García, 2024, 2025). When systems accommodate variability in how users process and engage with information, they reduce the cognitive and emotional cost of participation for users whose needs diverge from neurotypical norms.

Autonomy and self-regulation are central to this. Learning-controlled pacing, the ability to pause, revisit, skip or sequence content independently, is associated with higher engagement and reduced anxiety for autistic learners (Barrera Ciurana & Moliner García, 2025; Noor et al., 2022). This requires systems to be structured in ways that make self-directed navigation legible and manageable rather than presenting users with an undifferentiated body of material. The underlying principle, that systems should respond to users rather than requiring users to adapt to systems, is consistent with the social model orientation established earlier in this paper.

Structured and Predictable Navigation

Flexibility and structure are not in tension; they are mutually reinforcing. Users are more willing and able to explore non-linearly when they have a clear sense of the overall system they are navigating within (Falconer, 2008; Meyers & Bagnall, 2015). Consistent layouts, stable navigation, clear labelling, and reliable feedback reduce cognitive overload by empowering users to build accurate mental models of a system rather than expending effort to interpret and navigate the interface itself (Benton et al., 2011; Santos et al., 2017).

Progressive disclosure is a particularly well-suited structural strategy for information-dense environments, revealing complexity gradually rather than presenting it all at once, allowing users to orient at a high level prior to choosing how deeply to engage (Dam et al., 2023; van Calis et al., 2025). Research on inclusive digital platform design found that clear onboarding and guided entry points significantly reduced barriers to independent use, suggesting that the entry experience is at least as important as the quality of the content itself.

Co-Design as Method and Orientation

The most consistently supported finding across the reviewed literature is that inclusive design outcomes depend not only on what is designed, but also on who is involved in designing it. Co-design is positioned across multiple fields not as a methodological preference, but as an ethical necessity. Studies involving autistic users in the design of tools consistently find that participatory processes surface needs and barriers that would not be otherwise identified (Bayor et al., 2021; Bossavit & Parsons, 2018; Maun et al., 2024).

Effective co-design with autistic users requires individualized approaches, flexible methods, and genuine commitment to treating participants as experts in their own experience. Standard design tools often rely on capacities, such as abstract reasoning and verbal articulation, that may not equally accessible to all participants, and structured environments with visual and tangible supports improve the quality of participation (Hendriks et al., 2015; Maun et al., 2024). Beyond its practical benefits, co-design is also an expression of the values underpinning this project. The principle of “nothing about us without us” reflects a foundational ethical commitment to lived experience as a form of expertise, and co-design is the structural response to that commitment (Nguyen & Peers, 2025).

Core Themes of Literature

The literature reviewed across Part 1 converges on a set of recurring themes that cut across instructional design, UX research, disability studies, and digital accessibility. These themes are not isolated findings, they are patterns that emerged consistently across different contexts, populations, and methodological approaches, and together they form the conceptual foundation for the applied work undertaken in Part 2. Table 2 summarizes these themes and their connection to the visual navigation system developed as part of the *All Standards with Us* initiative.

Table 2

Core Themes Emerging from the Literature Review

Theme	Description	Key Sources
Accessibility Beyond Compliance	Technical conformance to guidelines is insufficient to ensure usable, inclusive experiences. Real accessibility is experiential, relational, and context-dependent, requiring human-centred evaluation and design rather than checklist-based auditing.	(Aizpurua et al., 2016; Campoverde-Molina et al., 2020; Giraud et al., 2018; Yesilada et al., 2015)
Cognitive Load as a Design Priority	Managing cognitive load through chunking, progressive disclosure, clear hierarchy, and reduced visual complexity, is a core accessibility practice. Environments that fail to address cognitive load disproportionately exclude autistic and cognitively diverse users.	(Bozgeyikli et al., 2018; Friedman & Bryen, 2007; Meyers & Bagnall, 2015; Wood et al., 2021)
Visual Design as Functional Accessibility	For autistic and cognitively diverse users, well-designed visual systems are not aesthetic enhancements, but functional accessibility tools that support comprehension, orientation, and navigation in ways that text-heavy formats cannot.	(Andreou & Raxioni, 2024; Bayor et al., 2021; Folostina et al., 2022; Rezae et al., 2020)
Multiple Entry Points and Non-Linear Navigation	Inclusive systems accommodate diverse cognitive styles by offering multiple ways into the same content, allowing users to orient themselves and navigate according to their own needs and priorities, rather than a fixed sequence imposed by the system.	(Barrera Ciurana & Moliner García, 2024; Dam et al., 2023; Falconer, 2008; Meyers & Bagnall, 2015)
Flexibility and User Autonomy	Systems that give users control over pacing, sequence, and depth of engagement reduce barriers and increase both accessibility and motivation. Autonomy is not a preference feature; it is a structural accessibility requirement for users whose processing needs diverge from defaults emerging from neurotypical assumptions.	(Barrera Ciurana & Moliner García, 2025; Noor et al., 2022; Schmidt et al., 2024; Whyte et al., 2015)
Structure and Predictability	Consistent layouts, stable navigation, and predictable interaction patterns reduce the cognitive cost of using a system and allows users to focus on content rather than interface interpretation. Structure and flexibility are mutually reinforcing rather than in tension.	(Benton et al., 2011; Santos et al., 2017; Tarantino et al., 2023; Valencia et al., 2019)

Universal Design for Learning	UDL provides a proactive, flexible framework for reducing barriers through multiple means of representation, expression, and engagement. Its principles apply not only to instructional design, but to any complex information engagement where diverse users must be meaningfully supported.	(Al-Azawei et al., 2016, 2017; CAST, 2024; Rao et al., 2014; Redstone & Luo, 2024; Yang et al., 2024)
Strengths-Based and Neurodiversity-Affirming Design	Designing from autistic cognitive strengths; pattern recognition, spatial reasoning, and systemic thinking, can produce more effective and more inclusive systems. This reframes inclusive design as activating capacity rather than compensating for deficit, consistent with the social model orientation of this project.	(Contreras-Ortiz et al., 2023; Nguyen & Peers, 2025; Schmidt et al., 2024; Valencia et al., 2019)
Co-Design and Lived Experience as Expertise	Inclusive design outcomes depend on the meaningful involvement of people most affected by a system in its development. Lived experience is a form of expertise that produces design insights unavailable through other means, and its absence from design processes is a primary driver of exclusion.	(Bossavit & Parsons, 2018; Gormley et al., 2024; Hendriks et al., 2015; Maun et al., 2024)
Systemic Over Individual Responses	Accessibility failures are systemic rather than individual, requiring responses at the level of processes, institutions, and design practices. Retrofitted accommodation and individual workarounds are inherently insufficient responses to barriers that are structural in origin.	(Barrera Ciurana & Moliner García, 2025; Janse van Rensburg & Liang, 2025; Lazar et al., 2015a; Peláez et al., 2025)

These themes collectively establish the evidence base and values that informs the applied work in Part 2. Each is traceable to specific design decisions in the visual navigation system, and the table will be re-visited in that section to make those connections explicit.

Limits of Domain-Specific Standards

The themes established across Part 1: cognitive accessibility, multimodal representation, flexible navigation, co-design, and systemic orientation, were developed primarily in digital learning contexts. However, when this same lens is applied to the domain of standards development, a striking parallel emerges. The barriers that autistic learners encounter in poorly designed digital learning environments and the barriers that disabled and Deaf people encounter in standards development processes share a common structural logic: both are produced by systems designed around a narrow set of assumptions about who will use them, how, and with what prior knowledge and capacity. This recognition is what motivated the shift in scope that defines the second part of this project.

The Problem with Domain-Specific Approaches

The original aim of this research was to develop a set of domain-specific standards for accessible online learning tailored to autistic learners in higher education. This is a legitimate and necessary area of work, the literature reviewed in Part 1 makes clear that the barriers autistic learners face in digital environments is specific, well-documented, and insufficiently addressed by existing frameworks. However, as the research progressed, several limitations of the domain-specific approach became apparent.

Limitation 1: Scope

The range of barriers identified in the literature, spanning interface design, instructional strategy, institutional policy, language and terminology, co-design practice, and systemic orientation, is too broad and too deeply interconnected to be addressed by a single set of domain-specific guidelines. Effective responses to these barriers require coordinated change across multiple levels of a system simultaneously, and a domain-specific standard focuses on online learning environments alone cannot reach the institutional, procedural, and cultural dimensions where many of the most significant barriers originate (Janse van Rensburg & Liang, 2025; Lazar et al., 2015b).

Limitation 2: Generalizability

The variability documented across the literature, in autistic users' needs, preferences and processing styles, and support requirements, resists reduction to a fixed set of prescriptive guidelines (Al-Azawei et al., 2016; Hendriks et al., 2015). Standards that are specific enough to be actionable risk being too restrictive to accommodate the diversity they are meant to serve, while standards broad enough to accommodate that diversity risk being too vague to drive meaningful change. This tension is not unique to accessibility through an autistic lens; it is a structural challenge facing any attempts to standardize responses to human variability.

Limitation 3: Process

Even well-designed domain-specific standards are limited by the processes through which they are developed. Standards created without meaningful involvement of the communities they are intended to serve will inevitably reflect the assumptions and priorities of those who did the creating, reproducing the same exclusions they aim to address (Gormley et al., 2024; Maun et al., 2024). This is not a problem that can be solved at the level of content, it requires a fundamental rethinking of how standards are made.

From Accessibility Standards in Online Learning to Inclusive Standards Development

The process limitations identified in the preceding section point toward a more fundamental question: not just what accessibility standards should say, but how they should be made. This section traces the conceptual shift that reoriented the present research, from domain-specific standards for autistic learners in online learning, towards contributing to a broader initiative dedicated to making the standards development itself more inclusive and argues that this shift is not a departure from the original research focus, but a logical extension of the findings.

Standards Development as an Accessibility Problem

Standards Development Organizations (SDOs) operate as complex institutional environments with their own significant barriers to participation. Dense documentation, inaccessible meeting formats, lack of compensation, inadequate support for disabled and Deaf contributors, and processes that assume a level of technical familiarity that many community members do not have systematically exclude the people whose lived experience is most relevant to the standards being developed (IDRC, n.d.-b). The result is a self-reinforcing cycle: standards meant to reduce barriers are developed through processes that reproduce the very barriers they are designed to address.

This dynamic is directly recognizable from the literature reviewed in Part 1. The gap between what accessibility standards measure and what users experience has a precise analogue in standards development: the gap between who standards claim to serve and who is involved in making them. The response requires the same orientation in both contexts: moving from compliance towards participation, from technical specification toward lived experience, and from individual accommodation toward systemic redesign.

The *All Standards with Us* Initiative and Contributions of this Project

The *All Standards with Us* initiative, developed by the Inclusive Design Research Centre (IDRC) at OCAD University, in collaboration with various individuals and organizations, focuses on developing meta-standards for the process of standards development itself. Its central premise is that inclusive standards cannot be produced by exclusive processes, and that the participation of disabled and Deaf communities is a foundational requirement rather than a consultation exercise (IDRC, n.d.-a). The guidelines are grounded in co-design findings from the *All Standards with Us* project, reflecting the direct input of community members whose participation may have previously been excluded or inadequately supported.

The connection between this initiative and the research conducted in Part 1 is substantive. The barriers the guidelines address and the principles they apply are structurally similar to those identified throughout the literature review. The *All Standards with Us* initiative is, in this sense, an application of inclusive design at the level of process rather than product.

The primary contribution from this project to the *All Standards with Us* initiative was the development of a visual navigation system for the guidelines, a spatial, interactive map designed to function as an alternative entry point for users who prefer to explore the whole system before locating themselves within it at a deeper level. This system is a direct application of the research conducted in Part 1: designed in response to the barriers of cognitive overload, additional/multiple entry points, and the challenge of making complex interconnected content navigable without requiring linear reading. Its development: design, rationale, structural decisions, and relationship to the co-design findings, is the focus of the part that follows.

Part 2: Applying Inclusive Design Principles – Developing a Visual Navigation System for the *All Standards with Us* Guidelines

Part 1 of this project established a clear evidence base: accessibility in digital environments is effectively achieved through systems designed with cognitive clarity, flexible navigation, multiple entry points, and the meaningful involvement of the people they are intended to serve. It also traced the conceptual shift that reoriented this research, from developing domain-specific standards for autistic learners in online learning toward contributing to the *All Standards with Us* initiative, a project dedicated to making standards development itself more inclusive.

Part 2 documents the applied contribution that emerged from that shift: the development of a visual navigation system for the guidelines that emerged from the *All Standards with Us* initiative. This system is not a redesign of the guidelines themselves, nor a simplification of their content, the full accessible text already exists on the website and was deliberately preserved. It is, instead, an alternative entry point into the information, as a spatial, interactive overview of the guidelines ecosystem designed to help users understand the whole system before locating themselves within it.

Each design decision documented in this section can be traced back to the research conducted in Part 1. The Core Themes established in that section is revisited here, with each theme connected explicitly to the design choices that give it practical expression. Together, the two parts of this project demonstrate that research on accessibility in digital learning and practice in inclusive standards development are not parallel tracks, but a deeply interconnected endeavor. And that the most productive site of intervention is not the content of the standards alone, but the systems and processes through which that content is made accessible, navigable, and useable by the people it is meant to serve.

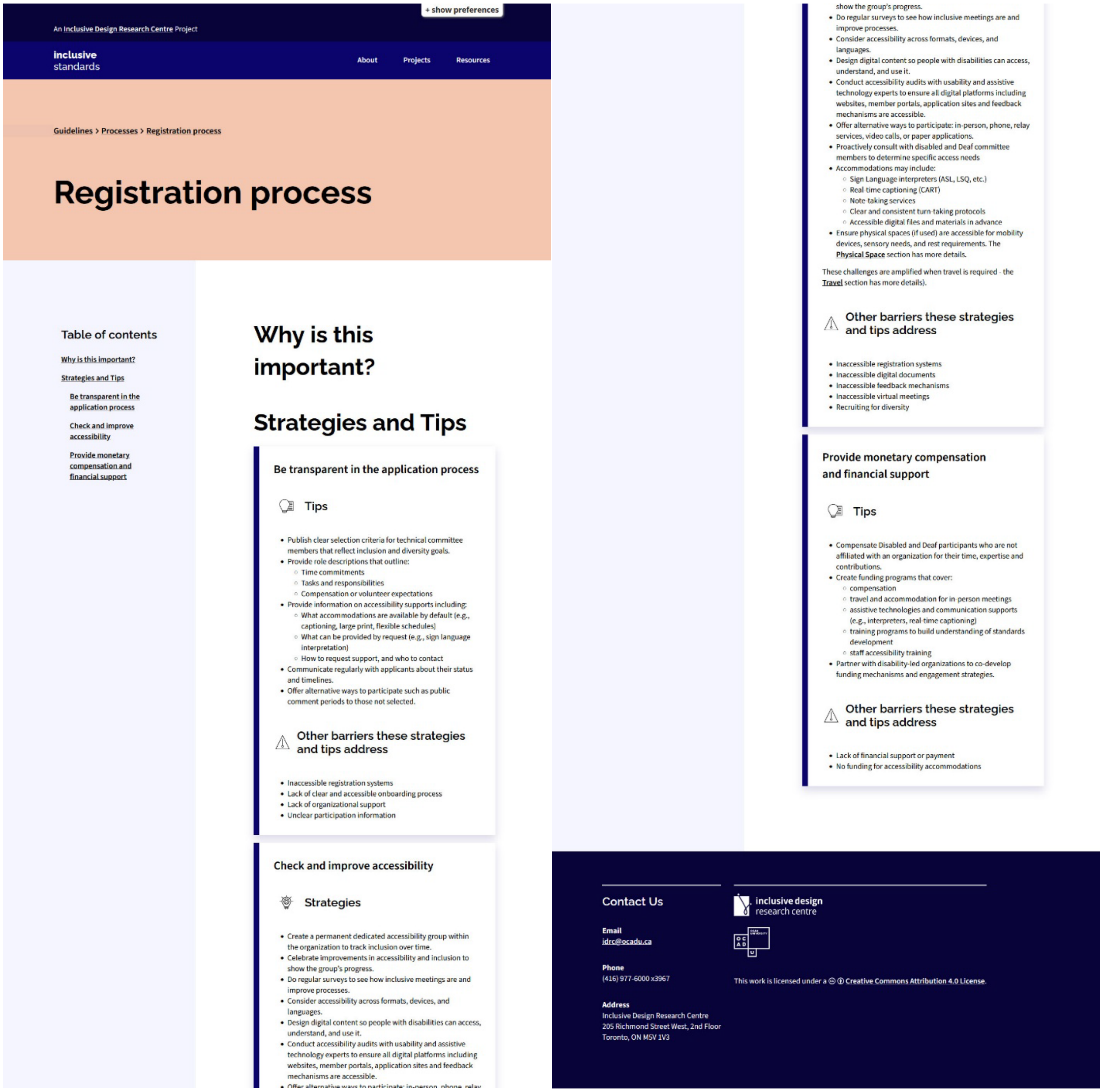
The All Standards with Us **Guidelines – Context and Content**

The *All Standards with Us* initiative was developed by the Inclusive Design Research Centre (IDRC) in collaboration with disabled and Deaf community members, researchers, and Standards Development Organizations. Its focus is the development of meta-standards for the process of standards development itself, not for any particular accessibility domain, but for how standards are made. (IDRC, n.d.-b).

Involvement with the project began when the content was near completion and ready to move the content online to the guideline's website. During this phase, recommendations were made to address cognitive load within the site's content structure, grounded in findings from the literature review in Part 1. These recommendations addressed dense material that was presented to users without structural scaffolding and including iconography. Although these recommendations were not initially taken forward by the project team, those same recommendations were ultimately revisited and implemented with the backing of other members involved in the project (see Figures 1 through 6).

Figure 1

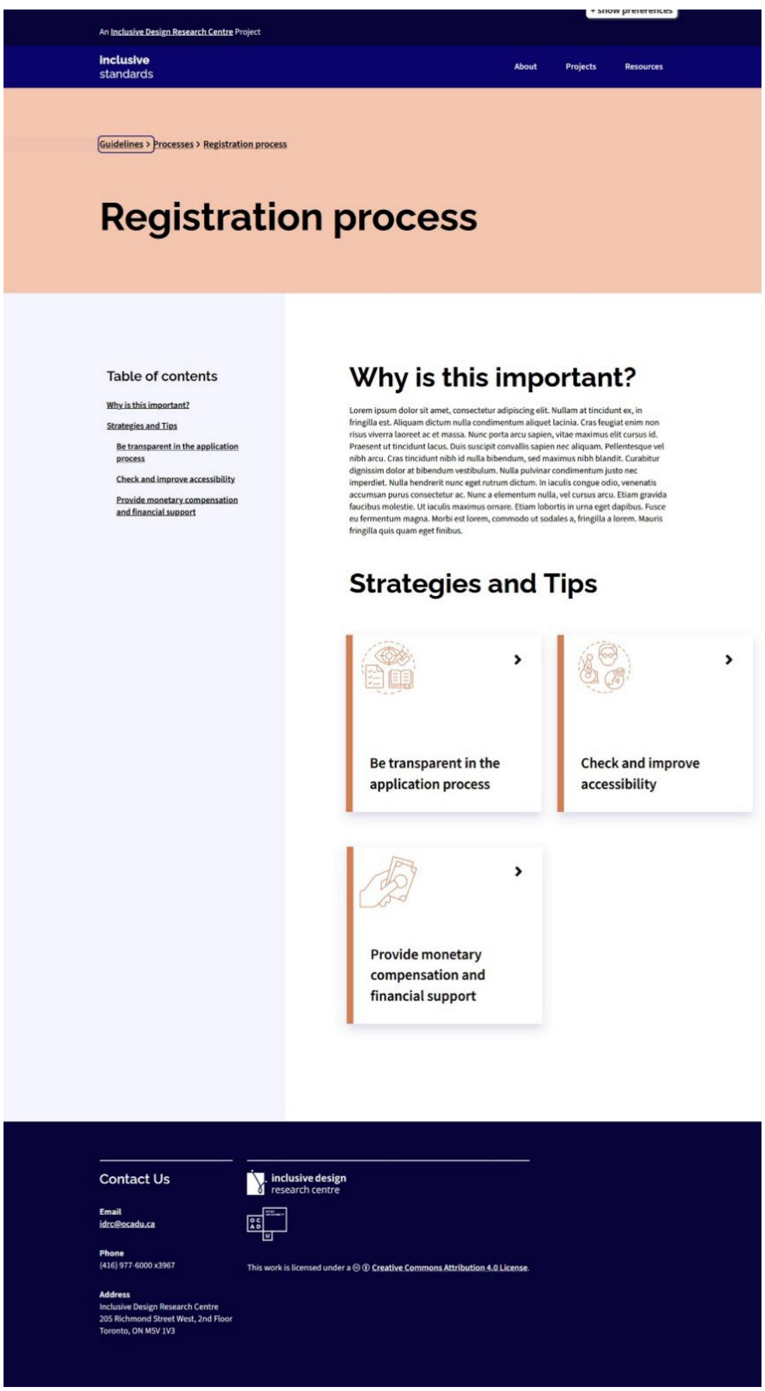
Registration Process Page as Found in the Browse by Standards Development Process Section Prior to Redesign [image]



Note. Screenshot from the *All Standards with Us* guidelines website draft prior to implementation of cognitive load recommendations. From Inclusive Standards by the Inclusive Design Research Centre, n.d.

Figure 2

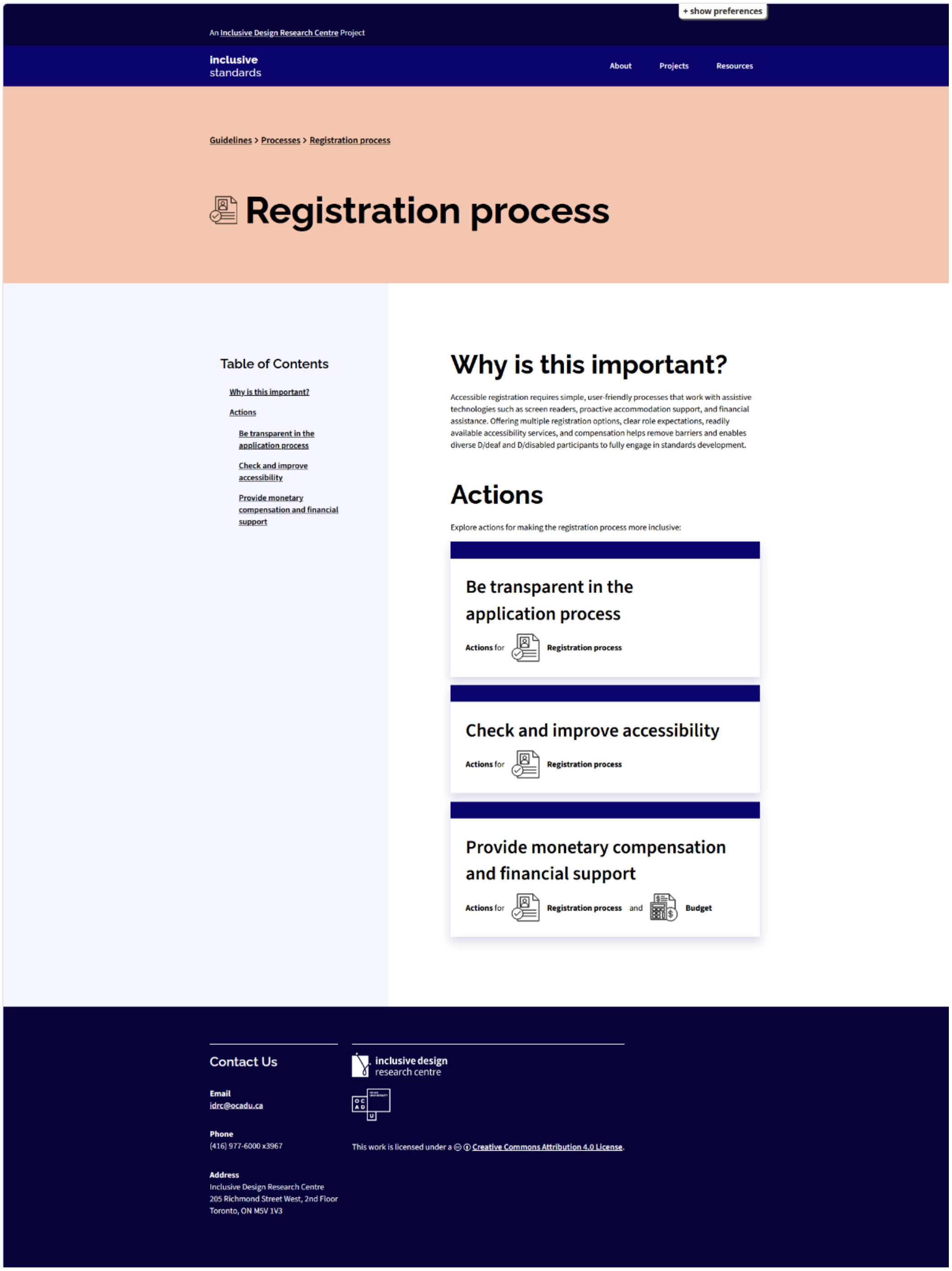
Registration Process Page: Prototype Submitted to Project Team [image]



Note. Author's prototype mock-up submitted to the *All Standards with Us* project team proposing restructured layout with iconography and scaffolded information.

Figure 3

Registration Process Page at Time of Publishing [image]



Note. Screenshot from the *All Standards with Us* guidelines website reflecting the implemented design.

From *Inclusive Standards* by the Inclusive Design Research Centre, n.d.

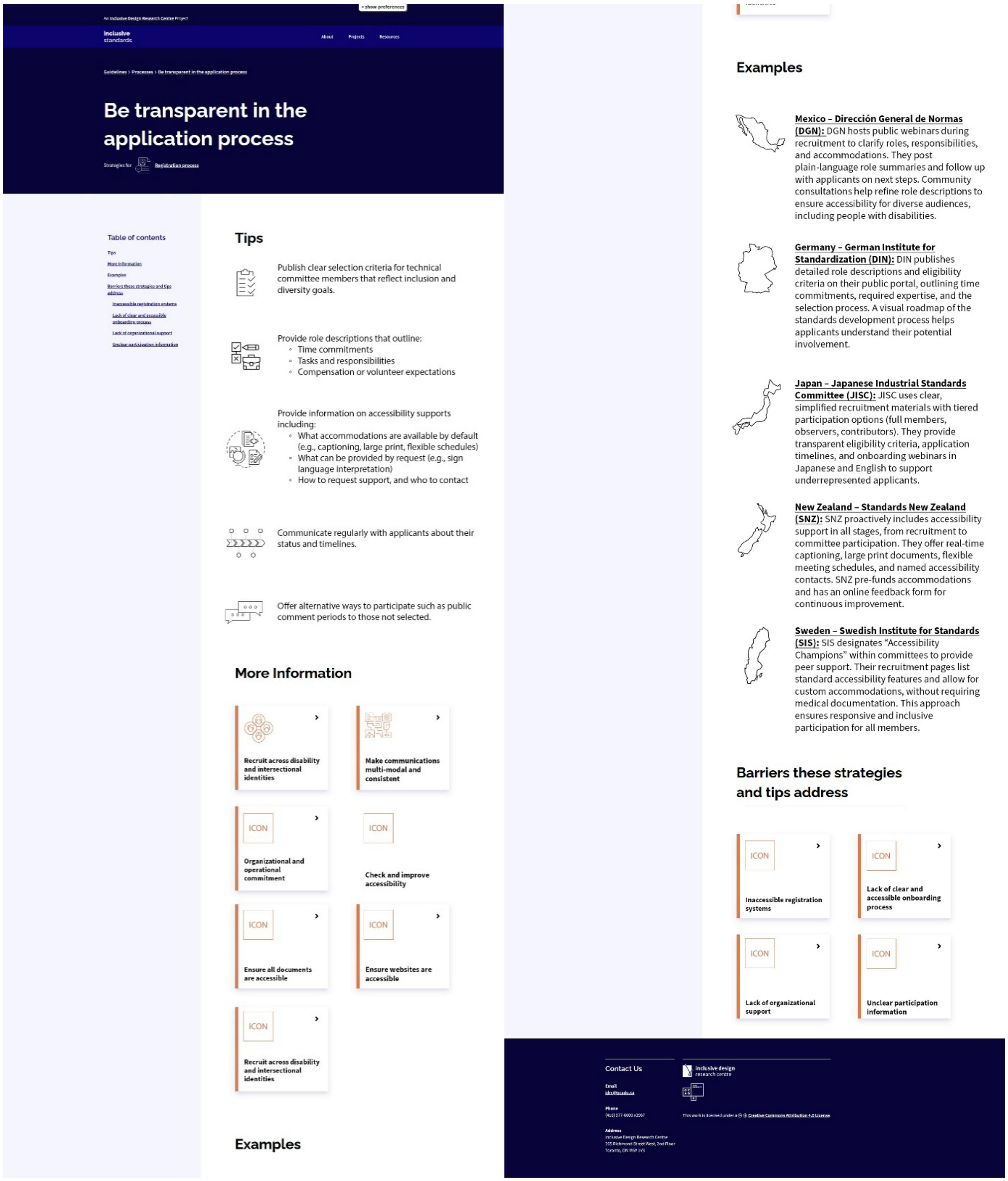
Figure 4

Be Transparent in the Application Process Page Prior to Redesign [image]

Note. Screenshot from the *All Standards with Us* guidelines website draft prior to implementation of cognitive load recommendations. From *Inclusive Standards* by the Inclusive Design Research Centre, n.d.

Figure 5

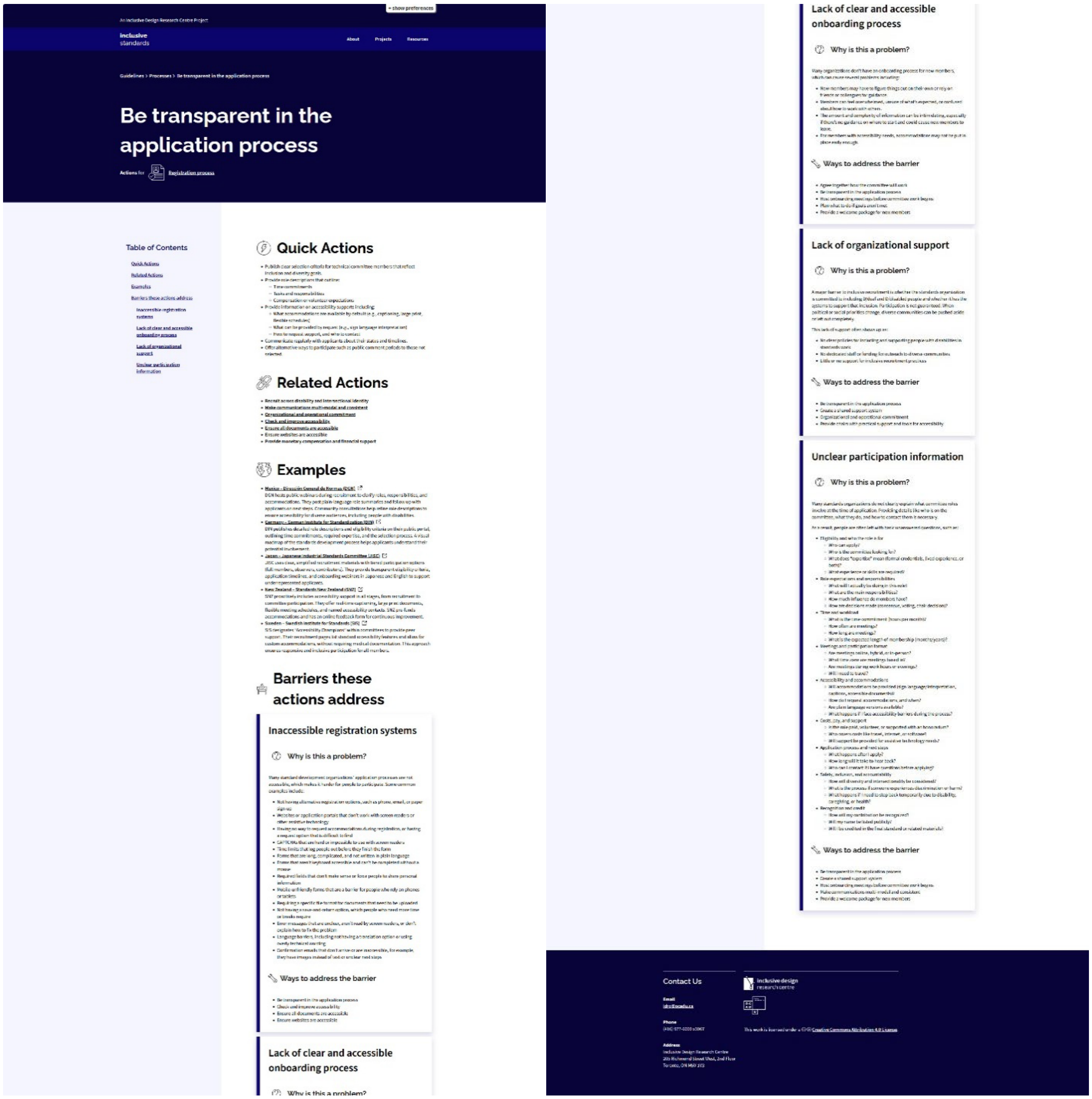
Be Transparent in the Application Process Page: Prototype Submitted to Project Team [image]



Note. Author’s prototype mock-up submitted to the *All Standards with Us* project team proposing restructured layout with iconography and scaffolded information.

Figure 6

Be Transparent in the Application Process Page at Time of Publishing [image]



Note. Screenshot from the *All Standards with Us* guidelines website reflecting the implemented design.

From *Inclusive Standards* by the Inclusive Design Research Centre, n.d.

The Navigation Challenge

The guidelines are a substantive resource, but their scope creates a secondary challenge: the content is extensive and layered, and locating relevant guidance without reading everything sequentially, which can place significant demand on users navigating the content.

Three navigation pathways currently exist: browsing by process stage, browsing by barriers, and search. Each serves a distinct need but may not provide users with a whole-system overview before entering the content at a particular pathway. This is the gap most addressed by the research in Part 1, and the gap the visual navigation system was designed to fill.

Design Rationale

The development of a visual navigation system for the guidelines emerged from a recommendation within the project team at the Inclusive Design Research Centre, following a recommendation to explore ways of making the guidelines more accessible through visual or interactive elements, as part of a broader set of priorities for the next phase of the guidelines. The concept was partly inspired by the *Co-design Kit*, an existing IDRC project which uses rich visual elements and spatial metaphor to convey complex process information in an accessible and engaging way (*The Design Process*, n.d.).

The visual system was understood from the outset as comparable to a site map, a way of orienting users to the full scope of the guidelines before they engage with its detail, providing them entry points to explore the information in-depth. The existing navigation pathways each serve users who may have a sense of what they are looking for. What they may not provide is an overview for users who need to understand the structure of the guidelines before they can locate themselves within it. The visual map is a way to close that gap.

The research conducted in part 1 provided the theoretical grounding for this contribution. The literature demonstrates that users, and particularly autistic and cognitively diverse users, benefit significantly from being able to orient to a complex system at a macro level before engaging with its detail (Falconer, 2008; Meyers & Bagnall, 2015). The visual system is a direct application of these findings to a real design problem identified by the project team.

Design Principles and Decisions

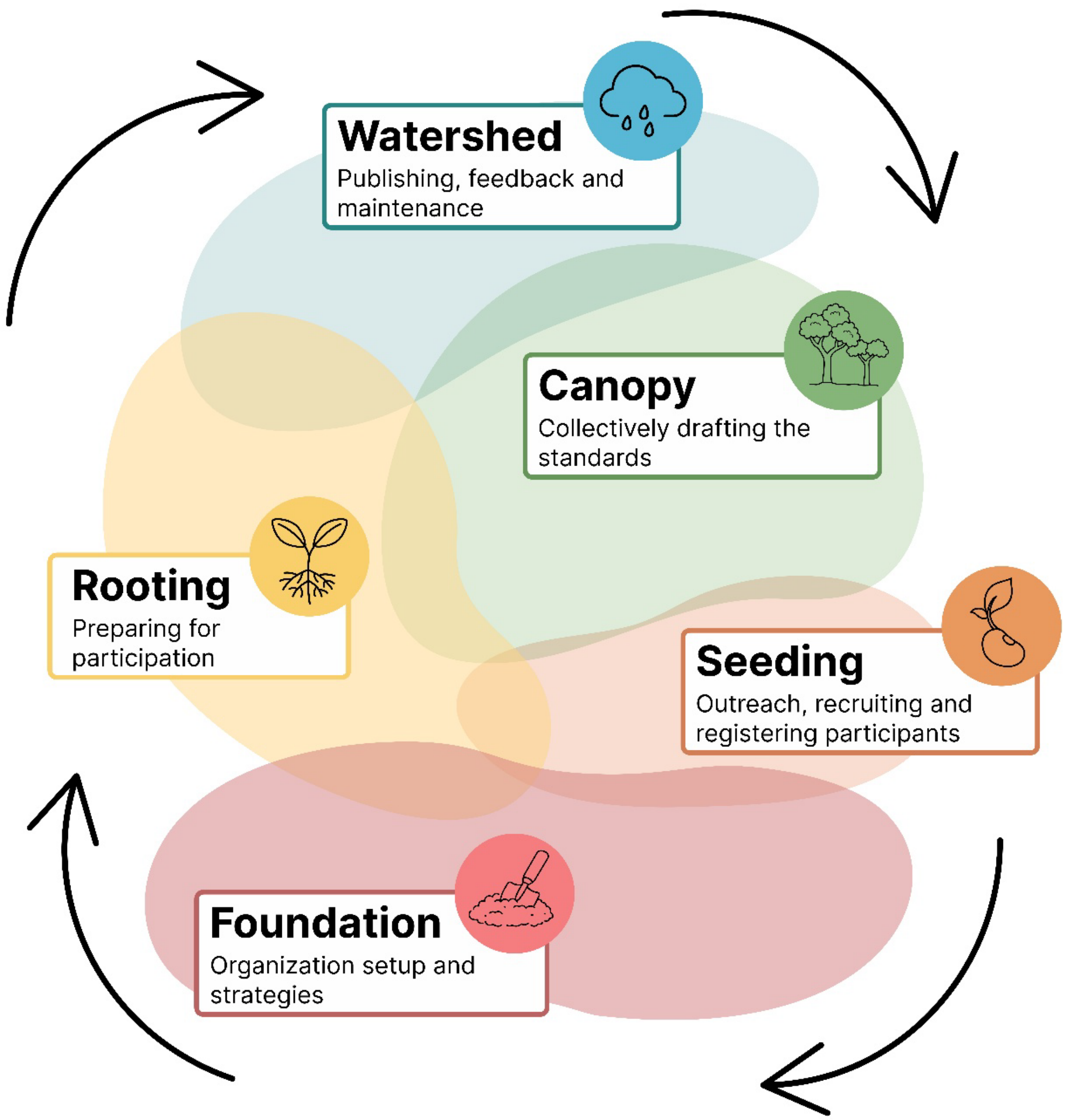
The visual navigation system was developed according to a set of principles that emerged from the research conducted in Part 1, the co-design findings from the *All Standards with Us* project, and the specific constraints of the guidelines site.

The Ecosystem Metaphor

The central organizing metaphor is an ecosystem: interdependent, recurring, with no fixed start or end. Falconer (2008) argues that spatial metaphors help users organize complex information by leveraging spatial cognition, enabling pattern recognition, and conceptual mapping that supports non-linear exploration. The ecosystem metaphor accurately reflects the nature of the guidelines: the five stages are not truly sequential, and the cross-cutting themes resist linear representation. A journey or pathway metaphor, similar to the one used in the *Co-design Kit* (*The Design Process*, n.d.*)*, was not used as it implies a single correct route and may carry connotations of movement and mobility that may not resonate with all users. The metaphor is expressed abstractly, soft organic shapes suggest a living system without depicting one, keeping the visual language calm and cognitively clear (Faruq et al., 2025; Folostina et al., 2022; Schmidt et al., 2024) (see Figure 7).

Figure 7

Visual Navigation System Prototype: Ecosystem Overview Map [image]



Note. Author's prototype showing the five-stage ecosystem layout (Foundation, Seeding, Rooting, Canopy, and Watershed) arranged as overlapping organic nodes with circular directional arrows communicating the interdependent nature of the standards development process.

Wayfinding Over Content Delivery

Each node contains only enough information to orient a user: a label, a brief description, and a link to the relevant section of the full guidelines. The visual system points: it does not explain. Cross-cutting themes are represented as threads running through the whole ecosystem, making visible the interconnectivity across the stages visual that linear navigation cannot convey.

Accessibility as a Design Constraint

The system was developed as an interactive web page as its foundation, ensuring the visual layer does not create new accessibility barriers. It is designed to complement the existing accessible browse modes rather than compete with them. Visual design decisions follow directly from the cognitive accessibility principles established in Part 1: a muted palette, generous whitespace, minimal motion, and consistent typography throughout.

Connecting Principles to Evidence

Table 3 connects the Core Themes established in Part 1 (Table 2) to the specific design decisions that are described in the prior section

Table 3

Core Themes from Part 1 and Corresponding Design Decisions

Theme	Description
Accessibility Beyond Compliance	The system is evaluated against navigational clarity and user experience, not technical conformance alone.
Cognitive Load as a Design Priority	Nodes contain minimal text. Information is layered: overview first, with the detail on the linked page. Muted palette, whitespace, and minimal motion reduce cognitive overhead.
Visual Design as Functional Accessibility	The navigation layer is visual and spatial. Organic shapes and proximity relations do the structural work that dense text would otherwise require.
Multiple Entry Points and Non-Linear Navigation	The map has no fixed starting point. Users can enter at any node and explore in any order, accessing all five stages and cross-cutting themes simultaneously.

Flexibility and User Autonomy	No pathway is imposed. The map supports both open directed navigation and open exploration according to user need.
Structure and Predictability	Consistent visual language and stable organizational logic are maintained throughout, allowing users to build a reliable mental model across visits.
Universal Design for Learning	The visual map is one of multiple navigation modes on the site, each serving a different cognitive orientation, enacting multiple means of representation at the level of navigation.
Strengths-Based and Neurodiversity-Affirming Design	The spatial, relational structure activates pattern recognition and systems thinking rather than requiring linear sequential processing.
Co-Design and Lived Experience as Expertise	The structure of the map reflects the five stages and cross-cutting themes identified through co-design with disabled and Deaf participants. For example, the co-design sessions identified that standards are often long and dense with no structured way to access or process content, and that a visual map of how existing standards connect was explicitly recommended as a solution (IDRC, n.d.-a). The navigation system is a direct response to these findings.
Systemic Over Individual Responses	The map makes the whole system visual at a glance, communicating the guidelines as an interconnected ecosystem, rather than a list of isolated recommendations.

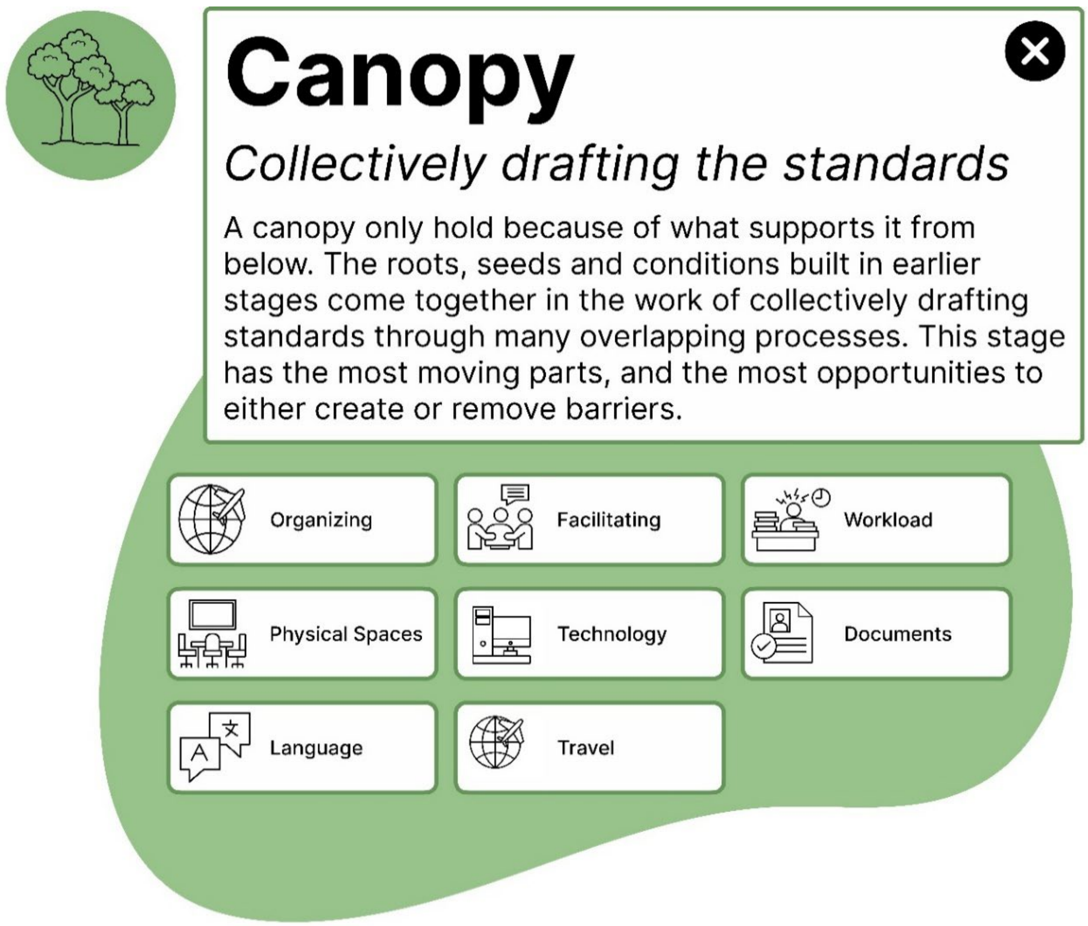
Together, these design decisions demonstrate that the visual navigation system is not an aesthetic addition to the guidelines but a principled response to an evidence-based understanding of how diverse users navigate complex information environments. Each decision is traceable to the research conducted in part 1 and to the lived experience of the communities the guidelines are designed to support.

Structure and Content of the Navigation System

The visual navigation system is organized around the five stages of the standards development process as its primary structural nodes: Organization and Setup, Recruitment and Registration, Preparing for Participation, Drafting the Standard, and Publishing, Feedback and Maintenance. Arranging these as nodes within an ecosystem layout, rather than sequentially along a timeline, communicates that while the stages have general developmental logic, they are interdependent and mutually reinforcing. Each node links users directly to the relevant section of the guidelines site, where the full content is available in its existing accessible format. The precise level of detail represented within each node is currently determined through the iterative development process, with cognitive load and navigational clarity as the primary criteria (see Figure 8).

Figure 8

Visual Navigation System Prototype: Canopy Node Detail View [image]

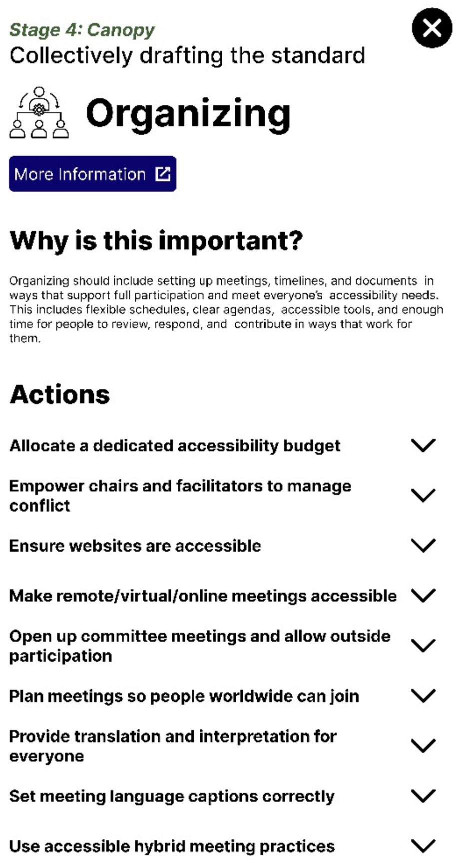


Note. Author's Figma prototype showing the expanded Canopy node (Collectively Drafting the Standards), which is overlayed when user selects Canopy on main view (Figure 7). Within this view, there is a stage description and eight sub-page navigation links: Organizing, Facilitation, Workload, Physical Spaces, Technology, Documents, Language, and Travel.

Each button expands a sidebar to reveal the node's sub-pages. Providing next level of detail while maintaining consistent visual language (see Figure 9).

Figure 9

Visual Navigation System Prototype: Organizing Sub-Page Sidebar Overlay [image]



Note. Author's Figma prototype showing the Organizing sub-page opening as a sidebar within the Canopy stage (Collectively Drafting the Standards), displaying with iconography, contextual framing, and a collapsed list of nine actions that can be taken.

Each action item expands to reveal detailed guidance, demonstrating scaffolded information in practice (see Figure 10).

Figure 10

Visual Navigation System Prototype: Organizing Sub-Page Sidebar Overlay with Expanded Actions

Note. Author's Figma prototype showing the Organizing sub-page sidebar with all action items expanded, revealing an overview for each of the nine action items for Organizing. The More Information button takes users to the page within the main content, with more details included.

Cross-Cutting Themes

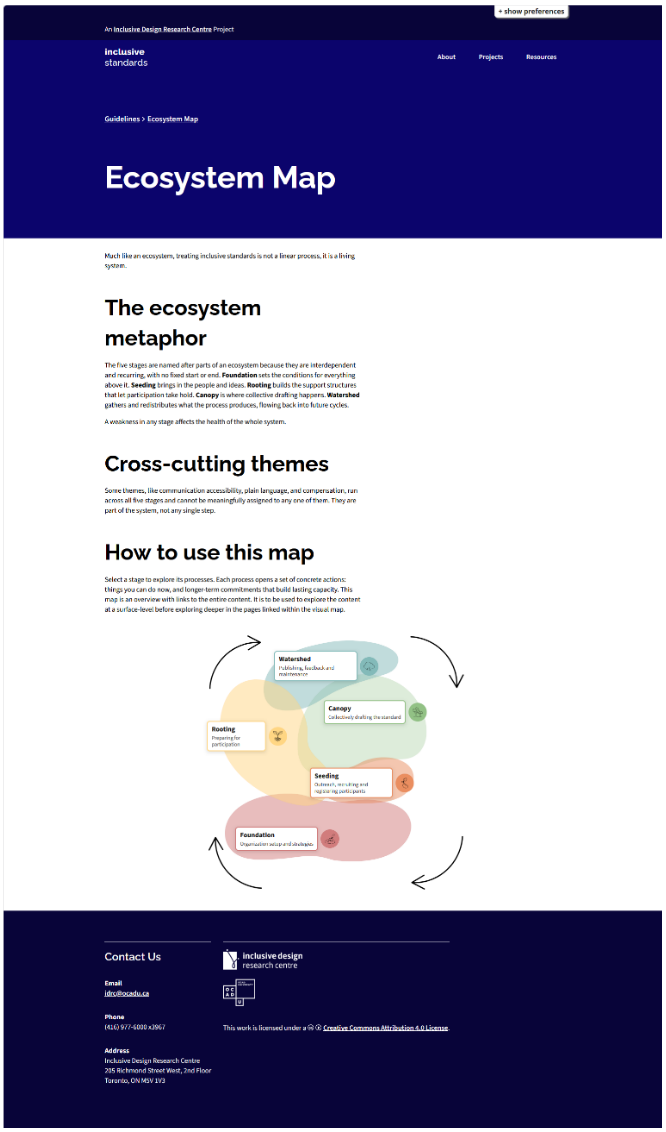
One of the most structurally distinctive features of the visual system is its representation of cross-cutting themes. Topics such as communication accessibility, compensation, and plain language that recur across multiple stages and cannot be meaningfully assigned to any single one. The ecosystem map makes these visible as connective threads running through a whole system, a representational affordance unique to the visual layout that directly addresses the co-design finding that users struggle to understand how different parts of the standards process relate to each other (Appendix A).

Iterative Development

The product of this project is an initial prototype, a first iteration of a system that is expected (and intended) to evolve. As with all design work, and particularly inclusive design work, the prototype will need to be refined as the *All Standards with Us* project changes or evolves, or users encounter any challenges with navigating the visual map (Hendriks et al., 2015; Maun et al., 2024). The decisions documented in this paper represent the conceptual and structural foundation of that prototype, not as a finished project. Future iterations may revise the visual language, the level of detail at the map level, the treatment of cross-cutting themes, or the interaction design of individual nodes, all in response to feedback from the communities that work with the guidelines. The value of current work lies not in producing a definitive solution, but in establishing a principled starting point from which that iterative process can proceed. At the time of submission, the visual navigation system has been developed as a functional prototype and deployed as a live web application, accessible at https://mrp-visual-map-all-standards-with-us.netlify.app/guidelines/ecosystem-map/.The underlying code is housed in a GitHub repository forked from the *All Standards with Us* guidelines site (https://github.com/mitch-ocad/visual-map-for-standards.inclusivedesign.ca), ensuring that technical implementation is directly compatible with the existing codebase and can be integrated into the live site by the project team and adapted as needed. Figures 11 through 15 document the visual navigation system as deployed at the time of submission.

Figure 11

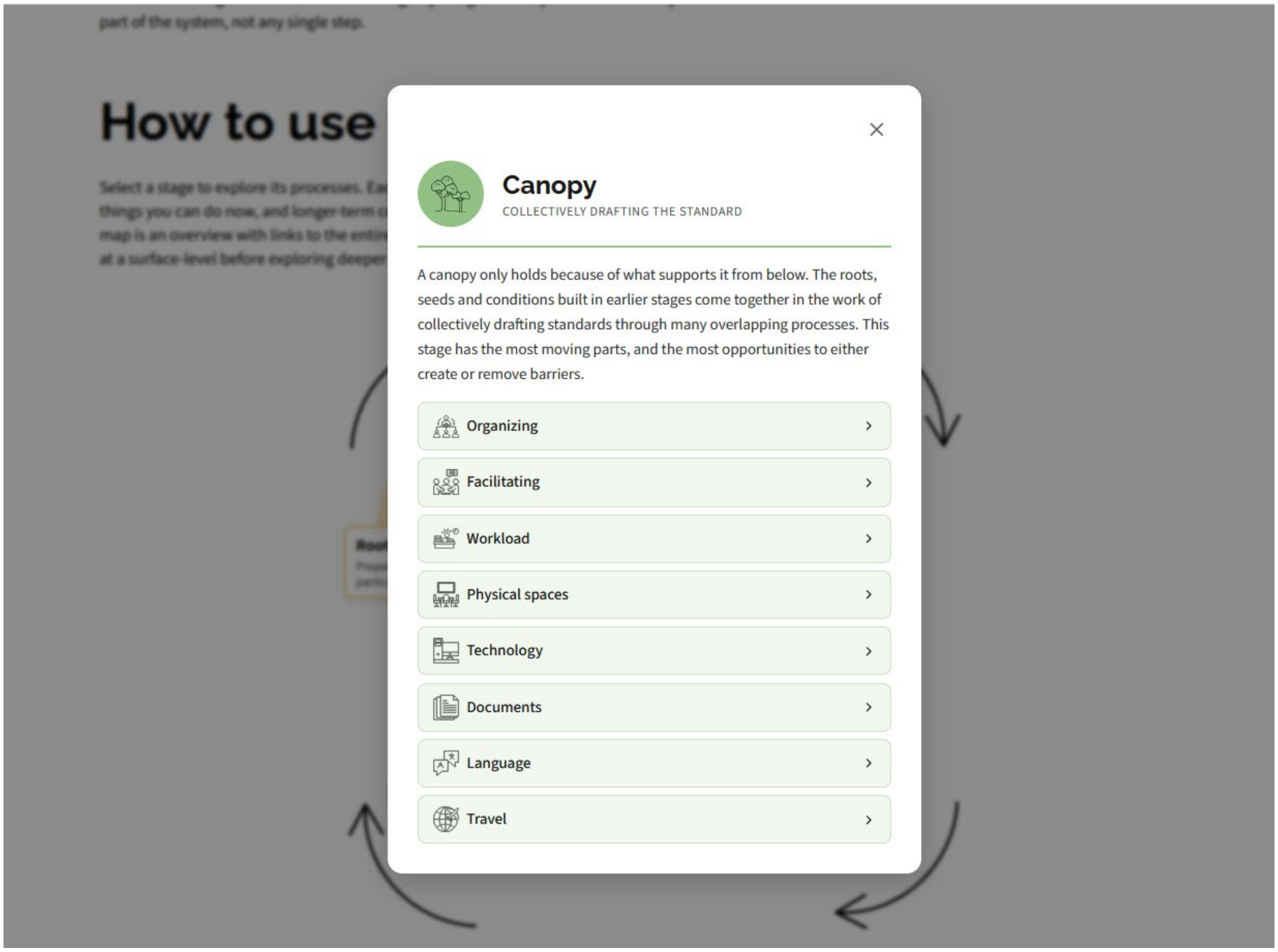
Live Deployment of the Visual Navigation System: Ecosystem Map Page [image]



Note. Screenshot of the deployed visual navigation system at time of submission, showing the full Ecosystem map including the ecosystem metaphor explanation, cross-cutting themes description, usage guidance, and the interactive five-stage map. Retrieved from https://mrp-visual-map-all-standards-with-us.netlify.app/guidelines/ecosystem-map/.

Figure 12

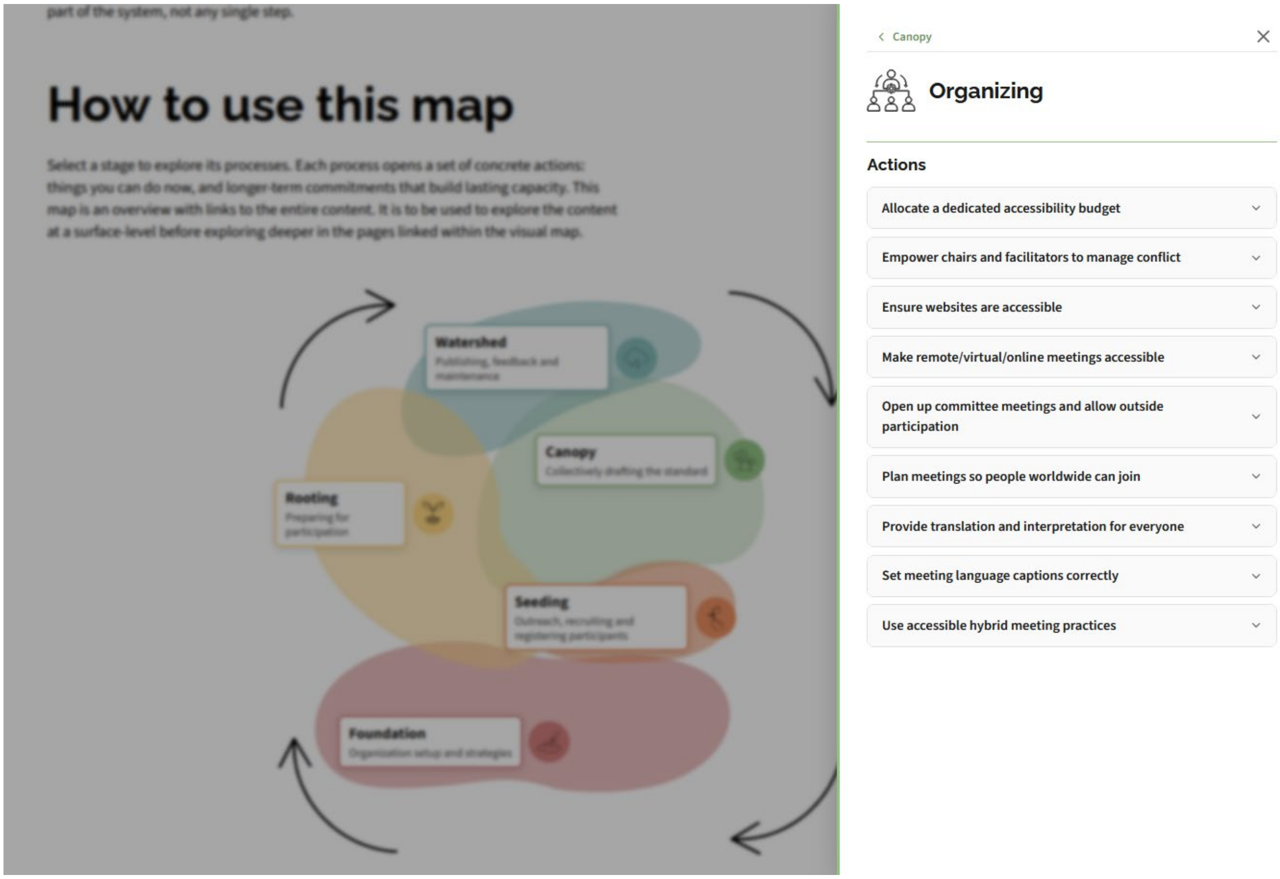
Live Deployment of the Visual Navigation System: Canopy Node Overlay [image]



Note. Screenshot of the deployed visual navigation system at the time of submission, showing the Canopy Node (Collectively Drafting the Standard) opening as a native HTML <dialog> element above the dimmed ecosystem map, with stage description and eight sub-node navigation links. Retrieved from https://mrp-visual-map-all-standards-with-us.netlify.app/guidelines/ecosystem-map/.

Figure 13

Live Deployment of the Visual Navigation System: Organizing Sub-Node Sidebar Panel [image]



Note. Screenshot of the deployed visual navigation system at the time of submission, showing the Organizing Sub-Node opening as a sidebar above the dimmed ecosystem map, with breadcrumb navigation back to the Canopy stage and nine collapsed action items. Retrieved from https://mrp-visual-map-all-standards-with-us.netlify.app/guidelines/ecosystem-map/.

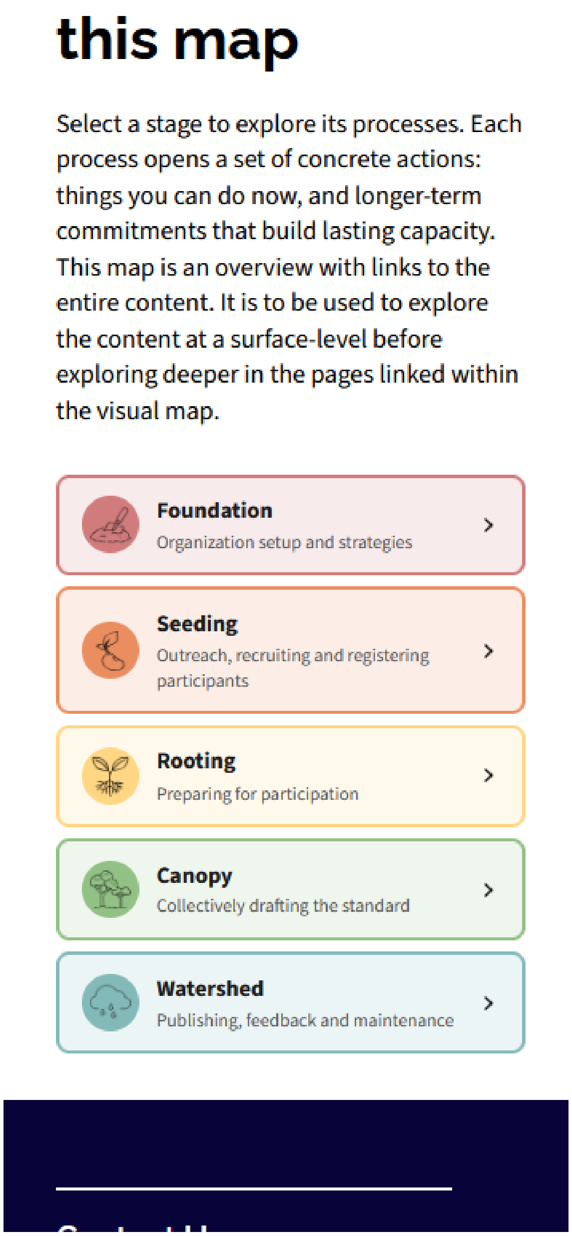
Figure 14

Live Deployment of the Visual Navigation System: Organizing Sub-Node Sidebar Panel with Expanded Actions [image]

Note. Screenshot of the deployed visual navigation system at the time of submission, showing two expanded action items within the Organizing sub-node sidebar. Action content is drawn directly from the corresponding guideline sub-pages from the *All Standards with Us* website, accessible via the “More Information” links within each expanded item. Retrieved from https://mrp-visual-map-all-standards-with-us.netlify.app/guidelines/ecosystem-map/.

Figure 15

Live Deployment of the Visual Navigation System: Mobile View [image]



Note. Screenshot of the deployed visual navigation system at the time of submission, showing the responsive mobile layout of the Ecosystem Map page. On smaller screens the five-stage organic map is replaced by a vertically stacked card list, each card displaying the stage icon, name, and subtitle, preserving full navigational funtionality across device contexts. Retrieved from https://mrp-visual-map-all-standards-with-us.netlify.app/guidelines/ecosystem-map/.

Accessibility Considerations

As demonstrated in the extensive research that led to this outcome in Part 1, accessibility is not a secondary consideration in the development of the visual navigation system, it is a foundational design constraint. This is particularly significant given the context: a navigation tool developed for a resource dedicated to inclusive standards development must itself be accessible, or it risks reproducing the same contradictions it is designed to address.

Semantic HTML as Foundation

The system is built as an interactive web page with semantic HTML underling the visual layer. This ensures that the structure and the content of the map are accessible to screen reader users, keyboard navigators, and users of other assistive technologies, not as an afterthought but as a core architectural decision. The visual presentation is a layer on top of an accessible structure, not a replacement for one.

A concrete example of this approach is the use of the HTML <dialog> element for node detail views (as mentioned in Figures 12 to 14). This method provides built-in focus management, keyboard navigation, and screen reader announcements handled directly by the browser. Using the Escape key will close the element and return focus back to the map.

Complementing Rather Than Competing

A key accessibility consideration is the relationship between the visual system and the existing accessible pathways on the guidelines site. The current site was developed with screen reader users specifically in mind, keeping strategies and tips content visible without requiring additional clicks or page loads. The visual navigation system is designed to function alongside this structure rather than disrupting it, providing an additional entry point for users who benefit from visual and spatial orientation without removing or complicating the existing experience for users who do not.

Visual Accessibility

The visual design decisions documented in the preceding section, muted palettes, generous whitespace, minimal motion, consistent typography, and clear labelling, are each directly informed by the accessibility needs of autistic and cognitively diverse users identified in Part 1. Colour is not used as the sole means of conveying information. Interactive elements are clearly identified and consistently behaved. The organic shapes used to represent stages and themes are differentiated though multiple visual cues: shape, label, and spatial position, so that users are not reliant on any single visual cue to interpret the system.

Limitations of Visible Accessibility

It is important to acknowledge that a visual navigation system carries inherent accessibility limitations. For users with significant visual impairments, a spatially organized map will always present challenges that a well-structured text-based navigation system does not. This is precisely why the visual system is positioned as a third entry path rather than a replacement for existing modes, it extends the range of users who can orient themselves effectively to the guidelines without reducing the accessibility of the resource for those who rely on non-visual navigation. The goal is additive inclusion, not substitution.

Limitations and Future Directions

The most significant limitation of the present project is that the visual navigation system has not yet been tested with the users it is designed for. The design decisions documented here are grounded in research and informed by co-design findings, but they remain untested assumptions until evaluated against the actual navigational experiences of disabled and Deaf users, autistic users, and others the guidelines are intended to support.

A second limitation relates to scope. The visual navigation system addresses one component of a larger initiative, the challenge of navigating the guidelines content, but does not address other identified priorities such as content and language review or the addition of narratives and case studies.

A third limitation is the absence of direct co-design in the development of the visual system itself. While informed directly by co-design findings from the *All Standards with Us* project, the design process did not include iterative co-design sessions with community members focused specifically on the navigation system, a gap that future development should address.

Future Directions

The most immediate next step if given more time would be user testing the prototype with autistic users, disabled and Deaf users with a range of access needs, and users who are new to the guidelines. Findings should drive the next iteration of the system, with particular attention to the level of detail at the map level, the visual language used for cross-cutting themes, and screen reader accessibility.

Beyond the immediate prototype, the approach taken here, applying research on accessibility in digital learning to the challenge of making complex standards content navigable, has potential applications beyond the *All Standards with Us* guidelines. The visual ecosystem approach, the wayfinding-over-content-delivery principle, and the multiple entry path model are transferrable to any standards resource or policy framework that presents dense, interconnected content to a diverse user population.

Conclusion

This project began with a focused question: how can digital learning environments be made more accessible for autistic learners in higher education? Through an extensive review of literature across digital accessibility, instructional design, UX research, and disability studies, it became clear that this question could not be fully answered at the level of interface design or domain-specific standards alone. The barriers autistic learners encounter in digital environments are structural and systemic, produced by design processes that do not meaningfully include the people they are meant to serve, and addressing them requires the same systemic orientation.

This recognition prompted a shift in scope. Rather than developing standards for accessible online learning, the project turned toward a context in which inclusive design principles could be applied at a more fundamental level: the process of standards development itself. The *All Standards with Us* initiative, the specific contribution of a visual navigation system for its guidelines, provided that opportunity.

The visual navigation system documented in Part 2 is a direct application of the evidence base established in Part 1. Every design decision, the ecosystem metaphor, the wayfinding priciples, the multiple entry paths, the semantic HTML foundation, the muted and cognitively calm visual language, is traceable to findings in the literature review and to the lived experience of the disabled and Deaf community members whose participation in the co-design process shaped the guidelines the system is designed to navigate. It is an initial prototype, subject to iteration and refinement, but it is a principled one.

Taken together, the two parts of this project make an argument that extends beyond either of its specific contributions. Accessibility is not only a property of products or interfaces, it is a property of the processes through which those products are made, the values encoded in the systems that govern them, and the degree to which the people most affected by design decisions are included in making them. Research on accessibility in digital learning and practice in inclusive standards development are not separate endeavors. They are expressions of the same commitment: that the systems people are asked to navigate should be designed with and for the full range of people who will use them.

References

Aizpurua, A., Harper, S., & Vigo, M. (2016). Exploring the relationship between web accessibility and user experience. *International Journal of Human-Computer Studies*, *91*, 13–23. https://doi.org/10.1016/j.ijhcs.2016.03.008

Al-Azawei, A., Parslow, P., & Lundqvist, K. (2017). The effect of universal design for learning (UDL) application on e-learning acceptance: A structural equation model. *International Review of Research in Open and Distance Learning*, *18*(6), 54–87. https://doi.org/10.19173/irrodl.v18i6.2880

Al-Azawei, A., Serenelli, F., & Lundqvist, K. (2016). Universal Design for Learning (UDL): A content analysis of peer reviewed journals from 2012 to 2015. *Journal of the Scholarship of Teaching and Learning*, *16*(3), 39–56. https://doi.org/10.14434/josotl.v16i3.19295

Al-Rahmi, W. M., Al-Adwan, A. S., Al-Maatouk, Q., Othman, M. S., Alsaud, A. R., Almogren, A. S., & Al-Rahmi, A. M. (2023). Integrating communication and task–technology fit theories: The adoption of digital media in learning. *Sustainability*, *15*(10), 8144. https://doi.org/10.3390/su15108144

Andreou, G., & Raxioni, K. (2024). Language development, reading and word learning in Autism Spectrum Disorder (ASD): A review on eye tracking studies. *International Journal of Developmental Disabilities*, *70*(1), 2–19.

Barrera Ciurana, M., & Moliner García, O. (2024). 'How does universal design for learning help me to learn?': Students with autism spectrum disorder voices in higher education. *Studies in Higher Education*, *49*(6), 899–912. https://doi.org/10.1080/03075079.2023.2259932

Barrera Ciurana, M., & Moliner García, O. (2025). What faculty already do: Universal Design for Learning strategies to support autistic students at university. *Teaching in Higher Education*, *30*(7), 1840–1857. https://doi.org/10.1080/13562517.2025.2487792

Bayor, A. A., Brereton, M., Sitbon, L., Ploderer, B., Bircanin, F., Favre, B., & Koplick, S. (2021). Toward a competency-based approach to co-designing technologies with people with intellectual disability. *ACM Trans. Access. Comput.*, *14*(2). https://doi.org/10.1145/3450355

Benton, L., Johnson, H., Brosnan, M., Ashwin, E., & Grawemeyer, B. (2011). IDEAS: an interface design experience for the autistic spectrum. *CHI '11 Extended Abstracts on Human Factors in Computing Systems, CHI EA '11*, 1759–1764. https://doi.org/10.1145/1979742.1979841

Bossavit, B., & Parsons, S. (2018). Outcomes for design and learning when teenagers with autism codesign a serious game: A pilot study. *Journal of Computer Assisted Learning*, *34*(3), 293–305. https://doi.org/10.1111/jcal.12242

Bozgeyikli, L. "Lila," Bozgeyikli, E., Katkoori, S., Raij, A., & Alqasemi, R. (2018). Effects of Virtual Reality Properties on User Experience of Individuals with Autism. *ACM Trans. Access. Comput.*, *11*(4). https://doi.org/10.1145/3267340

Campoverde-Molina, M., Lujan-Mora, S., & Garcia, L. V. (2020). Empirical studies on web accessibility of educational websites: A systematic literature review. *IEEE Access*, *8*, 91676–91700. https://doi.org/10.1109/ACCESS.2020.2994288

CAST. (2024). CAST Universal Design for Learning guidelines version 3.0. https://udlguidelines.cast.org

Chown, N., Baker-Rogers, J., Hughes, L., Cossburn, K. N., & Byrne, P. (2018). The 'High Achievers' project: An assessment of the support for students with autism attending UK universities. *Journal of Further and Higher Education*, *42*(6), 837–854. https://doi.org/10.1080/0309877X.2017.1323191

Contreras-Ortiz, M. S., Marrugo, P. P., & Ribon, J. C. R. (2023). E-learning ecosystems for people with autism spectrum disorder: A systematic review. *IEEE Access*, *11*, 1–1. https://doi.org/10.1109/ACCESS.2023.3277819

Dam, L. T., Heidler, P., & King, I. (2023). Bridging the gap in healthcare: Creating an online health information prototype for individuals with intellectual disabilities to promote equity and knowledge transfer. *Frontiers in Public Health*, *Volume 11-2023*. https://doi.org/10.3389/fpubh.2023.1194892

Fabri, M., & Andrews, P. (2016). Hurdles and drivers affecting autistic students' higher education experience: Lessons learnt from the multinational Austism&UNI research study. 1811. https://doi.org/10.21125/inted.2016.1373

Falconer, L. (2008). Evaluating the use of metaphor in online learning environments. *Interactive Learning Environments*, *16*(2), 117–129. https://doi.org/10.1080/10494820701288626

Faruq, O., Mambetaliev, A., Karshiboev, A., Ahmed, N., Khan, R., & Mohammad, N. (2025). Designing inclusive digital media environments for learners with autism spectrum disorder: Integrating artificial intelligence and data analysis to enable adaptive learning, communication, and accessibility. *Journal of Posthumanism*, *5*. https://doi.org/10.63332/joph.v5i6.2338

Folostina, R., Dumitru, C., Iacob, C. I., & Syriopoulou-Delli, C. K. (2022). Mapping knowledge and training needs in teachers working with students with autism spectrum disorder: A comparative cross-sectional investigation. *Sustainability*, *14*(5), 2986. https://doi.org/10.3390/su14052986

Friedman, M. G., & Bryen, D. N. (2007). Web accessibility design recommendations for people with cognitive disabilities. *Technology and Disability*, *19*(4), 205–212. https://doi.org/10.3233/TAD-2007-19406

Giraud, S., Thérouanne, P., & Steiner, D. D. (2018). Web accessibility: Filtering redundant and irrelevant information improves website usability for blind users. *International Journal of Human-Computer Studies*, *111*, 23–35. https://doi.org/10.1016/j.ijhcs.2017.10.011

Gormley, L., Feeney, A., & McNally, S. (2024). A scoping review of research trends and future directions for research on the experiences of autistic students and staff in post-secondary education. *European Journal of Higher Education*, *14*(4), 554–573. https://doi.org/10.1080/21568235.2023.2231186

Hatfield, M., Falkmer, M., Falkmer, T., & Ciccarelli, M. (2016). Evaluation of the effectiveness of an online transition planning program for adolescents on the autism spectrum: Trial protocol. *Child and Adolescent Psychiatry and Mental Health*, *10*. https://doi.org/10.1186/s13034-016-0137-0

Hendriks, N., Slegers, K., & Duysburgh, P. (2015). Codesign with people living with cognitive or sensory impairments: A case for method stories and uniqueness. *CoDesign*, *11*(1), 70–82. https://doi.org/10.1080/15710882.2015.1020316

Henry, S. L., Abou-Zahra, S., & Brewer, J. (2014). The role of accessibility in a universal web. *Proceedings of the 11th Web for All Conference, W4A '14*. https://doi.org/10.1145/2596695.2596719

Inclusive Design Research Centre (IDRC). (n.d.-a). *All standards with co-design sessions* [Unpublished internal report].

Inclusive Design Research Centre (IDRC). (n.d.-b). *All standards with us*. Inclusive Standards. Retrieved April 20, 2026, from https://standards.inclusivedesign.ca/projects/all-standards/

Iniesto, F., & Rodrigo, C. (2024). Understanding accessibility in MOOCs: Findings and recommendations for future designs. *Journal of Interactive Media in Education*, *2024*(1), NA(NA). Gale Academic OneFile.

Janse van Rensburg, M., & Liang, B. (2025). Improving autistic students' experiences in higher education: Developing a community framework for individual autistic student and autistic community flourishing. *Autism in Adulthood*, *7*(2), 141–154. https://doi.org/10.1089/aut.2022.0079

Kent, M. (2015). Disability and eLearning: Opportunities and barriers. *Disability Studies Quarterly*, *35*(1).

Koenig, K. P., Bleiweiss, J., Brennan, S., Cohen, S., & Siegel, D. E. (2009). The ASD nest program: A model for inclusive public education for students with autism spectrum disorders. *TEACHING Exceptional Children*, *42*(1), 6–13. https://doi.org/10.1177/004005990904200101

Lazar, J., Goldstein, D. F., & Taylor, A. (2015a). Best practices in education. In *Ensuring Digital Accessibility Through Process and Policy* (pp. 187–191). Elsevier Science & Technology. http://ebookcentral.proquest.com/lib/oculocad-ebooks/detail.action?docID=2060797

Lazar, J., Goldstein, D. F., & Taylor, A. (2015b). The discriminatory impact of digital inaccessibility. In *Ensuring Digital Accessibility Through Process and Policy* (pp. 41–58). Elsevier Science & Technology. http://ebookcentral.proquest.com/lib/oculocad-ebooks/detail.action?docID=2060797

Lei, J., Jones, L., & Brosnan, M. (2021). Exploring an e-learning community's response to the language and terminology use in autism from two massive open online courses on autism education and technology use. *Autism*, *25*(5), 1349–1367. https://doi.org/10.1177/1362361320987963

Maun, R., Fabri, M., & Trevorrow, P. (2024). Participatory methods to engage autistic people in the design of digital technology: A systematic literature review. *Journal of Autism and Developmental Disorders*, *54*(8), 2960–2971. https://doi.org/10.1007/s10803-023-06015-5

Meyers, C. A., & Bagnall, R. G. (2015). A case study of an adult learner with ASD and ADHD in an undergraduate online learning environment. *Australasian Journal of Educational Technology*, *31*(2). https://doi.org/10.14742/ajet.1600

Nguyen, A., & Peers, D. (2025). Valuable diversity or pathological problem?: A comparative thematic analysis of self-advocate and adapted physical activity teachings about autism. *Quest*, *77*(1), 1–19. https://doi.org/10.1080/00336297.2024.2386319

Noor, U., Younas, M., Saleh Aldayel, H., Menhas, R., & Qingyu, X. (2022). Learning behavior, digital platforms for learning and its impact on university student's motivations and knowledge development. *Frontiers in Psychology*, *Volume 13-2022*. https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2022.933974

Peláez, C. A., Domínguez, J. C. E., Fernández, J. E., Solano, A., & Luna-García, H. (2025). Social sustainability in interactive learning systems: A systematic review of factors and tensions in vulnerable communities. *Proceedings of the XXV International Conference on Human-Computer Interaction, Interacción 2025, Valladolid, Spain, September 3-5, 2025.* https://ceur-ws.org/Vol-4000/paper16.pdf

Power, C., Freire, A., Petrie, H., & Swallow, D. (2012). Guidelines are only half of the story: Accessibility problems encountered by blind users on the web. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, CHI '12*, 433–442. https://doi.org/10.1145/2207676.2207736

Rao, K., Ok, M., & Bryant, B. (2014). A review of research on universal design educational models. *Remedial and Special Education*, *35*(3), 153–166. https://doi.org/10.1177/0741932513518980

Redstone, A. E., & Luo, T. (2024). Empowering learners in higher education: Redesigning an online computer science course through universal design for learning implementation. *TechTrends*, *68*(5), 869–881. https://doi.org/10.1007/s11528-024-00980-z

Reeve, J., Farmer, E., & Bayley, W. (2022). 'Sharing our voices'—Taking a learning disability history project online during a pandemic. *British Journal of Learning Disabilities*, *50*(2), 287–297. https://doi.org/10.1111/bld.12472

Rezae, M., Chen, N., McMeekin, D., Tan, T., Krishna, A., & Lee, H. (2020). The evaluation of a mobile user interface for people on the autism spectrum: An eye movement study. *International Journal of Human-Computer Studies*, *142*, 102462. https://doi.org/10.1016/j.ijhcs.2020.102462

Santos, M. I., Breda, A., & Almeida, A. M. (2017). Design approach of mathematics learning activities in a digital environment for children with autism spectrum disorders. *Educational Technology Research and Development*, *65*(5), 1305–1323. https://doi.org/10.1007/s11423-017-9525-2

Sauer, J., Sonderegger, A., & Schmutz, S. (2020). Usability, user experience and accessibility: Towards an integrative model. *Ergonomics*, *63*(10), 1207–1220. https://doi.org/10.1080/00140139.2020.1774080

Schmidt, M., Newbutt, N., Lee, M., Lu, J., Francois, M.-S., Antonenko, P. D., & Glaser, N. (2024). Toward a strengths-based model for designing virtual reality learning experiences for autistic users. *Autism: The International Journal of Research and Practice*, *28*(7), 1809–1827. https://doi.org/10.1177/13623613231208579

Tarantino, L., Attanasio, M., Di Mascio, T., De Gasperis, G., Valenti, M., & Mazza, M. (2023). On the evaluation of engagement in immersive applications when users are on the autism spectrum. *Sensors*, *23*(4), 2192. https://doi.org/10.3390/s23042192

Terras, M., & Jarrett, D. (2021). Accessible information isn't easy: Shifting practice and production perspectives of information accessibility (2021). Global Journal of Intellectual and Developmental Disabilities. https://doi.org/10.19080/GJIDD.2021.09.555763

The design process. (n.d.). Community-Led Co-Design Kit. https://community-led.design/design-process/

Valencia, K., Rusu, C., Quiñones, D., & Jamet, E. (2019). The impact of technology on people with autism spectrum disorder: A systematic literature review. *Sensors (Basel, Switzerland)*, *19*(20), 4485. https://doi.org/10.3390/s19204485

van Calis, J. F. E., Naaldenberg, J., van der Cruijsen, A. W. C., Koks-Leensen, M. C. J., Leusink, G. L., & Bevelander, K. E. (2025). Inclusive digital platforms: Designing for and with users with mild intellectual disabilities or low literacy skills. *Computers in Human Behavior Reports*, *17*, 100617. https://doi.org/10.1016/j.chbr.2025.100617

Whyte, E. M., Smyth, J. M., & Scherf, K. S. (2015). Designing serious game interventions for individuals with autism. *Journal of Autism and Developmental Disorders*, *45*(12), 3820+. Gale Academic OneFile.

Wood, R., Dixon, E., Elsayed-Ali, S., Shokeen, E., Lazar, A., & Lazar, J. (2021). Investigating best practices for remote summative usability testing with people with mild to moderate dementia. *ACM Trans. Access. Comput.*, *14*(3). https://doi.org/10.1145/3460942

Yang, M., Duha, M. S. U., Kirsch, B. A., Glaser, N., Crompton, H., & Luo, T. (2024). Universal design in online education: A systematic review. *Distance Education*, *45*(1), 23–59. https://doi.org/10.1080/01587919.2024.2303494

Yesilada, Y., Brajnik, G., Vigo, M., & Harper, S. (2015). Exploring perceptions of web accessibility: A survey approach. *Behaviour & Information Technology*, *34*(2), 119–134. https://doi.org/10.1080/0144929X.2013.848238

Appendix A: Accompanying Digital Materials

1. **Figma Prototype Export [pdf] – 2026**
    - A PDF export of the interactive visual map prototype that was used to develop the live website showing all five stages and their sub-categories.
    - File Name: Visual_Map_Figma_Prototype.pdf
2. **Figma Prototype [link] – 2026**
    - Interactive prototype for the Visual Map for the *All Standards with Us*, demonstrating navigation between ecosystem stages and detail panels.
    - Link: https://www.figma.com/proto/H7AvsyWGzrElQ3scGJvrKW/All-Standards-with-Us---Visual-Map--Prototype-?node-id=0-1&t=4m6hU7t12ioOSRuh-1&scaling=scale-down&content-scaling=fixed
3. **GitHub Repository [link] – 2026**
    - Source code for the Visual Map web application, forked from https://github.com/inclusive-design/standards.inclusivedesign.ca.
    - Link: https://github.com/mitch-ocad/visual-map-for-standards.inclusivedesign.ca
4. **Live Website of Visual Map [link] – 2026**
    - Web version of the Visual Standards Map for *All Standards with Us.*
    - Link: https://mrp-visual-map-all-standards-with-us.netlify.app/guidelines/ecosystem-map/