

# The Development of Accessibility Recommendations for Online Learning Researchers

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Attracting more individuals from underrepresented groups can help the United States meet the demand for science, technology, engineering, and mathematics (STEM) professionals. As stated by the director of the National Science Foundation (NSF), “Science is too important and rewarding to be exclusive, and too vital to the nation’s future to leave anyone out” (Cordova, 2017). Those often left out of STEM opportunities include people whose disabilities impact sight, hearing, mobility, learning, social interactions, and other abilities. There is little evidence that inclusive practices are routinely applied to ensure access to STEM for this group. The accessibility of learning opportunities is often only considered after a person with a disability reports accessibility barriers (e.g. lack of captions, inaccessible PDF or other documents). This approach can result in expensive and unsatisfactory accommodations.

Technological innovations at the intersection of learning theory and emerging technologies—often referred to as digital learning or cyberlearning—are used in growing quantity and variety in academic courses and research. Almost overnight, the pandemic of 2020 required that educators convert learning opportunities from those primarily offered on-site to online, with a range of success as reported by students, parents, and instructors. Most educators aimed to make these online opportunities available to all potential students, but many fell short due the accessibility barriers their course designs created for some students and a lack of understanding for how to avoid the creation of these barriers. For example, educators who previously only provided instruction in-person now had to navigate creating online content that was accessible to screen readers and possibly provided audio descriptions for students with visual impairments. In addition, they had to consider that students might be trying to access content via smartphones, tablets, or other devices, which have varying screen sizes and user interfaces for accessing content.

Emerging technologies used to deliver online learning provide promising opportunities for inclusive learning by offering multimodal representation of information, interactive learning environments, and data science-driven personalized learning. When designers assume that students will have a variety of abilities, understand challenges individuals with disabilities often face, and engage in inclusive design approaches, the result is online learning technologies and pedagogies that are engaging and effective for all learners. Arguably the most inclusive and well

developed approaches center around universal design (UD). UD requires that a broad spectrum of abilities and other characteristics of potential users be considered when developing products and environments, rather than simply designing for the average user and relying on accommodations alone when a product or environment is not accessible to an individual with a disability. UD is defined by the Center on Universal Design as “the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design” (1997).

UD is underpinned by seven basic principles for the inclusive design of any product and environment: equitable use, flexibility in use, simple and intuitive use, perceptible information, low physical effort, and size and space for approach and use. UD-inspired instructional practices are based upon a common finding in educational research that learners are highly variable with respect to their interests, abilities, and responses to instruction. The Universal Design for Learning (UDL) approach, developed by the Center for Applied Special Technology (2018), promotes three principles: that learning activities and resources offer students multiple means of engagement, representation, and action and expression. A third set of principles that offer specific guidance for online educators and technology developers are those that underpin the internationally developed Web Content Accessibility Guidelines (WCAG) of the World Wide Web Consortium (2018); the principles require that IT components be perceivable, operable, understandable, and robust.

Online learning pedagogy and technology that are guided by the principles that underpin UD, UDL, and WCAG minimize the creation of barriers to digital tools and online content for individuals with disabilities. Together, these principles require that students are offered multiple, accessible ways to learn, demonstrate their learning, and interact in an online course using tools with features that are designed to be accessible to students with a wide variety of abilities. With this approach, the need for accommodations for individual students are minimized.

## ACTIVITY

The DO-IT (Disabilities, Opportunities, Internetworking, and Technology) Center at the University of Washington (UW) has worked since 1992 to increase the success of individuals with disabilities in postsecondary studies and careers with interventions that include the use of digital technologies as empowering tools. Beginning in 2015, the DO-IT Center undertook two projects that were funded by the National Science Foundation’s Cyberlearning and Future Learning Technologies program. The AccessCyberlearning project (Grant #IIS-1550477) conducted a capacity building institute (CBI) and online community of practice that engaged leaders representing a wide variety of stakeholders with respect to digital learning to address disability-related issues to help researchers and educators make the online experiences of learners effective for students with diverse characteristics. AccessCyberlearning 2.0 project (Grant #DRL-182540) sought to answer four research questions:

1. What challenges do learners with different types of disabilities face in using current and emerging digital learning tools and engaging in online learning activities?
2. How do current digital learning research and practices contribute to the marginalization of individuals with disabilities?

3. What advances in digital learning design are required to support multi-modal learning and engagement that is fully accessible to and usable by students with disabilities?
4. What specific actions can digital learning researchers, funding agencies, educators, and other stakeholders take to systematically address issues with respect to disabilities?

Participants were recruited nationwide; they formed a pool of 22 individuals representing stakeholder groups that included faculty, researchers, administrators, IT accessibility specialists, and project directors. Before the AccessCyberlearning 2.0 capacity building institute (CBI), held in Seattle on January 16–18, 2019, participants began to engage in an online community of practice and reviewed relevant materials to prepare them for the work before them, which encouraged them to zero in on specific areas to which they felt best suited to contribute. At the CBI, participants explored how to make digital learning research, products, activities, and resources welcoming to, accessible to, and usable by those with disabilities, as well as began to develop project products. Recommendations for cyberlearning researchers emerged from a literature review, an online community, and presentations and discussions in the AccessCyberlearning 2.0 CBI (2019). Although participants in the project agreed that digital learning opportunities should be made available to all potential students, including those with disabilities, they revealed different opinions regarding how much effort it is reasonable to expect researchers and practitioners should be expected to make toward accessible design and how they can gain the expertise they need to do so.

The following sections of this paper share recommendations that evolved from the AccessCyberlearning 2.0 collaboration that apply to researchers developing technology tools and pedagogy to be used in online learning. For comprehensive information about these findings, consult *Accessible Cyberlearning: A Community Report of the Current State and Recommendations for the Future* (Burgstahler & Thompson, 2019a), *Designing Accessible Cyberlearning: Current State and Pathway Forward* (Burgstahler & Thompson, 2019b), *Guidelines For Cyberlearning Researchers* (Burgstahler & Thompson, 2019c), and *20 Tips for Teaching an Accessible Online Course* (Burgstahler, 2020).

## RESULTS AND DISCUSSION

Participants considered whether new design principles are needed, but concluded that it is less about new principles and more about ensuring that researchers and practitioners apply existing UD, UDL, and WCAG principles as technologies and pedagogical practices are developed and applied. Most agreed that getting more researchers and practitioners to routinely consider accessibility in their work will be difficult because researchers are unfamiliar with accessibility principles and have little or no experience applying them. The recommendations listed below are adapted from the more general digital learning recommendations developed through a brainstorming and iterative process with project collaborators to include those specifically relevant to online learning pedagogy and technology. They are organized into two groups: Those that can be implemented immediately in existing projects and products, and those that may take longer to implement.

### **Recommendations for Immediate Actions**

Immediately, online learning researchers should

- become familiar with the UD, UDL, and WCAG principles and established guidelines and practices they support as they apply to the design of inclusive learning tools and pedagogy;
- explore how online learning practices supported by the science of learning can be overlaid with UDL, UDL, and WCAG principles to make them inclusive of individuals with disabilities;
- invite specialists with IT accessibility knowledge to be members of their research teams;
- ensure project staff are trained on basic accessibility principles and standards-compliant coding practices;
- establish internal policies and guidelines for accessibility within their projects, and, if relevant, their departments or institution;
- consider a broad range of learning styles and disability types during the earliest phases of conceiving and designing a project;
- analyze the experiences of participants with different types of disabilities along with other demographic groups when reporting research results; and
- when reporting limitations of their studies, include those related to accessibility.

### **Recommendations for Future Actions**

In the future—both in near-term (1-3 years) and longer-term (3-5 years) timeframes—online learning researchers should develop and promote practices related to the following suggestions that fully embrace disability-related considerations into their research workflows. They should

- implement an agile, iterative design process that involves users with a wide variety of disabilities and other human characteristics in all phases of the research and design process;
- actively participate in collaboration and communication among academia and industry on issues pertaining to the accessible design of online learning tools and instructional practices;
- contribute to the development and sharing of guidelines for accessible design of online learning tools and pedagogy;
- avoid being deterred by cost. Low-cost interventions can provide great benefits to users. On the other hand, early designs of innovative technologies may be quite expensive, but long term, if widely adopted and/or if adjustments are made to the design, the cost per user can drop significantly;
- articulate the broad characteristics of potential users in the design of a tool or pedagogy being developed or studied, and specify how the characteristics of various groups of individuals with disabilities will be addressed in the research design;
- resist generalizing all people who share a specific disability when designing technology to improve access for a population—for example, designing something to improve access for people who are blind should consider that not all people who identify as “blind” have the same vision capabilities or personal preferences for learning. Technology design should allow the user to customize their experience;

- if instructor guidelines will be created as part of the study, share information about accessibility issues for students with disabilities, including how some activities/products developed in the project may not be accessible to certain groups (e.g., students who are blind) along with suggested accommodations that might be provided (e.g., working with a sighted person); and
- integrate accessibility recommendations into existing project management practices to keep them on the forefront, rather than being an afterthought. Doing so will allow accessibility to be addressed as an integrated part of the project.

## LESSONS LEARNED

Two lines of research can make important contributions to the online learning field: (1) building products and pedagogy that benefit individuals with specific disabilities and (2) creating mainstream technology and pedagogy that are accessible to all students, including those with a wide range of disabilities. In particular, online learning researchers are encouraged to pursue research in both learning science and technology design that specifically addresses the unique needs of individuals who have a wide variety of abilities and other diverse characteristics. Research is needed to evaluate accessibility implications of current and emerging technologies, solve accessibility problems that exist with current technologies, and harness emerging technologies into solving accessibility challenges. Research is also needed that helps to reduce the cost of accessibility implementation so that it can be more feasible on a large scale.

The ideal state for future online learning research is that researchers routinely include individuals with disabilities and accessibility considerations within every phase of research, design, development, and evaluation processes. Reaching this goal requires a paradigm shift from designing for some to designing for everyone. In order for online learning to be effective for all students, including those with disabilities, many stakeholders need to be involved to work together toward a common goal. Roles of various stakeholder groups in supporting positive change are suggested in the paragraphs that follow.

- *Researchers*: The availability of inclusive online learning technology and practices will increase if online learning researchers routinely include individuals with disabilities and accessibility considerations within every phase of their design, development, and evaluation processes.
- *Students with disabilities and their allies*: Students who report accessibility barriers with respect to an online learning activity can encourage instructors to design more accessibly, especially when they not only register a concern, but suggest a solution. Instructors, in turn, can share the need for research in this area with researchers in their field.
- *Online learning designers and instructors*: Practitioners can apply practices supported by the science of learning overlaid with UD, UDL, and WCAG principles and related guidelines and practices throughout their course development workflows. They can ensure that all tools used for online learning are tested and verified for accessibility and work around inaccessible features, perhaps in collaboration with disability service personnel through accommodations for specific students with disabilities.

- *Instructors of K-12 and postsecondary computing courses:* The creation of more accessible cyberlearning tools of the future can be promoted when those who teach computer science and other IT-related courses teach about access issues for individuals with disabilities, including barriers that are erected by IT, and how they can be avoided through standards-compliant and other inclusive design practices.
- *Disability services staff:* Disability services staff should be responsive to requests for accommodations from students with disabilities and provide reasonable accommodations that give them access to online course content and activities in a timely manner. In their interactions with faculty and designers, they can encourage the application of inclusive technologies and teaching practices in research and practice.
- *Educational administrators and other leaders:* Educational leaders at all levels who value diversity, equity, and inclusion can ensure that policies and processes in all areas of the organization reflect this view by proactively addressing potential access issues for individuals with disabilities. Specifically, they can implement policies, guidelines, and procedures related to accessibility, as well as ensure that sufficient staffing, training, and resources are available to support these efforts.
- *Personnel who procure online learning products:* To ensure that institutions meet their legal and ethical obligations for access, procurement administrators can put processes in place for those who procure IT and related products and services to ensure that online learning technologies are tested and verified for accessibility prior to purchase and deployment.
- *Technology companies:* To develop expertise within IT companies, company leaders can include accessibility knowledge and skills among the qualifications in job announcements and demonstrate a preference for hiring people who meet these qualifications. They can also offer training opportunities to current staff and encourage colleges and universities to teach about accessibility in computing courses.
- *Funding agencies:* Agencies that fund online learning projects can require those projects to develop technology and pedagogy that is accessible to individuals with disabilities. Funded projects could be required to design prototypes and project products that comply with WCAG, apply UD principles to on-site and online environments, incorporate UDL practices in learning activities, and share the participation and experiences of individuals with disabilities in project reports and published articles. In cases where innovative designs are in early stages of development and there are not enough resources to make the designs fully accessible, projects should, within their reports and published articles, recommend future research that would address accessibility issues.

## CONCLUSION

Attracting more individuals with disabilities can help the United States meet the demand for professionals in critical fields of study and application, including those in STEM. With increasing rates of educational opportunities delivered online, it is critical that they be made accessible to individuals who have disabilities. In order to ensure the accessibility of online education in the future, researches that focus on technology and pedagogy must consider accessibility issues in all aspects of their research and those who develop and teach online courses must use accessible IT and employ inclusive pedagogical practices.



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