Feature Article

Inclusive Design for Online and Blended Courses: Connecting Web Content Accessibility Guidelines and Universal Design for Learning

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Abstract

Course accessibility is a priority in higher education, particularly in the design and delivery of digital learning experiences. Proactively addressing accessibility as part of online and blended course design meets the needs of all learners, including those in the margins. Inclusive design for online and blended courses connects the Web Content Accessibility Guidelines (WCAG) and Universal Design for Learning (UDL) framework in order to address learner variability as an intentional part of course design. Inclusive design fosters expanded options in the ways that learners access learning materials, engage in learning experiences, and demonstrate the knowledge and skills they have learned. This paper describes practical applications of WCAG and UDL for the design and facilitation of inclusive online and blended courses in the post-secondary setting.

Designing for All Learners

Variability in learners is the norm, rather than the exception. Some students have disabilities in visual, auditory, physical, social/emotional, and focus/organizational dimensions, and all learners differ in areas of language, motivation, interests, learning preferences, study skills, and schedules. It turns out that the conception of an *average* learner rarely characterizes the complex make-up of varying combinations of characteristics in any learners (Rose, 2015). These differences can become barriers to learning when the scope of course design is limited to just an *average* learner. Designing for the *average*, therefore, is likely to produce mismatches between the designed instructional strategy and most learner needs.

Further, accessibility of digital educational materials continues to be of great concern for higher education (Brown, 2018). In a 2010 "Dear Colleague" letter issued jointly by the U.S. Department of Justice and the U.S. Department of Education, accessibility is framed as a civil rights issue (Perez & Ali, 2010). Referencing the Americans with Disabilities Act of 1990 and Section 508 of the Rehabilitation Act of 1973, the letter advocates for college students with disabilities to receive all of the educational benefits of the instructional technologies that are incorporated into their learning experiences. It also argues that if incorporated technologies are found to be inaccessible, accommodations and modifications should be equivalently effective and integrated. Section 508 of the Rehabilitation Act of 1973 was amended in 1998 to specify that accessibility involves *comparable access*, that is "access to and use of information and data that is comparable" to that provided to individuals

without disabilities (29 U.S.C. §794 (d)). Information and data should be accessible either directly or through the use of assistive technologies, like screen readers. Comparable access relates to both the content of information as well as the timeliness in which access is provided.

Web Content Accessibility Guidelines (WCAG)

Within 508, section E205 specifies that electronic content should conform to the Web Content Accessibility Guidelines (WCAG). At the time of this writing, the WCAG 2.0 guidelines are currently in effect, and proposed revisions are in the process of being reviewed and approved (Kirkpatrick, O'Connor, & Cooper, 2018). The guidelines characterize accessible design of electronic content in terms of it being perceivable, operable, navigable, understandable, predictable, compatible, distinguishable, and adaptable (see Figure 1). What is key for higher educators to know is that the guidelines address making web content more accessible for individuals with visual, auditory, physical, speech, cognitive, language, learning, and neurological disabilities, as well as greater usability by older individuals with changing abilities due to aging. Workable design for such groups promotes greater access across a greater range of users, and this inclusive design approach serves to reduce barriers for learners on digital platforms (Kumar & Wideman, 2014).
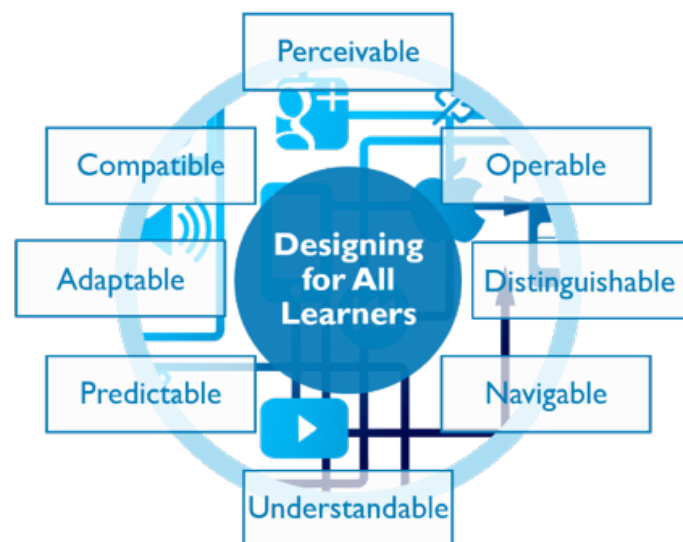

Figure 1. Accessible instructional design areas addressed through WCAG.

Inclusive design of online and blended course activities and materials involves accessibility for learners with specific disabilities, as well as benefits for all learners (Dalton, 2017). For faculty and course designers, accessibility should therefore be viewed not as an *add-on*, but rather as an *integral facet* of instructional design. Elevating accessibility in course design supports customization in areas such as participation and content presentation that enable learners to select options aligned with their learning preferences (Rogers-Saw, Carr-Chellman, & Choi, 2018). For example, captioning video and audio components is of particular concern to designers of online courses as it is necessary to support accessibility for students with hearing impairments (Cifuentes, Janney, Guerra, & Weir, 2016). Quality captions can also be beneficial to students who may be watching the videos in noisy places and language learners (Vanderplank, 2010). The captioning serves as an additional available option for how the content is represented, promoting accessibility and enabling learners to select format options that best meet their needs (Tobin, 2014).

Universal Design for Learning (UDL)

Designing for all learners from the outset is at the core of the Universal Design for Learning (UDL) framework, a set of curricular principles and guidelines that identify how to incorporate flexibility in the design and delivery of instruction. The framework was developed by Rose and Meyer (2002) and was built upon the premise of three brain networks – affective, recognition, and strategic. Affective networks pertain to caring and prioritizing and are the *why* of learning. Recognition networks involve how content is represented and are the *what* of learning. Strategic networks relate to learner activity and are the *how* of learning. The philosophy of UDL is more than just ensuring access to the content; it addresses how learners are supported and challenged during learning experiences.

Tied to each of the three brain networks are the UDL principles of (a) provide multiple means of engagement, (b) provide multiple means of

representation, and (c) provide multiple means of action and expression (Meyer, Rose, & Gordon, 2014). The UDL framework thus has a horizontal orientation in which each principle supports different aspects of student learning. The recent release of version 2.2 of the UDL guidelines also makes evident a vertical orientation, in which each principle has three levels – *Access, Build,* and *Internalize* (Center for Applied Special Technology (CAST, 2018). Similar to the foundation of a building (as illustrated in Figure 2), *access* is foundational in the UDL framework, as it supports learners to be able to *build* and *internalize*. The ultimate goal of the framework is equipping learners to become *purposeful and motivated, resourceful and knowledgeable,* and *strategic and goal-directed* (CAST, 2018).
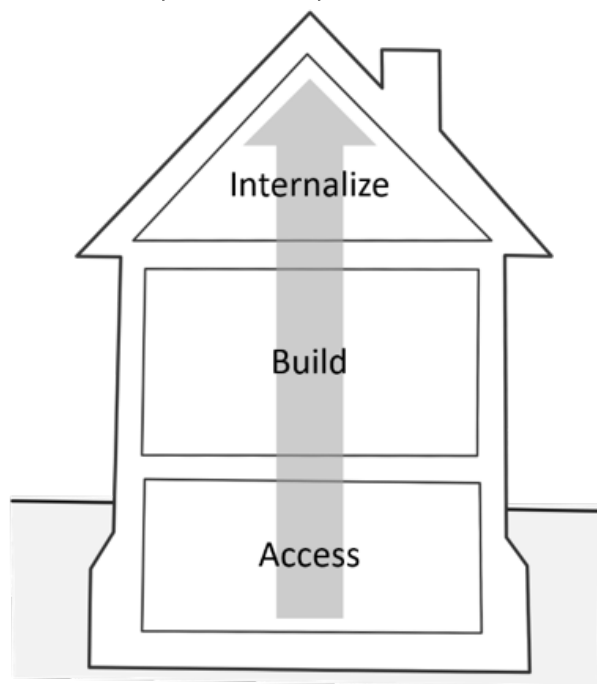

Figure 2. *Access* as the foundation of UDL

The UDL framework can be applied to the learning goals, materials, methods, and assessments of a course, as it involves thinking about how options can be incorporated into each course aspect. First, the ways in which course information is presented can vary, such as through text, image, animation, audio, video, and demonstration. Second, students can show their learning in different ways, such as through speaking, writing, drawing, acting, building, or even singing/rapping. Finally, different

strategies can be used to focus student attention, sustain their interest and motivation, and ultimately empower them to self-regulate to persist throughout a course.

Connecting WCAG and UDL

In online and blended courses, applying WCAG and UDL guidelines can positively impact the learner experience, especially for those *in the margins* (Black, Weinberg, & Brodwin, 2015). There are also legal implications regarding accessibility of digital learning experiences when users with disabilities experience inequitable access (U.S. Department of Justice, 2015, 2016). Accessibility is a worthy goal to pursue, as inclusive design strategies that follow WCAG and are grounded in the UDL framework can address the varying needs of all learners (National Center on Accessible Educational Materials, 2018). The WCAG areas can be simplified into the mnemonic *POUR,* which stands for perceivable, operable, understandable, and robust, and strategies and corresponding UDL connections to the guidelines are described next.

 Perceivable. Course materials and the interfaces of course websites and tools should be presented to learners in ways that they can perceive. Users with sensory challenges, for instance, may experience barriers to accessing information when it is presented in certain formats. Providing equivalent format alternatives connects to the UDL principle of providing multiple means of representation and enables users to choose the formats that best meet their needs. Text alternatives for auditory and visually represented information supports greater flexibility in how learners can read or hear the content. The information can be accessed in multiple ways, such as through text-to-speech, large print, braille, symbols, and language translation or simplification.

The perceivable aspect is enhanced when displays offer options for user adaption and customization. This corresponds to the UDL representation guideline of providing options for perception through personalization and alternatives of how

information is displayed. Individuals with sensory challenges may have difficulties distinguishing characteristics such as shape, color, size, visual location, orientation, or sound. When content involves these characteristics, descriptions can be provided so that the information is presented in varying formats. For example, color in graph elements could be presented in hue, by color code, or through varying patterns.

Perception is also supported when content features are distinguishable. The important aspects of content can be made more distinguishable through enhancing contrast and learner capability in separating the main content from any background imagery or sounds. Educators and course designers can address this area by incorporating greater contrast, allowing user control over turning sound on/off, supporting resizing of text, and avoiding presenting text as images only. Enabling user control in this area minimizes distractions (under the engagement principle) and optimizes perception (part of the representation principle).

Operable. Students access course materials and activities in different ways, and some students may use assistive technology like screen readers and switch controls to operate course tools and website interfaces. In addition, there are also navigation differences that now exist among the great variety of device types that learners may use to access course content, from laptops and smart TVs to mobile technologies such as tablets and smartphones. Addressing the operable area connects to the UDL principle of providing multiple means of action and expression and optimizes access for those using assistive technologies. Operability is enhanced through keyboard navigation functionality, a gateway to access through multiple devices. Adjustable timings can also be applied, as they provide users with sufficient time to read and use content. Flashing page elements should be limited, as they can be not only distracting and bothersome to users, but more than three consecutive flashes in a second can induce seizures in individuals with

photosensitive epilepsy (Harding & Harding, 2010).

Another component of operability is navigation. Consistent and clear organization of course sites and materials can enable students to navigate the provided information and locate assignments, activities, and course content. When users know where they are in a course and how to find materials, they are better able to self-manage the information and their progress, thus supporting their empowerment and self-regulation. Navigation practices that enhance usability include titling web pages to describe their topic or purpose, using section headings to organize content, and creating meaningful links that effectively communicate the content of the link through the link text (for example, _WCAG 2.1_).

Understandable. Clearly written course materials and intuitive tool interfaces aid in understanding. From the stance of recognition networks and the UDL principle of providing multiple means of representation, course materials that are written in understandable ways to users support comprehension and enable users to better plan how they might accomplish what is expected of them. To do this, educators and instructional designers should consider learner reading levels and background knowledge to comprehend abbreviations and jargon in written instructions and handouts. Defining vocabulary and providing related resources for students to reference can support in this area.

Digital course materials and activities are likely to be more understandable when they appear and operate in ways that students expect. This helps students not only locate course items but also reduces extraneous cognitive load, enabling users to direct more of their focus, time, and attention towards engaging in course activities (Çakiroğlu & Aksoy, 2017). Predictability in course design connects to the UDL action and expression guideline of providing options for executive functions through contributing to how students manage course information and resources. To support this, consistent navigation should be used, including consistent headings, labels, and ordering

of items and activities on handouts and course site pages.

Robust. The use of the word *robust* in this discussion refers to the capacity of the designed materials and technologies to perform for a diverse user base. Robust course materials, websites, and tools are compatible with the technologies that learners use to access them, including assistive technologies. Compatibility with assistive technologies facilitates options for perception and access, which addresses the UDL action and expression guideline of providing options for physical action. A practical way that instructors and course designers can check compatibility is listening to course materials using a screen reader function. This may illuminate areas that could be better formatted for improved access and clarity.

Built-in accessibility checkers are available within Microsoft Office and Adobe Acrobat, and Grackle (https://www.grackledocs.com/) is a Chrome extension that can be used to check accessibility in Google Docs, Sheets, and Slides. The Web Accessibility Evaluation Tool (WAVE) (http://wave.webaim.org/) can be used to check webpage accessibility. Instructors and course designers can also view course materials and try out tools on tablets and smartphones, as display and operability on mobile technologies may differ when touch is used for navigation as compared to access through a desktop computer with a keyboard and mouse.

Practical Applications for Inclusive Design

Inclusive design for online and blended courses can thus involve WCAG and the UDL framework in order to support varying learner abilities, preferences, and needs. Specifically, practical applications of these guidelines include strategies relating to the UDL framework areas of engagement, representation of content, and learner action and expression. Proactively addressing learner variability through strategic design decisions can reduce barriers to access and participation in learning activities, facilitate

personalization in course experiences, and promote student interest and engagement (Smith, 2012).

Engagement. Regarding engagement, the overall goal is for learners to become more purposeful and self-regulated. Providing learners with supportive structures as part of the course design can equip students with study skills resources they may need to be able to more purposefully direct their time and attention to the course activities. For example, rubrics offer students specific guidance as to the expectations for open-ended demonstrations of their learning. The criterion areas can specify the components of a project that relate to the learning objectives and describe qualities of performance in those areas.

Student engagement can also be enhanced through multiple options for recruiting interest (Coy, 2016). Connecting course activities with authentic contexts and real-world problems can naturally produce a range of viable directions for students to select and experientially learn. Course conversations can be expanded beyond the walls of the classroom through online forums and social media. For instance, students can engage in larger book study and Twitter chat conversations offered by relevant professional organizations and Professional Learning Networks (PLNs). Students can use a variety of tools to follow and post to the conversations, and contributions can be posted in real-time or pre-scheduled for greater timing flexibility.

Representation of content. Enhancing how content is represented involves considering information formatting and incorporating media flexibility. Content can be communicated in multiple ways, including text, visuals, videos, and audio. For example, course announcements can be distributed as text emails, audio recordings, or even videos. Web-based tools and mobile apps, like *Blabberize* (https://blabberize.com/), can be used to create talking images, with text-to-speech or recorded voice-over (Marcovitz, 2012). See Figure 3 for an example of a *Blabberized* course announcement. It should be noted, though, that

such tools vary in accessibility, and instructors are advised to check for accessibility statements from the developers. Providing multiple options for tools and formats can enable students to select ones that best meet their needs and preferences.
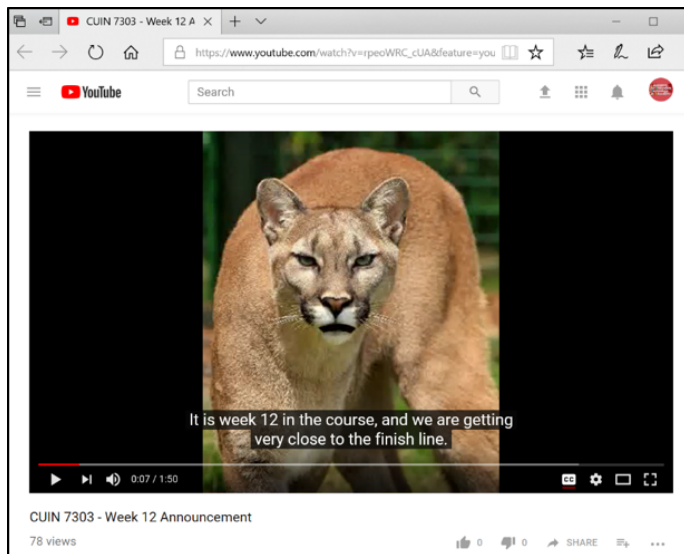

Figure 3. Example *Blabberize* video announcement featuring a talking cougar.

Video content should be closed-captioned. Video storage and sharing sites, such as YouTube, provide auto-captioning features that can make captioning faster and easier. Captions can be loaded from video transcripts and adjusted or created through transcription within the video storage and sharing platform. Similar to content in a video format, graphical content should also be accompanied with descriptive text alternatives, so that the visuals and text alternatives provide equivalent information.

Learner action and expression. Applying headings and using descriptive text for hyperlinks throughout syllabi and handouts ensures clarity for those accessing content with screen readers. Headings provide the capability to create tables of contents so that all users (instructors included) can more easily navigate to any section of a document. Heading links can facilitate navigation from a *to-do list* table to detailed instructions in another part of the document or in another handout.

Incorporating options into how students express what they know promotes student ownership of

what they create within the scaffolds of instructor-provided expectations (Mino, 2004). An array of learning demonstration options may make evaluation of student learning more interesting and enjoyable for instructors, who are able to view a variety of products and formats that reflect varying learner skills, preferences, and interests. A *Course Integrative Challenge*, for example, is a way for students to demonstrate how three topics relate to each other and their areas of interest (see Figure 4).

Figure 4. Example of expanded options for demonstrating learning through a *Course Integrative Challenge*.

Emerging technologies for online discussion and course communications can be used to support idea generation, sharing of drafts, and reflection (Gronseth & Zhang, 2018). Digital whiteboards and bulletin boards, such as Realtimeboard (https://realtimeboard.com/) and Padlet (https://padlet.com/), are collaborative spaces for groups of learners to collectively brainstorm and link to related resources (Byrne, 2014). Ideas can be posted as *bubbles* or *sticky notes* on the digital board space, and the tools offer options for arranging postings, controlling sharing and security settings, and customizing the theme and color scheme of the board. In addition to text, audio and video discussion postings are also possible through tools such as Voicethread (https://voicethread.com/) and Flipgrid (https://flipgrid.com/). Instructors provide a prompt in text, audio, video, and/or images to start a discussion (see Figure 5), and the audio/video recording, threaded reply, and emoji reaction features help to organize conversations and expand the ways that students can engage in academic conversations (Mahmoudi & Gronseth, 2018).
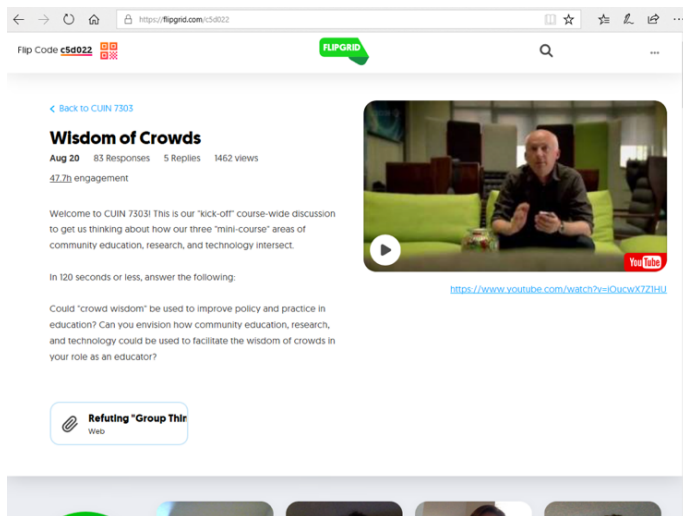
Figure 5. Prompt for video-based discussion in Flipgrid.

Recommendations

 Instructors and course designers can promote accessibility in online and blended course materials and activities by applying inclusive design practices. A recommended place to start is in the area of navigation by considering the clarity and consistency of how materials are organized on a course website. This first step is likely to make a noticeable difference in supporting all learners to be better able to access course content so that they can make strides toward becoming more self-regulated.

The next priority area to address relates to how learners perceive course materials and activities. Instructors and course designers should reflect on possibilities for how course content can be communicated through multiple format options. For instance, content delivered through readings could be similarly communicated via multimedia resources, such as infographics, podcast episodes, and video clips. Care should be taken to ensure that accompanying text descriptions, captions, and transcripts are available and provide equivalent information. Students can be involved in advancing an inclusive curriculum by converting historic learning documents and creating new materials (Everett & Oswald, 2018).

A third action step towards more inclusive design

in online and blended courses involves incorporating multiple means for how learners demonstrate what they have learned. Project-based learning allows learners to individualize based on their own unique makeup of prior experiences, personalities, and talents. Structured project options can provide opportunities for learners to integrate newly acquired knowledge. Project-based learning can also foster collaborative learning partnerships and authentic applications of course content (Koh, Herring, & Hew, 2010).

As a baseline, making sure that learners with disabilities have comparable access to online and blended course materials and activities is essential. Inclusive design, though, recognizes that variability is characteristic of all learners, and incorporating multiple pathways to access, engagement, and expression enables learners to select options that best meet their needs. The benefits of practices grounded in WCAG and UDL are far-reaching and applying them can produce online and blended course experiences that are intentionally designed for all learners.

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