Universally Designed Virtual Classrooms: Making Online Learning Accessible to all Students

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Universally Designed Virtual Classrooms: Making Online Learning Accessible to all Students

Abstract
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UNIVERSALLY DESIGNED VIRTUAL CLASSROOMS:
MAKING ONLINE LEARNING ACCESSIBLE TO ALL STUDENTS

by
Jennifer Yee Cole

A Capstone Project submitted to the
Faculty of the School of Occupational Therapy at Pacific University

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in Partial Fulfillment of the Requirements for the Degree of
Doctor of Occupational Therapy
Abstract

As higher education continues to incorporate technology, universities must address the accessibility of virtual environments, including online courses. However, legislation specific to the accessibility of technology only applies to federal institutions. Because of the low legal risk, private universities must consider the universal benefits of providing accessible virtual environments for all students, including social justice and enhanced learning experiences. Building upon accessibility standards, universal design (UD) proactively considers potential users’ needs, so all users can benefit from the space. Using an occupational therapy perspective, this paper analyzes the current state of online course accessibility at a private university to identify methods for achieving accessibility and implementing virtual UD principles. This author developed a checklist for educators to assess the accessibility and UD of their course. Educational materials were developed to provide rationale of how virtual UD can enhance learning experiences and promote social justice for all students.

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occupational therapy
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Universally Designed Virtual Classrooms: Making Online Learning Accessible to All Students

Higher education is incorporating the use of technology to enhance the learning experience of students at an increasing rate. Information for prospective students, application to the university, registering for courses, accessing library services, and paying for tuition are among some of the uses of the Internet that universities employ (Asselin, 2014; Dutta, Schiro-Geist, & Kundu, 2009; Federici et al., 2005; Gradel & Edson, 2010; Heiman & Shemesh, 2012; Huang & Russell, 2006; Thompson, Burgstahler & Comden, 2003; Thompson, Burgstahler & Comden, 2010; Wheaton, Chovan, O’Briant, & Howell, 2001). Online learning is becoming more prevalent and provides access opportunities to more people, including individuals in rural areas and those with severe disabilities (Wheaton, Chovan, O’Briant, & Howell, 2001). With the rapid changes in technology and the continual expansion of the Internet, many individuals, including those with disabilities, are unable to fully access the required webpages to carry out their daily routines or desired pursuits, including higher education (Asselin, 2014; Dutta, Kundu, & Schiro-Geist, 2009; Federici et al., 2005; Thompson, Burgstahler, & Comden, 2003; Thompson, Burgstahler, & Moore, 2010). With the increased use and continual development of technology, accessibility of virtual spaces must be proactively considered.

However, implementation of accessible online presence can be challenging for higher education institutions, particularly private universities, which are not mandated by legislation specific to accessible webpages (i.e., Section 508 of the Rehabilitation Act of 1973). Therefore, it is necessary to consider the benefits for all individuals, not just individuals with disabilities, when an accessible virtual environment is created. Universal design (UD) is a concept that has emerged from accessibility recommendations (Center for Universal Design, 1997). It refers to the products and environments being usable by all individuals without adaptation, use of
specialized equipment (i.e., assistive technology [AT]), or separate areas (i.e., of a building or of a website). Educators are more likely to see the impact that UD can have on overall learning effectiveness, when the environment is viewed as a barrier to learning.

This author is a third-year dual-degree doctor of occupational therapy (OTD) and master of healthcare administration (MHA) student at Pacific University who completed a 16-week doctoral internship at Pacific University’s Center for Educational Technology and Curricular Innovation (CETCI) beginning in April 2016. The doctoral internship focused on creating resources for Pacific University educators to support implementation of UD principles in their online courses. The purpose of this paper is to identify methods to enhance the quality of online learning in higher education by increasing access to virtual courses through the review of current literature and analysis of the current state of accessibility in online learning at Pacific University. This paper reflects on the challenges identified during the development of UD education materials and creation of a self-administered checklist for UD in online education at a private university.

Legal Considerations

Accessibility is mandated by multiple civil rights acts, including the Americans With Disabilities Act (ADA) of 1990 and Sections 504 and 508 of the Rehabilitation Act of 1973 (ADA, 2008; Rehabilitation Act, 1998). The ADA is a broad piece of legislation that protects individuals with disabilities from discrimination in the areas of employment, purchasing goods and services, participating in government programs and services, and telecommunications (ADA, 2008). Titles II and III of ADA include Standards for Accessible Design which focus on the accessibility of physical structures of state and local government facilities and public accommodations and commercial facilities, respectively.
Section 504 of the Rehabilitation Act (1998) requires reasonable accommodations for students with disabilities in federal and private institutions. Disability services at public and private universities operate primarily under this piece of legislation. Some of the academic accommodations include alternative formats and various types of AT. Accommodations are provided only after a student is determined eligible, which means that disability services are provided in a reactive manner. To be eligible for academic accommodations, students must provide the university with documentation that they have a current disability and have a need for academic accommodations. This means that students must elect to disclose their disability to the university. While Section 504 and ADA protect individuals with disabilities from discrimination, students may not wish to disclose their disability to avoid the stigma of disability.

While Section 504 focuses on preventing discrimination and providing academic accommodations to individuals with disabilities, Section 508 of the Rehabilitation Act, as amended (1998) requires federal agencies to ensure that electronic and information technology (EIT) acquired and maintained adhere to minimum accessibility standards. This law addresses the accessibility of federal webpages, including state universities. Section 508 standards were not intended to be implemented in an ad hoc manner, which means that federal institutions must proactively consider and plan for accessible EIT (United States Department of Education, 2015).

The Access Board is responsible for determining and monitoring the minimum standard for webpage accessibility set by Section 508 (United States Department of Education, 2015). Established 508 standards provide general recommendations for EIT; however, a proposal has been made to make the World Wide Web Consortium (W3C) Web Content Accessibility Guidelines (WCAG) 2.0 the new standard for Section 508 (General Services Administration [GSA], 2016). The W3C WCAG 2.0 are considered the ideal standards for webpage accessibility.
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(GSA, 2016; U.S. Access Board, n.d.). These recommendations cover a variety of considerations to make Internet content accessible to more users, including individuals with disabilities (W3C, 2008). Recommendations are sorted into four principles: (a) perceivable, (b) operable, (c) understandable, and (d) robust. Each recommendation has detailed guidelines with specific elements to achieve one of three levels of accessibility conformance. Yet, despite the variety of policies addressing equal access, efforts are still being made to increase awareness and make accessibility of virtual spaces a priority in web design and online education.

However, Section 508 does not apply to private universities unless these private institutions receive federal funding under the Assistive Technology Act of 1988 (Assistive Technology Act, 1998; S. Shuman, personal communication, June 24, 2016; Thompson et al., 2003; United States Department of Education, 2015). Private universities have lower legal risk because they are not mandated to procure and maintain accessible EIT. While there is lower legal risk, private universities must still consider the social implication of non-accessible EIT for their students. Prospective students may not be able to access information about the university or apply to the university, if consideration is not placed on EIT accessibility. Even though Section 508 standards or WCAG 2.0 are not mandated for private universities, these standards can guide universities in the development of EIT accessibility practices, particularly in the area of online learning.

**Components of Online Learning**

Many courses utilize learning management systems (LMS), also referred to as virtual learning environments (VLE), to host online components or even the entire course. Some of the common LMS on the market currently are Moodle, Blackboard, and Desire2Learn. Online learning can be categorized into three types depending on the level of technological involvement:
(a) technology enhanced courses, which uses the LMS to provide access to materials and resources used or mentioned in the face-to-face course; (b) blended courses, which blends in-person lectures and labs with resources, quizzes, discussions, and/or self-directed modules on the LMS; and (c) fully online courses, which do not have an in-person component and the student completes all learning objectives and assignments within the LMS.

Each type of course requires different components depending on the content and the learning objectives. Therefore it is important for course designers to have the freedom to tailor the LMS to the specific needs of the course. However, within the freedom of course design, accessibility should be considered even if there are no students with disabilities enrolled in the course. Accessibility should be a priority from the planning stages of web design and course design. Instructors of online courses should seek to ensure that all students can access the course materials and content in order to achieve course objectives. If students can access the course easier, students can focus their time and energy on learning the course content. In addition to accessibility, quality of online courses should also be considered.

**Evaluation Tools**

With the increase in accessibility, it is important to ensure that there is no decrease in quality of web design. Distance education webpages that were classified as *accessible* were found to be simple and did not include quality web design elements (Wheaton, Chovan, O’Briant, & Howell, 2001). Some educational institutions utilize the *Quality Matters (QM)* *Rubric*, which outlines standards used to evaluate the quality of online course design (Pollicia & McCallister, 2009; QM, 2016b). The rubric acts like a checklist and assigns point values to 43 standards in eight categories, which results in a quantitative assessment of the overall quality of
the online course (Pollicia & McCallister, 2009). A peer review process follows the checklist by a QM Peer Reviewer or a QM Master Reviewer.

However, while Quality Matters emphasizes directing students to technology support, it has limitations in actually assessing the quality of the technological support at institutions (Legon, 2006). This means that students needing support might not be able to access those services, such as external websites, online assessment tools, or teleconferencing. New teleconferencing technologies used mainly in distance education allow a greater depth of information transmission to occur through LMSs. Yet, they have introduced new challenges especially for individuals with visual or hearing impairments, due to the real-time stream of audio, graphics, and group chat (Myhill et al., 2008). With the rapid change in emerging technologies and web development, it is necessary to identify some of the basic webpage elements that influence accessibility for all users.

**Webpage Elements Influencing Accessibility**

In order for AT devices to successfully relay the information on a webpage, certain elements need to present and correctly coded. The standard language of webpage writing is called Hypertext Markup Language (HTML). In addition to HTML, scripts (e.g., JavaScript) and Cascading Style Sheets (CSS) can affect how the HTML code is displayed in a browser. All of these components are brought together in the source code, which when viewed in an internet browser (e.g., Internet Explorer, Mozilla, and Chrome), display a typical webpage. The elements discussed below contribute to the accessibility of webpages.

Alternate text for images are given by alt attributes (alt="text" in HTML code) and are used to describe the image content. With this code, non-visual users can access the content of the image (Thompson et al., 2010; W3C, 2008). However, many studies have found
that while webpages may have alt attributes on the present images, they do not always provide meaningful descriptions of the content in the image (Myhill et al., 2008; Thompson et al., 2003; Thompson et al., 2010; Wheaton et al., 2001; W3C, 2008). Some examples of useless alt attributes include alt="photo" or alt="file.jpg". These descriptions do not allow non-visual users to have access to the information about the photo. Grogan and Ruzic (2000) further suggested adding a tag called *Long Description* to alt attributes which prompts users of AT that a longer description of the image content will be provided. Web developers should ensure that all images have alt attributes and that the alt attributes accurately and thoroughly convey the content of the image.

Similar to alt attributes, labels (<label="value"> in HTML code) are used to name certain elements in the source code (e.g., table columns and rows and form values) to allow clear descriptions of the content and purpose of that section of the webpage. Furthermore, they can work with skip navigation codes (<a href="#label value"> in HTML code) to allow users to efficiently jump between sections of the webpage. However, this feature only works if the sections are correctly labeled with label attributes or appropriate headers (e.g., <h1>, <h2>, etc. in HTML code) (Thompson et al., 2010; W3C, 2008).

Tables are identified as one of the most inaccessible elements of webpages (GSA, n.d.; Thompson et al., 2003; W3C, 2008). Tables are useful for web developers to display data; however, when used to construct the page layout, tables often create challenges when an AT such as a screen reader tries to decipher the correct order in which to read the content of the webpage (Myhill et al., 2008). Tables were most commonly found in course listing and course search webpages (Thompson et al., 2003). In addition to the compound tables, course search
webpages have multipart forms that require various manipulations (e.g., checkboxes, drop down menus, text boxes) with multiple labels for each form element.

Styling creates even more accessibility problems. Color needs to be used correctly, so there is a high contrast between text and background (Thompson et al., 2003; W3C, 2008). Animations and video can be challenging to convey the correct information. Dynamic content (e.g., menus that appear when the cursor hovers over a navigation link) may not be detected by older screen readers (Thompson et al., 2010). Another problem emerges in higher education with the multiple forms and documents available for download. Often times, these downloads are in Portable Document Format (PDF), which may be formatted to be an image making it difficult for screen readers and not allowing resizing of fonts. As described in the above section, it is challenging to develop a complete, high-quality website for a broad array of users of varying abilities and using various types of AT.

**Virtual Universal Design**

The goal of UD is to allow products and environments to be used universally by all individuals regardless of disability or previous experience (Asselin, 2014; Bühler, Engelen, & Soede, 2011; Federici et al., 2005; Myhill et al., 2008; Rowland, Mariger, Seigen, & Whiting, 2010). While efforts have been made to implement standards of UD in the creation of physical products and environments, the design and development of virtual environments has taken different interpretations of the basic principles. Grogan and Ruzic (2000) stated that a universally designed website is one that provides alternatives for users.

UD principles are well established for physical spaces; however, UD is still being established in the rapidly expanding virtual context. Suggested UD principles for webpages include: (a) ensuring that webpages can be used by any group of users; (b) accommodating for a
wide range of abilities; (c) making webpages simple and intuitive to use; (d) communicating necessary information and content; (e) minimizing hazards from accidental actions (e.g., clicking on a pop-up window and downloading a virus); (f) requiring low physical effort; and (g) using appropriate size and space for optimal use (Federici et al., 2005; Grogan & Ruzic, 2000; Myhill et al., 2008; Thompson et al., 2010). The WCAG 2.0 provide many recommendations based on various levels of accessibility conformance (i.e., minimum accessibility or alternative version provided); however, most of the guidelines focus on webpage use with AT, which concentrates on individuals with disabilities (W3C, 2008).

It has been proposed that true UD of a website would mean that a user would not need to use any AT in order to use the website (Asselin, 2014; Federici et al., 2005; Myhill et al., 2008). Myhill et al. (2008) state that existing technology does not allow true UD of the Web; however, they further shared the idea that by applying UD principles to the Web and technology, expensive and stigmatizing AT may be done away with. This highlights that UD principles “are consistent with the paradigm that disability is a social construct relative to the built environment rather than inherent in the person” (p. 163). The implementation of accessibility standards depends on web developers, educators, and course designers. These individuals must be educated about the legal standards, how to make online learning accessible, and about the social implications for individuals with disabilities.

**Role of Occupational Therapy**

Occupational therapy (OT) is a profession that promotes participation and independence in necessary and desired activities within the contexts that these activities occur (American Occupational Therapy Association [AOTA], 2014). OT practitioners examine the interaction of individuals, organizations, or populations and their environment when completing a meaningful
activity, or occupation. Virtual contexts, a type of environment within the scope of OT, allow people to interact through the use of smartphones, computers, tablets, and videogame consoles without physical contact.

Guiding Model of Practice. The United Nations (2006) declares that disability is not a result of an individual’s deficits, but rather the hindering environmental barriers (i.e., physical, virtual, and social) with which the individual interacts. The Person-Environment-Occupation (PEO) model of practice emphasizes the transaction of all three elements through an OT perspective (Law, Cooper, Strong, Steward, Rigby, & Letts, 1996). It focuses on the resulting occupational performance, which is the quality of an individual’s performance completing an occupation within context. This model is used in this paper as the guiding theoretical framework for examining the need for UD of LMS in higher education.

Methods

This needs assessment focuses on Pacific University, an educational institution located in Oregon. It is a private liberal arts university with a combination of undergraduate, graduate, and professional programs (Pacific University, 2016a). With four campuses in the state, the university requires advanced information systems to maintain communication, provide library services, and facilitate online learning. Because it is a private university, Section 508 does not apply to the university’s EIT.

Data Collection

The data collected for this quality improvement initiative were gathered through interviews, personal communication, observation, surveys, and review of current literature. Background information was gathered through personal communication with the director of Pacific University’s CETCI, Al Weiss, as well as through review of Pacific University’s website.
Additional information was collected through semi-structured interviews with Scott Shuman, Pacific University’s legal counsel, and Kim Garrett, director of Pacific University’s Learning Support Services (LSS) in regards to university and federal policy, disability services, and available resources.

This analysis will follow the structure of an A3, which is a tool prescribed by Lean philosophy. Lean philosophy emphasizes the elimination of waste to simplify the process, reduce errors, and improve overall quality (McLaughlin & Olson, 2012). An A3 lays out the steps of improving a process using a single sheet of paper from which the term A3 was derived (i.e., size A3 paper). A template of an A3 is shown in Appendix A. It emphasizes the importance of understanding how the process is currently occurring, identifying potential causes of the problem(s), developing a change to be implemented, and stating measurable goals to determine its progress.

**Services**

**LSS.** LSS provides disability services to students at Pacific University. This department is responsible for determining student eligibility, identifying necessary accommodations, communicating with instructors, and providing AT and alternative formats as needed (Pacific University, 2016b). Accommodations must be related to the student’s educational participation. LSS operates under Section 504 of the Rehabilitation Act of 1973. LSS coordinates accommodations on a case-by-case basis and have been able to meet the needs of all students to date (K. Garrett, personal communication, June 24, 2016). Federal Work-Study positions are available to eligible students to assist with converting books and other resources into alternative formats. These positions not only assist with converting resources to alternative formats, but they
also provide an opportunity for students to see the barriers to learning that some students may encounter.

**CETCI.** The CETCI offers educational technology resources, including tutorials, trainings, and events for faculty, staff, and students (Pacific University, 2016d). Moodle is monitored and updated by this department in partnership with University Information Services (UIS). The two CETCI staff members are also responsible for supporting video conferencing technologies (e.g., Adobe Connect and Google Hangouts) provided by the university. This department acts as an operational liaison between UIS and educator implementation of technology.

**UIS.** UIS is responsible for the information technology of the university, including maintaining all technology utilized at Pacific University (Pacific University, 2016c). This department works to develop and deploy technology to meet the needs of the university. UIS staff is comprised of 24 members who maintain the university network and classroom technology.

### Findings

**Current State**

Pacific University’s undergraduate and graduate/professional programs introduce many complexities. In order to best analyze the multitude of contributing factors, this paper primarily focuses on the School of OT’s online presence. The CETCI and LSS are included in the analysis as these department are directly related to operationalizing online accessibility within the School of OT.

**SWOT analysis.** A SWOT analysis, which identifies and assesses the positive and negative elements internal and external to an organization, was completed and is summarized.
below. A complete table can be found in Appendix B of this document. It highlights the weaknesses and threats that Pacific University faces regarding accessibility of online courses and overall online presence.

**Commendations.** Based on the findings from the strengths and opportunities sections of the SWOT analysis, Pacific University should be recognized for several commendations, including (a) existing LMS, AT, and other educational technology available; (b) strong focus on educational technology through a variety of university initiatives; and (c) current QM subscription.

**Available technology.** Students, faculty, and staff have multiple types of educational technology available. The personnel at Pacific University’s CETCI, UIS, and LSS bring years of educational, technological, and accommodation expertise to students and faculty to provide and service these technologies. Moodle serves as the university’s LMS; it offers third-party support, which is beneficial since CETCI has a limited number of staff. The university’s Moodle version is updated once a year and the CETCI staff develop certain features to customize the updates as needed (A. Weiss, personal communication, June 6, 2016). The university also uses Google Apps (e.g., Gmail, Drive, Docs, and Slides) for email, storage, and document collaboration. Pacific University’s library has multiple electronic books, articles, and other resources (e.g., critically appraised topics, dissertations) available for all enrolled students to access.

LSS has a variety of AT available to eligible students, including screen readers, tablets, and other software to provide alternative formats of learning materials (K. Garrett, personal communication, June 24, 2016). To date, Pacific University has been able to provide accommodations for all eligible students. However, the university is interested in being more proactive in providing alternative formats to all students.
Focus on educational technology. The collaborative effort between the CETCI and UIS departments has supported the use of educational technology in most courses and events at Pacific University. The university hosts multiple events focusing on educational technology. In addition to regular faculty trainings on Moodle and other types of educational technology, the CETCI offers an online learning intensive summit for select Pacific University faculty that occurs annually during the summer (A. Weiss, personal communication, April 18, 2016). Pacific University is also part of a consortium of five higher education institutions that host the annual Oregon Technology and Education Network (OTEN) conference (OTEN, 2016). The OTEN conference is open to educators in Oregon from kindergarten to higher education and highlights innovative uses of technology in pedagogy.

QM subscription. Pacific University has a subscription to QM, which allows the CETCI staff and select faculty to review courses through a systematic and peer-reviewed process to assess quality of the course design. The QM Rubric allows reviewers to determine if the course meets specific standards related to the course overview, learning objectives, assessments, instructional materials, course activities, course technology, learner support, and accessibility and usability (Pollicia & McCallister, 2009; QM, 2016b).

However, as discussed in the literature review, QM has a limited section on accessibility and focuses mostly on compatibility with AT. The review process takes a significant amount of time depending on the complexity of the course and the familiarity of the reviewer with the course (A. Weiss, personal communication, April 18, 2016; N. Krusen, personal communication, April 13, 2016). Fully-online courses require a far more involved review process than technology enhanced courses. Furthermore, Pacific University does not have a staff or faculty member that is certified as a reviewer. While reviewer certification is not necessary to utilize the tool, the QM
rubric was developed and peer-reviewed under the assumption that reviewers would be certified in the QM process (QM, 2016a).

**Areas of concern.** Based on the findings from the weaknesses and threats sections of the SWOT analysis, this author identified three areas of concern: (a) lack of university policy regarding online accessibility, (b) access to alternative formats or accommodations only through LSS, and (c) primarily reactive efforts of accessibility.

*University policy.* Pacific University does not have a policy regarding online accessibility. The university states compliance with ADA and Section 504. LSS established the university’s Disability Documentation Standards and Eligibility for Accommodations, which outlines the eligibility criteria for disability services (Pacific University, 2006). Moodle policies address the process of creating and renaming courses, access to courses, ownership of course materials, and course removal; however, there is no mention of accessibility in this policy (UIS, 2014). While a policy requiring minimum accessibility standards is not mandated by federal law (i.e., Section 508), a policy regarding online accessibility would reflect the university’s efforts to ensure high-quality learning that is accessible to all students.

*Accessibility only through LSS.* Once enrolled in the university, students may begin the process of determining eligibility for disability services through LSS. However, prior to admission to the university, students do not receive any support. Prospective students seeking information or those applying to the university may not have access to AT devices since it would require students to obtain AT independently. After enrollment, some students may choose not to disclose their disability to the university for various reasons. Some students may not be eligible for services, or they may not even be aware of LSS.
Reactive approach to accessibility. LSS provides accommodations on a case-by-case basis (K. Garrett, personal communication, June 24, 2016). While LSS has been able to support all students enrolled in LSS, it has always taken on a reactive approach. Because of the reactive approach, any increase in LSS student enrollment may not be supported by current resources and approaches. The reactive approach also limits some of the accessibility features that may benefit all enrolled students (i.e., audio versions of textbooks for auditory learners). While Section 508 does not directly relate to private institutions, in order to best serve students efforts should be made to meet those standards. UD principles are by definition a proactive effort, and thus, university trends should reflect this shift (Asselin, 2014).

Root Cause Analysis

In order to make informed recommendations for quality change, this author completed a root cause analysis following Lean methods. A root cause analysis examines the existing state of an area of concern to identify the root causes to wisely inform recommendations of change (McLaughlin & Olson, 2012). Based on the information gathered during the SWOT analysis three major themes emerge as root causes for inattention to accessibility and UD of online learning: (a) low risk of non-compliance to Section 508 standards, (b) technological literacy level of available accessibility recommendations, and (c) existing standards and recommendations lack specific applicability to online education.

Since Pacific University is a private university and does not receive federal funds through the Assistive Technology Act, webpages do not need to adhere to Section 508 standards. Pacific University’s legal risk is relatively low in the area of online accessibility. Section 504 poses greater risk; however, LSS has been able to fully provide educational accommodations to eligible
students. The low legal risk does not provide incentive to make the university’s online presence accessible.

Section 508 references the WCAG 2.0 recommendations as the standards for online accessibility; however, these recommendations are written for web developers targeting general webpages and were not intended for educators of online courses. Because the recommendations address general webpage items, it can be challenging for educators to interpret the recommendations for their course webpages. Additionally, the recommendations are written for web developers with a high technological literacy level, rather than educators or course designers who have limited education in technology and web design.

**Future State**

After completing a root cause analysis, the next step in the Lean A3 process is determining what the new process will look like, including measurable goals to determine if the process has indeed improved (McLaughlin & Olson, 2012). The ideal future state would remove all environmental barriers in the virtual context, facilitating uninhibited participation in higher education for all individuals, regardless of disability. By having clear and understandable standards of UD principles for the virtual context, educators could design online courses that would support enhanced learning for all students.

**Proposed Interventions.** Due to the complex nature of this area, it is recommended that Pacific University develop UD standards for professors to use in their online courses. UD standards should be supplemented by educational materials to disseminate this information to university faculty. Additionally, sample courses and easily importable templates should be created. University policies and procedures should also be written for continued implementation of these UD standards.
This author developed a checklist, titled UD Checklist for Online Courses, for educators to independently use as a self-assessment tool when creating courses in Moodle to ensure accessibility and promote use of UD principles (Appendix C). The checklist targets common accessibility issues that were identified in existing literature and during a review of current School of OT course pages. The most common accessibility issues identified included: non-HTML formatted headings and content, use of tables without correct HTML tables, alt tags for images and hyperlinks, use of color, and use of multimedia without captions or transcripts. The checklist also promotes implementation of UD principles, including clear orientation methods for weekly or section topics, consistent formatting within courses, logical sequencing of tasks and sections, and integrated alternative formats.

Supplementary to the checklist, this author organized and created educational materials for educators that addressed how to use the checklist, how to implement features within Moodle, and provided the rationale for using UD in online learning. These materials were organized on a website hosted within Pacific University’s WordPress account (http://web5.lib.pacificu.edu/universallydesignedonlinecourses/). Within the next year, the CETCI will integrate this website with the existing university library webpages (A. Weiss, personal communication, June 27, 2016). These materials will be disseminated during CETCI and LSS trainings and orientations.

**Discussion**

Accessibility of virtual spaces is not only a legal requirement; it is an issue of social justice. Education should be accessible to all individuals, regardless of disability. However, current federal policies primarily focus on institutions in the public sector. Private universities are held to the standards of Section 504, which follows a reactive, case-by-case approach.
Section 508 directly addresses the accessibility of information technology, but only applies to federal websites or institutions that receive federal funding under the Assistive Technology Act of 1988. This means that private universities are not federally mandated to develop and maintain accessible webpages unless a request for accommodation is made by a student eligible under Section 504. Therefore, private universities must evaluate the importance of virtual accessibility and carry out thoughtful strategic planning for achieving virtual UD.

Pacific University’s reactive approach to accessibility has been able to meet the needs of students with disabilities; however, students who do not receive learning support services under Section 504 must independently navigate their courses. The environmental barriers of inaccessible online classes can isolate students from fully accessing their higher educational pursuits. This project analyzed the current state of online course accessibility at Pacific University, a private university, in order to promote the adoption of UD principles in online course design, focusing on the universal benefits to enhance learning and better meet the needs of current and future students. In developing the self-assessment checklist and educational materials, this author encountered multiple challenges that are important considerations for virtual UD efforts at private universities, not mandated under Section 508.

When developing accessibility standards and educational materials for implementation, it is essential to consider technological literacy. Emerging technology is constantly changing what is addressed in education curriculum, which means that educators have changing exposure to pedagogical technology in their training. Furthermore, people have varying confidence levels with technology. All educational materials should be at a basic technological literacy level to ensure that all readers (i.e., university educators) are able to understand and implement content. Technical jargon should be avoided and specific technical terms must be defined for readers.
Additionally, educational materials should focus on the most crucial and relevant points of accessibility in order to gain buy-in from educators and have a more successful implementation of accessibility efforts.

Marketing proactive accessibility efforts to educators at private universities requires careful consideration since legal risk is low. If purposeful rationale is not provided to stakeholders (i.e., educators and course designers), accessibility considerations may seem like a demand of more time and effort. This project focused on the opportunity to enhance learning of all students rather than adding on another task to complete for students with disabilities. Rationale for overall learning benefits supplemented the UD self-assessment checklist, in order to reinforce the concept that UD benefits all users, not just individuals with disabilities. This approach was rooted in the UN’s (2006) position and sought to change the perception of disability as an individual’s deficits to the perception that environmental barriers inhibit function. By placing emphasis on environment as a barrier to learning, educators are more likely to see the impact UD can have on overall learning effectiveness.

Because of the environmental focus of virtual UD, the OT perspective was valuable in analyzing the activity demand of online learning for all students, including cognitive and sensorimotor demands. An OT perspective should be part of the process of user experience research and development. OT practitioners have an established expertise in environmental modification and facilitating functional participation of individuals, including those with disabilities. AT falls under the scope of OT under the profession’s practice framework (AOTA, 2014).

Furthermore, the PEO model of practice comprehensively frames the interaction of users (i.e., populations) and online learning, in order to promote optimal learning performance within
the virtual context. Virtual UD, by definition, anticipates the personal factors of various users within the same virtual environment. When looking at UD of online education, the intent of interacting with the virtual environment must also be considered. The PEO model highlights how the transaction between all three elements (i.e., person, environment, and occupation) influences the overall quality of performance—in this scenario, students learning online. Additionally, the PEO model places emphasis on the environmental influence on overall performance, rather than individual deficits. Education is a common occupation for many individuals, so it is imperative that efforts proactively support all individuals seeking access to education by addressing the virtual environmental barriers.

**Conclusion**

Equal access to educational pursuits is an important social issue. Use of the Web in higher education has increased the quality of services provided and reached many more people (Wheaton et al., 2001). Emerging technologies can be promising for individuals with disabilities, but it is often times disappointing to discover the inaccessibility of the Web (Besio & Salminen, 2004; Erlen, 2003; Steel, Gelderblom, & de Witte, 2011). It is important to remember that this virtual context plays an integral role in everyday life, including the pursuit of and participation in higher education. In order for successful incorporation of UD principles in online education, concepts and resources must be presented at a clear and understandable technological literacy level. Additionally, concepts must be accurately marketed to university faculty and staff, depending on the university’s legal risk (i.e., public or private university). Pacific University has an opportunity to address a social injustice and greater support occupational participation of their current and prospective students. Efforts should be made to create high-quality webpages that are usable for any individual, regardless of the presence of a disability. Future studies should seek to
evaluate the effectiveness of the UD checklist for online courses and educational materials created to ensure accessibility and promote implementation of UD principles in online learning.
References


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doi:10.1177/0022219410392047


Appendix A

Figure A1. Lean A3 Template

<table>
<thead>
<tr>
<th>Issue:</th>
<th>Title:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Process owners:</td>
</tr>
<tr>
<td></td>
<td>Date:</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Current State:</td>
<td>Future State:</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tests of Change/Intervention:</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Outcomes:</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Metrics:</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Problem Analysis (Root Cause):</td>
<td>Follow-up Plan:</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table B1. SWOT Analysis of Pacific University’s Online Accessibility

<table>
<thead>
<tr>
<th>Positive</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>STRENGTHS</strong></td>
<td><strong>WEAKNESSES</strong></td>
</tr>
<tr>
<td>Internal</td>
<td></td>
</tr>
<tr>
<td>• Knowledgeable technology support staff available (e.g., CETCI, UIS)</td>
<td>• Limited university resources dedicated to online accessibility initiatives</td>
</tr>
<tr>
<td>• LSS provides AT (e.g., tablets, screen readers, software)</td>
<td>• Lack of knowledge of UD principles</td>
</tr>
<tr>
<td>• LSS able to meet needs of students on a case-by-case basis</td>
<td>• Varying knowledge of how to use and set up LMS platform</td>
</tr>
<tr>
<td>• LMS (i.e., Moodle) and other communication software already purchased</td>
<td>• No current accessibility policy for online presence</td>
</tr>
<tr>
<td>• CETCI staff interested in being more proactive in virtual accessibility</td>
<td>• Increasing number of students in programs (e.g., School of OT)</td>
</tr>
<tr>
<td>• University is a subscriber to Quality Matters</td>
<td>• No proactive efforts for online accessibility in place</td>
</tr>
<tr>
<td><strong>OPPORTUNITIES</strong></td>
<td><strong>THREATS</strong></td>
</tr>
<tr>
<td>External</td>
<td></td>
</tr>
<tr>
<td>• Pacific University is a private institution, so Section 508 standards are only partially mandated</td>
<td>• Some students may not receive LSS services due to lack of awareness, desire to not disclose disability, or not being eligible for services</td>
</tr>
<tr>
<td>• OTEN Conference hosted by Pacific and free for faculty and students</td>
<td>• Students do not receive LSS until admitted to university, so prospective students may not be able to access information or application process</td>
</tr>
<tr>
<td>• Online learning intensive retreat available to selected faculty</td>
<td>• Less LSS enrollment in graduate programs</td>
</tr>
<tr>
<td>• Work study positions to convert resources to alternative formats for LSS</td>
<td>• Unequal representation of minority groups in higher education</td>
</tr>
<tr>
<td>• Northwest Alliance provide support</td>
<td>• Broad variety of LMS uses depending on the type of course and instructor</td>
</tr>
<tr>
<td>• TPACK curriculum for new educators</td>
<td>• Varying technological literacy levels of university educators</td>
</tr>
<tr>
<td>• WCAG 2.0 recommendations present</td>
<td>• Moodle tutorials are self-directed learning</td>
</tr>
<tr>
<td></td>
<td>• WCAG 2.0 recommendations targeted for general websites and are written for web developers rather than educators</td>
</tr>
<tr>
<td></td>
<td>• Third-party LMS platforms have varying customizability</td>
</tr>
<tr>
<td></td>
<td>• Time and work demands on educators to develop quality courses</td>
</tr>
</tbody>
</table>
Appendix C

Universal Design Checklist for Online Courses

Universal design (UD) refers to the proactive, intentional design of products, in this case higher educational courses, to be intuitive and accessible to all individuals without adaptation or use of specialized equipment, such as assistive technology (AT). Making online courses more accessible not only meets legal mandates, it also enhances the learning experience of students. If students can access the course easier, students can focus their time and energy on learning the course content.

This checklist is organized as a series of 15 questions for educators or course designers to ensure accessibility and implement UD in online courses. Each question addresses UD elements that are relevant for an online course. This checklist is intended for educators and course designers who use the learning management system, Moodle, to host or enhance their courses with an online presence.

How to use the checklist

Prior to opening the course to students, educators or course designers should review the course by asking each question on this checklist. Each item is a yes-no question and results can be marked in the Yes or No boxes next to each question. When initially creating a course website, the items of this checklist should be reviewed to identify methods for implementing UD in the course.

Supplemental Resources and Tutorials

This checklist is supplemented with an online resource created by this checklist developer. The online website provides rationale and tutorials for each item. There is an
electronic version of the checklist available for viewing directly on the website and can be downloaded for printing.

Supplemental resources can be found at the Universally Designed Online Courses website located at http://web5.lib.pacificu.edu/universallydesignedonlinecourses/.

Contact

Any questions or comments regarding development or use of this checklist and website should be directed to:

Jennifer Yee Cole, OTS
Pacific University
JYCole@PacificU.edu

Table C1. Universal Design Checklist for Online Courses

<table>
<thead>
<tr>
<th>Universal Design Item</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Are all headings and bodies of text formatted with <em>heading levels</em> and <em>paragraph level</em> using Moodle text editor’s <em>Heading levels</em> or Microsoft Word’s <em>Styles</em>?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Do all section titles include the topic name, week or module number, and date?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Does each week/topic/module section display information in a consistent layout?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Is content organized in a logical sequence that follows the order that students should access or prioritize?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Can sections be collapsed to focus on target section?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Are tables only used when necessary for displaying tabular information and not for formatting?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. If tables were used, is there a table ID, a description, and accurately labeled headers for columns and rows?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
8. Do all images have an accurate description (i.e., alt text)?
9. Do all hyperlinks have descriptive labels (i.e., no “Click here.”)?
10. Does all included or referenced multimedia have captions or transcripts?
11. Are sans serif fonts (e.g., Arial, Helvetica) used for text?
12. If color is used to emphasize text, is another, non-color method (i.e., bolding or italicizing) used to denote emphasis?
13. Are important course documents (e.g., syllabus, assignment prompts) provided in multiple formats, so students can access information on the Moodle page (i.e., HTML), as well as downloading the document (i.e., Word or PDF document)?
14. Was the accessibility of included resources (e.g., formats such as Word, Excel, PowerPoint, and PDF documents) confirmed?
15. Can students easily track progress of completing activities?