



Learning is for Everyone: Instructional Design for Accessibility

Technical Article

Stephen Victor, Ph.D.
Strategy and Design Lead

Abstract

This article examines several issues related to designing eLearning that is accessible for people with disabilities. The topics covered include legal requirements for accessible web sites, problems encountered by people with disabilities who use educational sites, guidelines for accessible design from various government and private organizations, assistive technologies that aid learners with disabilities, and guidelines for accessible design using the guiding principles of Universal Design for Learning.



CONTENTS

Introduction.....	1
Key definitions.....	1
Accessibility and the law	2
The Americans with Disabilities Act.....	2
Section 508.....	2
Technologies for accessibility.....	3
Assistive technologies for learners	3
Accessibility and eLearning design.....	4
Web Content Accessibility Guidelines (WCAG)	4
Section 508 guidelines	5
WebAIM accessibility guidelines.....	5
Universal Design for Instruction	6
Validating accessible design.....	7
Resources	8
Accessibility and the law.....	8
Assistive technologies.....	8
Accessibility standards	8
Accessibility validation.....	8
References	9
About Obsidian Learning	10



This work is licensed under the Creative Commons Attribution 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by/4.0/> or send a letter to Creative Commons, PO Box 1866, Mountain View, CA 94042, USA.

Editorial Team

Monica Savage, President
Heather Carter, Social Media Strategist
Amanda Costa, Instructional Designer and Editor
Lubos Janoska, Senior Learning Strategist
Stephen Victor, Strategy and Design Lead

For more information on Obsidian Learning's products and services, please contact Erik Pettine at ErikP@obsidianlearning.com or (281) 732-5940.



Transforming Learning. Accelerating Business. | i
www.obsidianlearning.com

Introduction

We've written a lot on our blog about various aspects of eLearning design, including [mobile learning and open technologies like HTML5 and xAPI/CMI-5](#). Here at Obsidian, we're not ashamed to admit that we're learning and technology geeks, and we're always looking at new tools to deliver value to our clients. One thing we haven't considered, though, is the issue of accessibility: are our courses open to all, including people with disabilities?

We often hear about the "digital divide" between developed and developing nations (for example, see Victor, 2010). Something we might not always think about, however, is the fact that learners with physical disabilities often find themselves unable to participate fully in learning experiences. Sheryl Burgstahler (2002) has written about a second digital divide: between those who *can* access digital technology and those who, because of physical or cognitive disability, *cannot* use this technology.

[Brian Dusablon](#) has written on the [ATD Learning Technologies blog](#) about accessibility issues, giving great tips on [designing accessible content](#) and using [Universal Design](#) principles to develop accessible eLearning. In this post, we'll look at several aspects of accessibility in more detail, including:

- Legal requirements for accessible web sites
- Typical problems encountered by people with disabilities who use educational sites
- Available guidelines for accessible design
- Assistive technologies that aid learners with disabilities
- Basic guidelines for accessible design using the guiding principles of [Universal Design for Learning](#)

Key definitions

First, let's define some terms. What is "accessibility"? The World Wide Web Consortium (W3C) provides this definition: "Web accessibility means that people with disabilities can perceive, understand, navigate, and interact with the Web, and that they can contribute to the Web" (W3C, 2005).

This inclusion of not only *using*, but also *contributing to*, the Web is particularly significant in the area of online learning because learners are typically required not only to use the Internet to access information but also to demonstrate in some way their assimilation of that information.

Next, what constitutes a disability? The [Americans with Disabilities Act \(ADA\)](#) defines an individual with a disability as "a person who has a physical or mental impairment that substantially limits one or more major life activities, a person who has a history or record

of such an impairment, or a person who is perceived by others as having such an impairment.”

The W3C includes the following types of disabilities in its consideration of designing for accessibility: visual disability, hearing impairment, physical (motor) disability, speech disability, cognitive and neurological disability (including learning disability and seizure disorders, for example), multiple disability, and aging-related conditions (W3C, 2005). That’s quite a range of possible disabilities, and it sets a high bar for designing eLearning that can accommodate the widest possible number of learners and instructors.

Accessibility and the law

There are legal as well as ethical reasons for making provision for disabled learners. This section examines how accessible web design has been influenced in the United States by federal legislation.

The Americans with Disabilities Act

The Americans with Disabilities Act (ADA) of 1990 prohibits discrimination on the basis of disability by public accommodations and requires places of public accommodation and commercial facilities to be designed, constructed, and altered in compliance with the accessibility standards established by the Act. The U.S. Department of Justice has published an extensive set of guidelines, the [ADA Standards for Accessible Design](#), which describe the requirements for providing physical access to facilities.

Unfortunately, however, the guidelines don’t provide guidance in the area of information technology or web design. In 2004, Congress updated ADA with the [Individuals with Disabilities Education Act \(IDEA\)](#), which governs how states and public agencies provide early intervention, special education, and related educational services to young people from birth to age 21.

Section 508

As noted above, the original ADA standards offered no guidelines for information technology or web design. In 1998, the standards were updated when Congress amended the Rehabilitation Act of 1973 to require federal agencies to make electronic and information technology accessible to people with disabilities.

This requirement is commonly referred to as [Section 508 compliance](#). While only federal sites are required to comply with Section 508, these regulations are typically used by a broad range of institutions to define accessibility provisions for the disabled.

Technologies for accessibility

Assistive technologies for learners

There are a number of tools that provide assistance for disabled users of the web and other technologies. Janet Hopkins (2006) describes assistive technologies in terms of whether they are low-, mid-, or high-tech options:

- **Low tech** options include magnification sheets for visually impaired readers, color coding of instructional materials, and large print materials.
- **Mid-tech** devices include tape recorders, headphones, and visual timers.
- **High-tech** options include text-to-speech software, concept-mapping software for visual learning, computer input tools like trackballs and speech recognition software for learners with physical disabilities, and scanners with OCR software to allow conversion of printed materials to electronic text that can be converted to synthetic speech.

For example, while the Windows and iOS operating systems offer some accessibility features (such as screen readers and high contrast displays), there are tools that provide even greater accessibility: screen readers and refreshable braille displays.

The [JAWS screen reader](#), developed by Freedom Scientific, is widely used by visually impaired users of PC software and Internet applications. JAWS uses an internal software speech synthesizer and the computer's sound card to read information from the computer screen aloud. JAWS is a great program, but it's also expensive – to the tune of over \$1000 for a professional license. A free alternative is [NVDA \(NonVisual Desktop Access\)](#) from NV Access, a not-for-profit organization founded in 2006 by two blind men.

Both JAWS and NVDA can output to [refreshable braille displays](#). A refreshable braille display is a piece of hardware that provides tactile braille output from a computer monitor (Stageberg, 2004).

Accessibility and eLearning design

Unfortunately, many instructional designers believe that the availability of assistive technologies is enough to remove access barriers to eLearning – how many of us have run through a course with JAWS and called it a day? While assistive technologies are invaluable in making eLearning accessible, it's crucial that we consciously design online courses for accessibility. Let's take a look at some guidelines that can help us do that.

Web Content Accessibility Guidelines (WCAG)

The most comprehensive set of guidelines on accessible web design are those provided by the W3C. The [Web Accessibility Initiative](#) guidelines cover just about all aspects of design. Here are just a few:

- [Web content accessibility](#), including not only what we typically think of as “content” (images and text) but also code or markup that controls presentation.
- [Authoring tool accessibility](#), including guidelines for making authoring tools themselves (not just their output) accessible. (We're using these guidelines as we develop [Obsidian Black](#).)
- [User agent accessibility](#). User agents include browsers, media players, and assistive technologies.
- [Mobile accessibility](#). Guidelines for assisting users of mobile phones, tablets, etc.

To keep this article from becoming an eBook, though, we'll just focus on the W3C guidelines for web content, the [Web Content Accessibility Guidelines \(WCAG\)](#).

The guidelines are grouped under four principles, as summarized below:

Principle 1. Perceivable: Information and user interface components must be presentable to users in ways they can perceive.

- 1.1 Text Alternatives: Provide text alternatives for any non-text content so that it can be changed into other forms people need, such as large print, braille, speech, symbols, or simpler language.
- 1.2 Time-based Media: Provide text alternatives for time-based media such as videos.
- 1.3 Adaptable: Create content that can be presented in different ways (for example simpler layout) without losing information or structure.
- 1.4 Distinguishable: Make it easier for users to see and hear content including separating foreground from background.

Principle 2. Operable: User interface components and navigation must be operable.

- 2.1 Keyboard Accessible: Make all functionality available from a keyboard.
- 2.2 Enough Time: Provide users enough time to read and use content.
- 2.3 Seizures: Do not design content in a way that is known to cause seizures. Avoid elements that flash more than three times in a one-second period.
- 2.4 Navigable: Provide ways to help users navigate, find content, and determine where they are.

Principle 3. Understandable: Information and the operation of user interface must be understandable.

- 3.1 Readable: Make text content readable and understandable.
- 3.2 Predictable: Make web pages appear and operate in predictable ways.
- 3.3 Input Assistance: Help users avoid and correct mistakes.

Principle 4. Robust: Content must be robust enough that it can be interpreted reliably by a wide variety of user agents, including assistive technologies.

- 4.1 Compatible: Maximize compatibility with current and future user agents, including assistive technologies.

Section 508 guidelines

The [Section 508 Standards for Electronic and Information Technology](#) provide comprehensive requirements for the design of a number of products, including software applications and operating systems, web-based information and applications, telecommunications products, video and multimedia products, and desktop and portable computers. Their guidelines for web-based information are similar to those of the W3C, so I won't summarize them here.

WebAIM accessibility guidelines

The [Web Accessibility in Mind](#) site at Utah State University provides many helpful resources and guidelines for making web content accessible. Here are their key principles of accessible design:

- Provide appropriate alternative text for non-text elements. This allows the visually impaired to have descriptions of non-text elements read to them by screen readers.
- Provide headings, lists, and other elements to give meaning and structure.
- Provide headings for data tables using the HTML <th> element. Proper formatting of tables makes it easier for screen readers to present tabular information in an understandable way.
- Ensure users can complete and submit all forms by labeling with the <label> tag. Verify that users can submit the form and recover from any errors.
- Ensure links make sense out of context. Avoid non-specific phrase like “click here” or “more.”
- Caption and/or provide transcripts for videos and live audio.
- Ensure accessibility of non-HTML content, including PDF files, Microsoft Word documents, PowerPoint presentations and Adobe Flash content. If this content cannot be made accessible, consider using HTML instead.
- Allow users to skip navigation and other repetitive elements on the page. This can be accomplished by providing a “Skip to Content” or “Skip Navigation” link at the top of the page.
- Do not rely on color alone to convey meaning. That information may not be available to a color blind person and will not be available to screen readers.

- Make sure content is clearly written and easy to read.
- Make JavaScript accessible by ensuring that script event handlers allow alternate input devices. Ensure that pages do not require JavaScript to function.
- Design to standards like HTML and Cascading Style Sheets (CSS) to separate content from presentation.

Universal Design for Instruction

A compelling idea in the area of designing for accessibility is the concept of [Universal Design](#). Universal Design (UD) looks at accessibility from the perspective of designing to accommodate a diverse range of consumers (e.g., young people, elderly people, and people with disabilities) and using this awareness to design products that are more functional to a broader range of people (McGuire, Scott, & Shaw, 2006).

This proactive approach minimizes the need to create special accommodations for those with disabilities. Universally designed products provide value not only to those with disabilities but to everyone who uses them. For example, captioning of television programs benefits not only the hearing impaired, but also people in noisy places such as airport waiting areas. Curb cuts are useful for those in wheelchairs, but they also benefit skateboarders and people pushing baby strollers. The W3C guidelines we looked at earlier also note the benefits that accessible design provides to all users, including those with disabilities.

The Center on Postsecondary Education and Disability (CPED) at the University of Connecticut has been conducting research on [Universal Design for Instruction \(UDI\)](#) since 1998. UDI uses nine principles of design to maximize learning outcomes for all learners (UDI Online Project, 2009):

1. Equitable use: Provide the same means of use for all students; identical whenever possible, equivalent when not.
2. Flexibility in use: To accommodate a wide range of individual abilities, provide choice in methods of use.
3. Simple and intuitive: Design clearly and predictably. Eliminate unnecessary complexity.
4. Perceptible information: Communicate necessary information so it is readily understandable, regardless of ambient conditions or learners' sensory abilities.
5. Tolerance for error: Anticipate variation in individuals' learning pace and prerequisite skills.
6. Low physical effort: Minimize nonessential physical effort. (This principle does not apply when physical effort is essential to course requirements.)

7. Size and space for approach and use: Design to allow appropriate size and space for approach, reach, manipulations, and use.
8. A community of learners: Promotes interaction and communication among learners and between learners and instructors.
9. Instructional climate: Designed instruction that is welcoming and inclusive.

Validating accessible design

Even with the variety of accessibility design guidelines available, it can be difficult for designers to gauge the accessibility of their content. The W3C provides a wide range of guidelines for validation, starting with several [“easy checks”](#) you can use to determine broadly if a site is accessible.

For a more thorough validation, check out the free tool [Cynthia Says](#), a joint project of Internet security firm [Cryptzone](#), the [International Center for Disability Resources on the Internet](#), and the [Internet Society Disability and Special Needs Chapter](#). To use Cynthia Says, just enter the URL you want to check and choose whether to analyze against Section 508 or one of the W3C guideless. Cynthia Says analyzes your content site structure and gives you a thorough report on missing elements (such as alt text for images).

Resources

In this post we've looked at ways in which basic principles of good web design, along with the principles of Universal Design, can improve access to and the experience of eLearning for all learners, regardless of ability. As you might have noticed, the various guidelines we've looked at are for the most part applicable to any design effort. The key takeaway is that good design is accessible design.

We've covered a lot of information here, so here's a summary of the resources we discussed:

Accessibility and the law

- The [Americans with Disabilities Act \(ADA\)](#) defines “disability” and provides guidelines for accommodating people with disabilities.
- The [Section 508 Standards for Electronic and Information Technology](#) provide comprehensive requirements for accessible design.

Assistive technologies

- The [JAWS screen reader](#) reads information from the computer screen aloud.
- [NVDA \(NonVisual Desktop Access\)](#) is a free alternative to JAWS.

Accessibility standards

- The W3C's [Web Accessibility Initiative](#) guidelines cover just about all aspects of accessible design.
- [Web Accessibility in Mind \(WebAIM\)](#) provides many helpful resources and guidelines for making Web content accessible.
- [Universal Design \(UD\)](#) looks at accessibility from the perspective of designing to accommodate a diverse range of consumers (e.g., young people, elderly people, and people with disabilities).
- [Universal Design for Instruction \(UDI\)](#) offers principles of design to maximize learning outcomes for all learners.

Accessibility validation

- The W3C provides “[easy checks](#)” you can use to determine broadly if a site is accessible.
- For more thorough validation, use the free tool [Cynthia Says](#).

References

- Burgstahler, S. (2002). Distance learning: Universal design, universal access. *Educational Technology Review*, 10(1). Retrieved September 2, 2007, from http://www.editlib.org/index.cfm?fuseaction=Reader.ViewAbstract&paper_id=17776
- Hopkins, J. (2006). Assistive technology: 10 things to know. *Library Media Connection*, 25(1), 12-14.
- Stageberg, S. (2004). The device that refreshes: How to buy a braille display. *AFB AccessWorld® Magazine*, 5(6). Retrieved May 3, 2016, from http://www.blind.state.ia.us/ASSIST/Publications/Display_Article.htm
- McGuire, J. M., Scott, S. S., & Shaw, S. F. (2006). Universal design and its applications in educational environments. *Remedial and Special Education*, 27(3), 166-175.
- UDI Online Project (2009). The nine principles of UDI. Center on Postsecondary Education and Disability, University of Connecticut, Storrs. Retrieved May 6, 2016, from <http://udi.uconn.edu/index.php?q=node/12>
- Victor, S. (2010). [Instructional design and the digital divide: Some ethical considerations](#). In J. Herrington & C. Montgomerie (Eds.), *Proceedings of EdMedia: World Conference on Educational Media and Technology 2010* (pp. 4072-4076). Association for the Advancement of Computing in Education (AACE).
- W3C (2005). Introduction to Web accessibility. Retrieved May 4, 2016, from <http://www.w3.org/WAI/intro/accessibility.php>

About Obsidian Learning

Simply Effective: two words that capture our approach to developing custom tools and products for learning. Since 1998, Obsidian Learning has been providing medium and Fortune 500 firms with interactive learning programs grounded in cognitive research, adult learning theory, and universal design principles.

In 2015, Obsidian applied these practices to the design and development of [Obsidian Black](#), an HTML5 authoring tool for today's mobile learner. Our team of programmers and instructional designers collaborated to create a tool for rapid authoring of interactive content in native HTML5 for responsive output on all devices. Using Obsidian Black, standards-conformant (SCORM/xAPI) content can be quickly exported for LMS/LRS integration and deployment.

Stephen Victor, Ph.D.



Steve is a Strategy and Design Lead at Obsidian Learning in Houston, TX. With over 20 years in the learning industry, he has completed major initiatives for oil and gas, healthcare, insurance/financial, telecommunications, airline, retail, and government agencies. He holds a Ph.D. in Education (Instructional Design for Online Learning emphasis) from Capella University. Follow him on Twitter ([@StephenPVictor](#)) for musings on learning and technology.