



**Accessibility in Online Learning:
Web Accessibility Process Manual**



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Preface

Background

The "Web Content Accessibility" project, proposed by the University of British Columbia, Vancouver, was funded by BCcampus in 2005. The main goals of this project were to improve usability for disabled learners. A number of modules from a variety of existing electronic courses in the Faculty of Education at the University of British Columbia were analyzed. Through consultation and collaboration with users, advocacy groups and other university and government agencies, Special Education and Technology – British Columbia (SET-BC) and Simon Fraser University (SFU),

procedures were developed for encoding these different modules so that they were made as "user friendly" as possible for persons with disabilities. These procedures were tested by making adaptations and necessary changes inside WebCT (the University-wide supported CMS). The ultimate goal was to provide online learners with disabilities, who were academically qualified, with full, fair and equal access to all university services, and programs. The project did not entail any modification of the academic standards of the University or the elimination of the academic evaluation of students. All steps in this process were carefully monitored and recorded. The deliverables were a manual of procedures for operationalization, and five workshops/modules to facilitate online accessibility anywhere distance education is offered.



Accessibility in Online Learning: Web Content Accessibility Process Manual

This Process Manual provides a guide that helps web developers, instructional designers and instructors responsible for, and involved in, developing online course materials to enhance their content and to make it more accessible. The Manual also provides a guide that serves as a readily available professional development reference document. At the beginning of this Manual you will find a brief description of the situation at post-secondary institutions, especially UBC, regarding adjustments of their online materials to students with disabilities, as well as a framework for working on this project. A description of various disabilities will follow, where we will focus on specific student needs. Next, you will be able to learn about legal requirements and existing standards for creating web content. Practical steps and procedures will be described and explained in respect to different elements of online material design, together with several ways for testing and assessing accessibility. At the end of the Manual, you will find a list of additional resources for further exploration. The Manual is available in HTML and in printable PDF format.

Accessibility Workshops



Online workshops on accessibility (delivered in the period August 21 to 25, 2006) offered an opportunity for interaction and knowledge sharing. We hope that the provided presentations (PowerPoint slides) or archived sessions will be a good starting point for improvement.

At the suggestion of our participants, we created a blog on accessibility to

accompany the workshops. It contains some additional information, as well as useful links and comments. You can download our Powerpoint presentations or listen to the archived sessions at <http://weblogs.elearning.ubc.ca/accessibility/>

Acknowledgements

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- Our partners at SET-BC
- Patricia Woods and Chad Leaman (Neil Squire Society)
- Deb Butler (the University of British Columbia)
- Kevin Kelly (San Francisco State University)
- Donovan Tildesley (University of British Columbia)
- Our focus group participants

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Next steps

The new one-year project, Accessible Media, (funded by BCcampus as well) starting in September 2006, will move from the general accessibility issues to a more specific field. With constant technical IT improvements, the electronic learning environment has becoming a space that is more and more based on rich media, which includes audio and video clips, animations and simulations. Numerous presentations, workshops, tutorials, etc. are done online, usually in real time and then archived for later review or references. We have to keep in mind that disability does not mean a complete loss of a specific ability. Most often people have a combination of impairments with various level of severity (Skills for Access <http://www.skillsforaccess.org.uk/index.php>). Making online content more accessible does not imply stripping it down to a plain text-based page, but meeting the needs of every learner. "Accessible Media" will produce video and audio components accompanied by transcripts or captions. Those media elements, as well as a new Process Manual for Accessible Media will be available to educators through BCcampus Shareable Online Learning Resources (SOL*R) repository.

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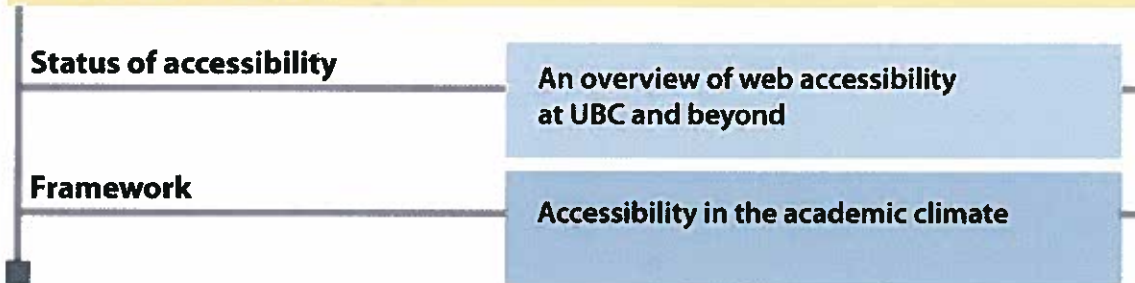
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Chapter One: Introduction

Chapter 1: Introduction



Great efforts have been made to give every student equal access to high-quality learning, and to remove barriers for people with disabilities. However, most of these efforts are focused on the traditional classroom experience. Less attention is devoted to those taking courses fully online, and their ability or inability to cope with web-based interactive content. While standards and guidelines have been developed to support and assist with accessible web design, their primary focus has been on technical specifications, assistive technologies, or legal issues. Fewer studies have been conducted to investigate how that "accessible" content is perceived from a learner's perspective, and how helpful it really is.

As distance learning adapts to accommodate new technology, so should instructors be innovative in the relationship with their students, and in the methods for developing educational content, accommodating the diverse needs and learning styles, which at the end, is beneficial for all, regardless of their (dis)abilities.

At the beginning of this Manual you will find a brief description of the situation at post-secondary institutions, especially UBC, regarding adjustments of their online materials to students with disabilities, as well as a framework for working on this project. A description of various disabilities will follow, where we will focus on specific student needs. Next, you will be able to learn about legal requirements and existing standards for creating web content. Practical steps and procedures will be described and explained in respect to different elements of online material design, together with several ways for testing and assessing accessibility. At the end of the Manual, you will find a list of additional resources for further exploration.

"If the basics of usable design are ignored all users can be disabled by the inappropriate use of technology."

(P. Jeffels, 2005)

Status of accessibility at UBC and beyond

It is the policy of UBC (and it is similarly stated in virtually every other university policy in Canada) that "...the University is committed to providing access for students with disabilities while maintaining academic standards" ([UBC Student Services](#), 2006, para. 1). This is in keeping with UBC Policy no. 73 that states that UBC recognizes its moral and legal duty to



provide academic accommodation. The University must remove barriers and provide opportunities to students with a disability, enabling them to access University services, programs and facilities and to be welcome as participating members of the University community. The Policy goes on to note that such accommodation is in accordance with the B.C. Human Rights Code and the Canadian Charter of Rights and Freedoms. Universities have worked hard to write and implement policy that improves access to campus buildings, ensures the health and safety of those with disabilities, and which provides appropriate supplementary support in the facilitation of learning.

[The External Programs and Learning Technologies office \(EPLT\)](#) acts as the facilitator for all off-campus Faculty of Education programs, both domestic and international. EPLT seeks to use innovative, efficient and effective delivery vehicles that are first and foremost designed to meet the diverse needs of learners. Furthermore, it provides them with access to the highest quality programs possible by making Web content accessible to a variety of Web-enabled devices, such as phones, handheld devices, kiosks and network appliances.

Simon Fraser University has a [Centre for Students with Disabilities \(CSD\)](#), which primarily offer services to students on campus, similar to UBC's [Access and Diversity - Disability Resource Centre](#).

Universities are increasingly becoming involved in technology-based education programs. The level of sophistication of such offerings (cohort organizations, electronic learning) is accelerating rapidly. However, it is not always the case that persons with disabilities, taking courses off campus, are provided with the same rights to access and program accommodation as those on-campus. In some cases the lack of internet access is a problem (at least in high speed format), and in other cases, electronic course offerings coming from the university have not been encoded to support adaptive technologies (like Braille display, enhanced print size, voice-over, sip and puff control, etc.). This results in inequities in academic access. Conformance with the World Wide Web Consortium's (W3C) Web Content Accessibility Guidelines 1.0 will enhance the market share and audience reach of programs by increasing their general usability. Adoption of WCAG 1.0 recommendations also demonstrates a commitment to social responsibility and equity of access to education, information and services.

Framework

The term "disability" is very broad, and can include persons with sensory impairments (blind or visually impaired, deaf or hard of hearing), learning disabilities, motor functioning problems, or neurological impairments. The number and severity of challenges increases with the age of the population served – especially in the area of sensory impairment. For example, while the Federal government reports that the overall disability rate in the total population is about 12.4% - for persons between the age of 65 and 74 it increases to 31.2% ([Statistics Canada](#), 2001, para. 2).

The main goal of change is to improve usability and to provide online learners with disabilities, who were academically qualified, with full, fair and equal access to all University services, and programs. It means either redesigning the existing electronic content or developing a new one with accessibility in mind. Usually, you need to do both. The first step is to carefully look at courses/modules and analyze their level of accessibility. Consultation and collaboration with users, advocacy groups, other university and government agencies, and various experts is very helpful. In this case, all the procedures were tested by making adaptations and necessary changes inside WebCT (UBC's campus-wide supported CMS). Whatever changes are made, it is important that the work does not entail any modification of the academic standards of the University or the elimination of the academic evaluation of students. Every effort in this direction will disseminate information on accessibility issues and provide a basis for raising accessibility awareness not only in British Columbia, but in wider academic communities as well.

Making online courses accessible to students with disabilities, i.e. providing easy and consistent navigation structure, and presenting the material in a clear and organized way brings benefit to all students, regardless of their physical and mental condition. Every student is different. Living with technology still has not become an inherent part of our everyday experience. We are in the process of adapting to new tools. It will take a lot of time for computers or similar devices to become invisible and user-friendly as books, for example. Universal design attempts to reach that "easiness" by improving usability for non-disabled and disabled users. It supports persons with low literacy levels, improves search engine listings and resource discovery, repurposes content for multiple formats or devices, increases support for Internationalization of courses and assists access for low-bandwidth users.

An inaccessible site in a corporate world may mean a loss of clientele. In an educational setting, the quality of a learning experience is much more difficult to measure, since it is not only a matter of numbers and physical access. In a survey conducted at Renton Technical College in Washington in 2002, the highest number of participants (31%) reported difficulties in studying and troubles with computers (Microsoft, 2005). Material that is inaccessible to a student with one type of disability could be offered in an alternative format and delivered to the learner. The variety of content presentation is necessary in order to meet the online learners' needs. It is important to realize, however, that not everything can be made accessible without compromising the value of the learning experience. Teaching visual concepts, explaining different colour schemes, for example, is not adaptable for students who are blind. The materials should be made as accessible as possible to most groups of disabled students, but some may still be excluded. In those cases, alternative exercises should be made available by the instructor. The production of such materials could be time consuming and costly. The choice of different delivery methods can exist, but only "in ideal world" (Draffan & Rainger, 2006).

References

A profile of disability in Canada, 2001. Retrieved May 16, 2006 from Statistics Canada web site: <http://www.statcan.ca/english/freepub/89-577-XIE/canada.htm>

Draffan, E. A., & Reinger, P. (2006). A model for the identification of challenges to blended learning. *ALT-J*.

Faculty & Staff Disability Resources: Accommodating students with disabilities. (n.d.) Retrieved May 16, 2006 from University of British Columbia, Student Services web site: <http://students.ubc.ca/facultystaff/disability.cfm?page=students>

Jeffels, P. (2005). Usability, the practical approach to accessibility. *ALT-N online 1*.

Kelly, B., & Sloan, D. (2005). Forcing Standardization or Accommodating Diversity? A Framework for Applying the WCAG in the Real World. Paper presented at International Cross-Disciplinary Workshop on Web Accessibility. Chiba, Japan on 20th May 2005. Retrieved March 2006 <http://www.ukoln.ac.uk/web-focus/papers/w4a-2005/html/>

Microsoft Accessibility: Technology for Everyone (2005). Renton Technical College Pilot Project Provides Accessible Technology to Help Overcome Barriers to Learning. Retrieved June 2006 <http://www.microsoft.com/enable/casestudy/rtc.aspx>

Chapter Two: About Web Accessibility

In this Chapter, we will consider

- what web accessibility is
- why it is important
- what policies and standards are in place supporting it

Chapter 2: About Web Accessibility

What makes a site accessible?

Why?

Fairness
Usability
Legality

Standards

Web Content Accessibility Guidelines

Testing

What makes a site accessible?

Accessibility involves making allowances for characteristics a person cannot readily change.
(Building Accessible Websites, Joe Clark)

Accessibility is about making sure **all the information** on your website is available to **all users**, regardless of any disability they may have or special technology they may be using. Accessibility is as much of an issue for someone using a cell phone browser as it is for someone using a Braille display.

**Accessibility
means.....**



Anyone

using



**Any
Browser**

can access

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010100101001010100010
101010100010101110101
01010111010110101001
011010010101011010101
010101010111010101010
101010101010101010101
01010101010101010111
110001110101110010100
```

**All the
information
on your site**

Why do it?

Fairness and equality

The simplest and most direct answer to this is that if your site is inaccessible to users with disabilities, you are excluding a section of the population from your content. If your site is a business, this translates to lost business and possibly some bad press. If your site is an academic course and some of your students cannot access the course materials, the situation is more serious: these students could be placed at a distinct disadvantage and their coursework could suffer as a result.

Accessibility benefits usability

Many site designers and developers drag their feet and grumble when asked to make their site accessible. There is a mistaken perception that "accessibility" means "dumbing down" the site - that they won't be allowed to use any graphics or any multimedia. Frequently, websites address accessibility by making a plain, text-only version of every page and labeling it "accessible". This does no one any favours - it requires the webmaster to maintain twice the number of pages, and provides an inelegant solution that lumps all disabled users into the same category.

The reality is that accessibility is a way of enhancing your website, and it can be done seamlessly without taking away from the design. Many of the recommendations and guidelines for making a site accessible actually improve the integrity of your site's code and the overall usability of your site. Usability is, simply put, how easy it is for people to use your site.

Anything you can do to improve accessibility can also improve usability for people *without* disabilities, for online courses or any other kind of website. Consider these examples:

- You've made the menus consistent on every page - now everybody has an easier time finding their way around your site, because the buttons are always in the same place.
- You've made sure your font size can be adjusted - now older readers with poor vision can increase the size of the text to see it better.
- You've set a unique page title for each page - now search engines can more accurately display your pages in their search results.
- You've added a text description for each image - now someone browsing with images turned off can tell if they are missing an important diagram.
- You've added captioning to a video - now a student using a computer in a public lab can watch it too without needing sound.
- You've added an audio reading of an important passage - now a student who learns better aurally can enjoy the reading as well.

Legal reasons

In the United States, a law called Section 508 requires federal agencies to ensure that people with disabilities have the same access to information in electronic systems as people without disabilities.

"Section 508 requires that when Federal agencies develop, procure, maintain, or use electronic and information technology, Federal employees with disabilities have access to and use of information and data that is comparable to the access and use by Federal employees who are not individuals with disabilities, unless an undue burden would be imposed on the agency. Section 508 also requires that individuals with disabilities, who are members of the public seeking information or services from a Federal agency, have access to and use of information and data that is comparable to that provided to the public who are not individuals with disabilities, unless an undue burden would be imposed on the agency" (Section 508, 2006, Subpart A – General, para. 1).

In the United Kingdom, there is a similar law known as SENDA (Special Educational Needs and Disabilities Act) that applies specifically to students.

Canada has no such law at the moment, but the Canadian Human Rights Act and the Charter of Rights and Freedoms both deal with discrimination on the basis of many factors, including

disability. A failure to provide information in an accessible manner could be considered discrimination if no reasonable attempt is made to accommodate the disabled person.

Accessibility Standards

There is one set of guidelines developed by the World Wide Web Consortium (W3C), a group that establishes specifications, guidelines, software and tools for various aspects of the web including file formats and scripting languages. One W3C program is the Web Accessibility Initiative (WAI), whose mission is to help make the Web accessible to people with disabilities.

The WAI has developed the [Web Content Accessibility Guidelines](#) to address the accessibility of information in a web site. These guidelines are what we will be using in this Manual, and should always be consulted if you are ever in any doubt of the best technique or the correct syntax of a tag. They are fairly technical, and not a quick read. At the time of writing, the current version of the guidelines is WCAG 1.0, and WCAG 2.0 is under review.

These Web Content Accessibility Guidelines (WCAG), relevant to developers of online content, help to ensure that Web resources are accessible. However, there is a need to recognize the limitations of these guidelines as well as the available checking tools (Ivory & Chevalier, 2002). Kelly and Sloan (2005) talk about the difficulties of implementing the guidelines, summarizing the concerns in regards to:

- theoretical nature of the guidelines
- dependencies on other WAI guidelines
- ambiguity, complexity and logical flaws of the guidelines
- closed nature of the guidelines
- level of understanding of accessibility issues required

Despite the difficulties with the guidelines' implementation and reliability, and the necessity of manual checking for accessibility, WCAG are very helpful in the initial stage of developing an online resource, as a quick checklist of obvious things that need fixing. The guidelines should not be taken as the only set of criteria that needs to be considered. A wider set of issues must be addressed, some of which could be in conflict with the guidelines.

Priority and Levels of Conformance

Each checkpoint has a **priority level** assigned by the Working Group based on the checkpoint's impact on accessibility.

- **Priority 1:** A Web content developer **must** satisfy this checkpoint. Otherwise, one or more groups will find it impossible to access information in the document. Satisfying this checkpoint is a basic requirement for some groups to be able to use Web documents.
- **Priority 2:** A Web content developer **should** satisfy this checkpoint. Otherwise, one or more groups will find it difficult to access information in the document. Satisfying this checkpoint will remove significant barriers to accessing Web documents.
- **Priority 3:** A Web content developer **may** address this checkpoint. Otherwise, one or more groups will find it somewhat difficult to access information in the document. Satisfying this checkpoint will improve access to Web documents.

Depending on which priority checkpoints a site meets, it can claim to meet a particular **level of conformance**:

- **Conformance Level "A"**: all Priority 1 checkpoints are satisfied;
- **Conformance Level "Double-A"**: all Priority 1 and 2 checkpoints are satisfied;
- **Conformance Level "Triple-A"**: all Priority 1, 2, and 3 checkpoints are satisfied

Testing for Accessibility

There are a number of tools available to help you check some of the more technical aspects of your website to see if it meets accessibility standards. One of these is WebXact Watchfire (<http://webxact.watchfire.com/>), previously known as Bobby. It is a very handy tool for double-checking that all your images have alt (text) tags, or that your data tables are properly labeled.

But these tools are not the whole picture. An accessibility analyzer like Watchfire cannot tell you if the descriptions of your images make sense to a blind user, or if your page titles are meaningful. Your web site needs to be considered from a human perspective, and many of the WAI guidelines ask you to examine the context and meaning of your content more carefully. We will discuss this further in Chapter 6.

	Automatic Checkpoints			Manual Checkpoints		
	Status	Errors	Instances	Status	Warnings	Instances
Priority 1	✓	0	0	⚠	11	81
Priority 2	✗	6	39	⚠	19	83
Priority 3	✗	3	20	⚠	11	11

Summary

Web accessibility is especially critical in education to ensure that all students have fair and equivalent access to learning materials. Government institutions in the US and UK are required by law to make their web content accessible. Standards and practices for accessibility are agreed upon by the W3C and implemented by the WAI.

References

Ivory, M., & Chevalier, A. (2002). A study of automated web site evaluation tools. Technical Report UW-CSE-02-10-01. University of Washington, Department of Computer Science and Engineering. Retrieved March 2006
<http://scholar.google.com/url?sa=U&q=ftp://ftp.cs.washington.edu/tr/2002/10/UW-CSE-02-10-01.pdf>

Section 508 Standards (2006, January 23). Retrieved May 16, 2006 from:
<http://www.section508.gov/index.cfm?FuseAction=Content&ID=12>

Chapter Three: Students with Disabilities

In this Chapter, we will consider

- different types of disabilities
- how they affect how people use the web
- what assistive technologies exist to accommodate these disabilities

Chapter 3: Students with Disabilities

Who is affected?

Sight, Hearing, Mobility, Learning and Cognitive Disorders, Aging

Assistive Technology

What can help students bypass obstacles?

Who is affected?

When we talk about making the web accessible for people with disabilities, who are the people we are talking about? Before we can learn what to do with our web pages, we need to understand what we're doing and who we're doing it for.

Sight

The first group that most people think of when considering accessibility for the web is the blind and visually impaired.

Blind: Users have little or no usable vision. While a few users may use Braille, the majority use a **screen reader** - software that reads text out loud. Some people listen to the Web at speeds that sighted users find completely incomprehensible - the audio equivalent of "skimming" a page. Keep in mind that screen readers read everything that they encounter, and that they read it in the order they find it.

Visually impaired: Users may have some sight, but difficulty focusing or distinguishing small text. They may use a **screen magnifier** - software that enlarges everything on the screen to a more manageable size.

Colourblind: Most colourblindness involves difficulties distinguishing red and green. There is a misconception that accessibility means black and white text, and that colour should be avoided. This is not true. The point is not to rely on the requirement of colour perception to reveal

Simulations

To help you understand what web navigation is like for people with disabilities, some organizations have developed simulations.

Inaccessible website demonstration

<http://www.drc.gov.uk/newsroom/website1.asp>

WebAIM simulations

<http://www.webaim.org/simulations/>

information. For example: asking readers (or learners) to "use only the words in green to compose a paragraph", or telling readers while filling in a form, that only "red" fields are required.

As we will find, making the web's highly visual content accessible is not as daunting a task as it might seem. There are methods in place for providing alternatives for nearly every type of web content, and for making sure your content works well with the specialized hardware and software used.

Ever wondered what the world looks like to colourblind people? Test out Vischeck, a colourblindness simulator, on your site or any image.

<http://www.vischeck.com>

Hearing

Since the majority of content on the web is visual, students who are deaf or hard-of-hearing are not as likely to be affected. However, they often have communication and comprehension difficulties. If audio files or videos are a part of the curriculum, a text alternative should be provided. Many users will also benefit from easily understandable icons and clear terminology.

Ideally, videos should be **captioned**. Don't confuse captioning with subtitling - subtitling is typically only a translation of speech into the viewer's language, while captioning is a direct transcript of any significant sounds. Professional captioning can be costly, though for course materials requiring extremely high accuracy (such as math and physics equations), it may be the best choice. Software is also available to allow you to include captions in your videos yourself. If captioning is simply not an option, a text transcript of the video would be a reasonable alternative.

Hearing people might assume that hard-of-hearing or deaf students would be reluctant to watch a video clip. But on the contrary, many find video and multimedia material entertaining and especially valuable because of all the other non-verbal communication that they convey. Samuel, a hard-of-hearing ESL student in our focus group, greatly preferred videos or webcam interactions to text so that he could see the emotions and gestures of the other person.

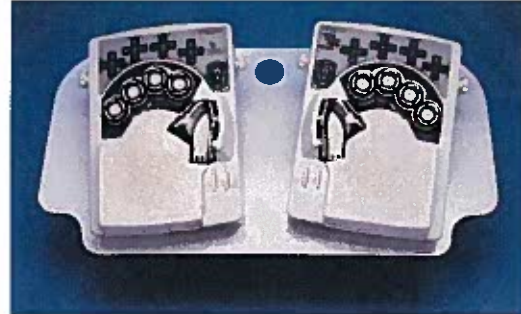
Mobility

Students with physical disabilities may be affected if their impairment hinders their ability to use a mouse or keyboard. This could be due to having little or no muscle control, nerve damage, or trembling; it could be a temporary problem, a lifelong condition, or the result of aging. Fine motor movements can pose a challenge, such as clicking on a very small icon.



Some users with mobility impairments will use a typical keyboard or mouse, but may take more time to perform tasks. Others use assistive input devices instead or in addition to a keyboard or mouse.

- A standard **trackball** is often easier to control than a mouse. Robert, from our focus group, uses a standards **graphics tablet** since touching locations directly with a pen is easier for him than sliding a mouse. Seen here is a **footmouse**, which the user can control with feet; trackballs can be used with the feet as well.
- **Alternative keyboards** allow users to position their hands more comfortably, or to press keys more accurately. A standard keyboard can be modified with a **keyguard**, which allows the user to rest their hand above the keyboard and press down only on the key they need. The **Datahand**, seen here, is a specialized keyboard that requires only small finger movements. Similarly, there are keyboards that require only broad arm movements.
- For people who cannot use their hands or feet at all, **headtracking** allows the user to control the pointer through head movements. Mouse clicks can be replaced with a breath-controlled **sip/puff switch** or tappable **headswitch**.



Learning & Cognitive

While visual, hearing and physical disabilities are the most familiar forms of disability, the majority of students you may encounter who have a registered disability may in fact be learning disabled. **Learning disability** or "learning difficulty" is a broad term that includes dyslexia, brain injury, and aphasia.

"Dyslexia is the most commonly registered disability within the University and always features in the most commonly asked questions on accessibility issues by staff." (Jeffels & Marston, 2003)

Students affected by learning disabilities may encounter difficulties with some of the following activities, among others:

- spelling
- reading aloud; stuttering
- mathematical calculations
- comprehension of large passages of text
- effective time management or organization
- rote memorization
- concentration and focus

One of the main things, in the middle of a thick forest, is a small cottage. I saw the home of a pretty little girl, known to everyone as Little Red Riding Hood, because of the brightly colored coat she wore. One day, her mother gave her a basket full of delicious food, and said:

"Grandma's ill. Take her this basket of cake, but be very careful! Don't stray from the path through the woods."

Trying to read this passage may give you an idea of the difficulty and frustration experienced by many dyslexic readers

Learning and cognitive disabilities are a challenging group to address, as there is no one approach that will suit everyone. Some students may learn just as quickly or more quickly than typical students when information is presented in a different medium. Some use the same technologies used by the visually impaired, such as screen readers and speech recognition software. Nevertheless, clear presentation and good navigation is critical. A variety of multimedia options will apply to different visual, auditory and learning skills.

Traditional approach	Adapted
Lecture type content	chunks, include questions, statements of clarification and key points
Text-based content	alternative presentation: audio, video, hands-on interaction; scaffold for various resources (preselect them)
Reading from a textbook	offer vocabulary, issues to discuss in the forum, encourage note-taking, using graphic organizers, offer information prompts (self-tests with open ended questions)
Assignments: written essay	offer a choice: written, oral, video or visual presentation
Assessment	offer variety in responses: open-ended questions, oral response give clear scoring rubrics, be prompt and detailed in giving feedback

Aging users

When considering accessibility in education, most people assume they will need to prepare for a few isolated examples of students with disabilities: one blind student in a class, or a handful of young students with learning issues. As we age, we may be affected by *any* of these types of disabilities to various degrees. Instructors should be aware that some of their older students may also have problems such as fading eyesight, or difficulty with fine mouse movements.

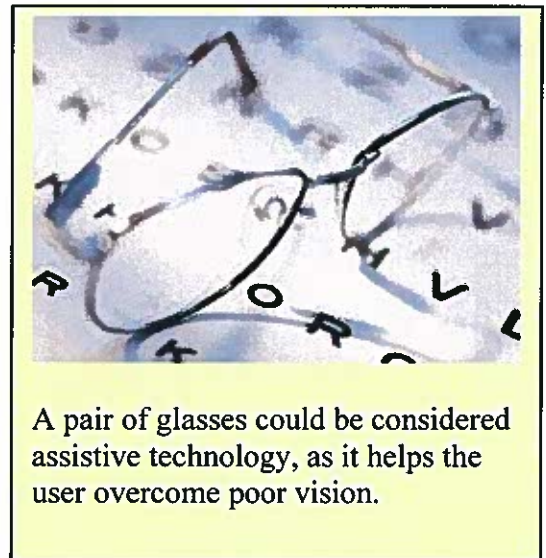
Assistive Technology

We've touched briefly on the idea of assistive technology, which is essentially any software or hardware that can be used to help overcome a disability.

Instead of thinking about assistive technology in terms of types of disabilities it assists, let's look at it from the point of view of what kind of help it offers. Assistive technology could provide:

- help users with accessing a computer
- help with reading
- help with writing (composing, spelling, typing)
- help with communication
- help with learning
- help with hearing and vision

The chart on the following page describes some of the problems encountered in online learning and some assistive technologies that are used to address them.



A pair of glasses could be considered assistive technology, as it helps the user overcome poor vision.

Activity	Issue	Assistive Technology Examples
 <p>Computer Access</p>	<p>When a student cannot access a computer with a standard keyboard and a mouse, he may need special input devices. These devices are commonly used by students with physical, visual or cognitive disabilities.</p>	<p>Software: OS accessibility features, word prediction, keystroke reduction, voice recognition, on-screen keyboard</p> <p>Hardware: Keyguard, arm support, trackball, trackpad, joystick, alternative keyboard, switch with Morse code, switch with scanning</p>
 <p>Communication</p>	<p>For many autistic people and some with learning disabilities, augmentative & alternative communication devices may be helpful. They use symbols, pictures and printed words.</p>	<p>Software: Symbol browser, art activities, games on the computer</p> <p>Hardware: Voice output devices or devices with speech synthesis for typing</p>
 <p>Reading</p>	<p>The low resolution of monitors can cause fatigue and eye strain for all users. For those with vision or learning issues, reading onscreen can be an added deterrent. Keeping track, following a line of text, understanding and remembering can be problematic.</p>	<p>Software: Talking electronic device/software to "pronounce" challenging words, electronic books, mindmapping, talking calculator, voice recognition</p> <p>Hardware: Single word scanners, scanner with OCR and talking word processor, hand-held scanners, hand-held computers</p>
 <p>Writing</p>	<p>There are two different accessibility issues when using computers for writing: 1) physical problems with typing; and 2) cognitive problems with composing and organizing ideas and converting them into written expression.</p>	<p>Software: Templates, word processors, voice recognition, talking dictionary, spelling & grammar checker, multimedia software for expression of ideas</p> <p>Hardware: Alternative keyboards and input devices used as for Computer Access (above)</p>
 <p>Learning</p>	<p>Students with learning difficulties may have problems with attention and with organizing ideas.</p>	<p>Software: Multimedia software for expression of ideas, mindmapping, electronic organizers</p> <p>Hardware: Hand-held computers</p>
 <p>Hearing & Vision</p>	<p>Assistive technologies for visually and hearing impaired students may either increase the signal or replace it with something else.</p>	<p>Software: Screen magnifier, screen color contrast, screen reader, captioning, computer-aided note taking</p> <p>Hardware: Braille/tactile labels, alternative keyboard with enlarged keys, Braille keyboard and note taker, signaling device, phone amplifier, personal amplification system/hearing aid, FM or loop system</p>

Summary

Sight, hearing, mobility, and learning disabilities can affect how your students access and interpret information on the Web. Assistive technologies can help with some of the difficulties faced; some must be addressed by your website itself.

References

Jeffels, P., & Marston, P. (2003). Accessibility of online learning materials. SCROLLA Invited Paper.

Chapter Four: Designing and Structuring Online Content

In this Chapter, we will examine:

- designing and structuring your site
- writing for the web
- writing for users with learning disabilities
- using Course Genie to build an accessible site (beginner)
- an introduction to XHTML and Cascading Stylesheets
- coding accessible HTML (intermediate/advanced)

Chapter 4: Designing, Writing and Coding Online Content

Design & Structure	Appearance Structure Navigation
Writing for the Web	Web vs. Print Learning-disabled students
XHTML & CSS	Using valid code Changes from HTML
Coding XHTML for accessibility	Text Images Links Tables Accessibility features

Design & structure

Don't throw away your art supplies

One of the most common misconceptions about accessible web design is that in order for a site to be accessible, it must have a simple, plain design with few or no images. Another myth is that an adequate accessible site can be made by providing a "text-only" version of an existing web site. This is a nuisance to maintain, as it requires you to keep not one but *two* versions of every single page.

Remember, not all disabled students are blind! People with mobility or hearing issues and even poor eyesight will certainly appreciate a well-thought-out, aesthetically pleasing website as much as anyone. As you'll see, many of your accessibility changes will be tucked away in the code of your pages, where they will be a benefit to disabled users without detracting from your site in any way.

Structuring your content

Before you begin to write a single line of HTML or even start writing your course content, you should think about how your course is going to be structured. Will you have a lot of material to read, or just a little? Will there be many pages or subpages?

The easier you can make it for students to find and read your course material, the easier it will be for them to learn.

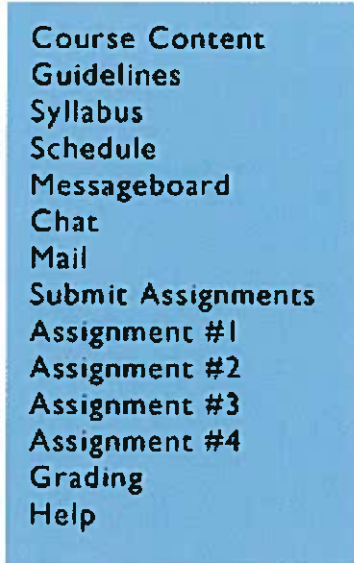
Menus and Navigation

The way you plan your site's navigation will affect your site's usability for your entire audience. A good approach is to write down the different categories that apply to each of your pages, and then group the pages into these categories. The key is to find an intuitive balance between overwhelming the user with too many options, and burying important information too deep in the site.

For example, if your site is made up of these pages, you're running the risk of creating a very cluttered and busy navigation. Try grouping your pages into these categories, and create subsections within this structure:

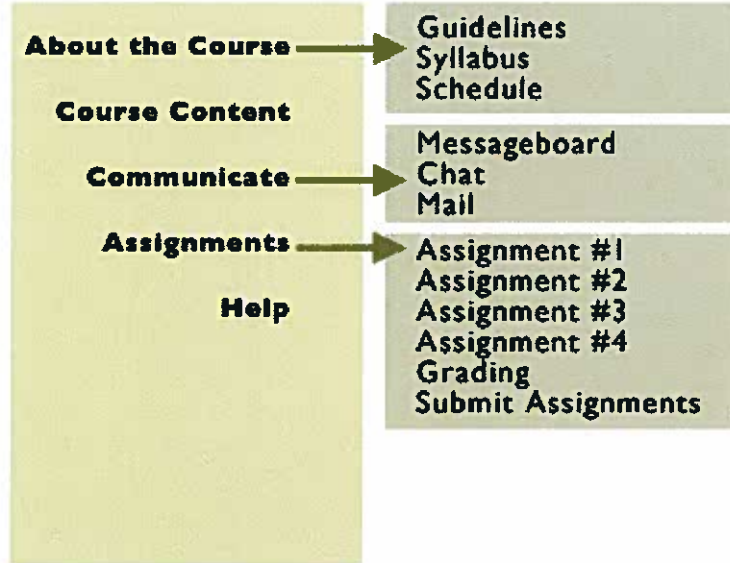
Now your students only have to sort through five links instead of fourteen.

Original



Cluttered site navigation

Modified



Navigation categories reduced....

....by moving some items to subnavigation

Use your reason when defining categories - there may be some links that a student might use several times a day, so you might want them to sit on the top level for quick and easy access. Be careful when making exceptions to your rules, though - if you do this too many times, everything becomes an exception, and you've got a cluttered site again!

When you're designing your site, and choosing where to place your navigation, keep these questions in mind:

- Are the links grouped together in one place, where they can be easily found?
- Are there so many links on the page that it becomes confusing?

Writing for the Web

Typically, users viewing websites do not read text as thoroughly as they do when reading printed text. Rather, they tend to skim pages looking for key points. Lengthy passages are often printed out to be read offline, in comfort, with less strain on the eyes.

You can make it easier for readers to find what they need by



- keeping your **paragraphs short** - one idea per paragraph
- using **headers** to announce and reinforce new themes
- using **bulleted lists** to group ideas into a simple, easy-to-read format

Writing for Learning-Disabled Students

Being learning disabled doesn't mean a student can't learn - it may just mean that traditional learning methods are particularly difficult for that individual. Some students with difficulty reading may learn the same material just as well upon hearing it, or after seeing a graphic that explains the concept. For this reason, it can be helpful to explain key ideas in multiple different ways: text *and* a graphic or video that reinforces what is being taught.

The same principle applies to how you ask your students to express their understanding. For many students, the choice of whether to write a paper or give an oral presentation can make a huge difference in their ability to communicate what they have learned.

Module 2: A systems ecological orientation to families

Table of Contents	Learning Activities
A. A systems ecological orientation to families	
B. Objectives	
C. Learning Activities	 Write: List all of the factors you can think of that could affect parenting. As you read through the material, are there any factors that you did not think of or that surprised you?
D. Important Concepts	
E. Web discussion	
F. References	 Read: Text, Chapter 5: Parenting in the Global Community The Ecology of the Family http://www.nwrnl.org/cfc/publications/ecology2.html

One of the biggest difficulties encountered by learning-disabled students is in interpreting academic demands and expectations. This can often be addressed by building checkpoints into assignments, such as "Submit a plan describing how you will approach this project." This allows the instructor to assess whether the student has understood what is expected of them, before the student has invested too much time into a project that may be on the wrong track.

Clear, explicit instructions are of course vital, but they alone are not the solution - the student must actively engage and interpret the tasks and requirements themselves.

Additional considerations

- Some students with disabilities may require additional time to complete tasks such as self-tests and quizzes. A student using an alternative keyboard may not be able to type as fast as his classmates. Extend the allotted time for that student, or remove the time requirement.
- Chat rooms are often inaccessible to users reading screenreaders. Make sure that chat room participation is not a course requirement, or make arrangements for a disabled student to participate using other means such as a discussion room.

Using correct code: XHTML & CSS

HTML (Hypertext Markup Language) is the code used to describe web pages so they can be rendered in a browser. When HTML was created many years ago, no one could have predicted the sorts of dynamic, interactive pages that they would eventually be used to create. While HTML was easy to learn and fairly flexible, it had some significant limitations: for example, objects could not be placed anywhere on a page, but had to flow in a linear fashion, one item before the next. Creative designers found ways around these limitations: the TABLE tag was manipulated to allow precise placement of text and graphics.

Intermediate users: We recommend using Macromedia Dreamweaver to assist you in writing accessible code.

Novice users: If you're not comfortable writing HTML code at all, we suggest Course Genie, a package from Horizon Wimba, which allows you to convert a Word document into a well-coded, accessible website that can be uploaded to WebCT. UBC has a site license for Course Genie, and it can be obtained from IT Services.

But these clever fixes came with their own set of problems. Redesigning a website meant rewriting and rebuilding every single page of HTML on the site. Visually simple designs often required complex, bloated HTML. If code was written inaccurately, the web browser had to interpret the code as well as it could, slowing down the rendering of the page.

To address these issues, HTML was given a fresh start by rewriting it using *another* language - XML, or eXtensible Markup Language. The result is called XHTML. Superficially, XHTML is not terribly different from HTML: the syntax is stricter, and some tags and attributes have been removed, but much of it is the same. The key is in the "extensible". XHTML essentially lets you **define new classes of objects**.

What does this mean? Suppose you need all news-related images (but no others!) to be surrounded by a five-pixel blue border. Using old-style HTML, you would do this by wrapping every news image in a table tag.

```
<table border="5" bordercolor="blue">
  <tr>
    <td>
      
    </td>
  </tr>
</table>
```

Every single image that needs a border would have to be treated this way.

Using XHTML saves you time and space. First define a class called "news" as having a five-pixel blue border.

```
.news {
  border: 5px solid blue;
}
```

Then add an attribute to any image tag that needs to be in class "news".

```

```

How does this work? The classes are defined within **Cascading Stylesheets** - stylesheets, because they define the style of a page; cascading, because you can apply multiple stylesheets. You can define any style once and apply it throughout your entire site.

So with a single CSS file, you can now define the look & feel of an entire web site consisting of hundreds of pages.

Why can't I do things the old way?

Feel free to skip this section if you're new to building web pages or are already familiar with XHTML and CSS.

Tables aren't meant for layout

If you ever built a website before CSS became widely accepted, chances are you built it using tables. You probably took a large image and chopped it up in an image editing program, then placed each chunk of the image into a borderless table to lay it out exactly where you wanted.

The first reason to avoid tables is that it'll make redesigning your site much easier in the future. You won't have to chop up new designs and recreate every page of your site any more - you can do it all with one change of your CSS sheet and maybe a few changes to the HTML.

But it also simply isn't all that accessible. Screen readers approach tables in a linear fashion; that is, they read out each column, left to right, and each row, top to bottom. If your table-based layout doesn't correspond to this model, blind users may not receive the information in the order you intended it. They may hear the menu read out in pieces, in between parts of your main content, and as you can imagine, it's very confusing to navigate a page like this.

A site that may help you visualize this process is CSS Zen Garden (<http://www.csszengarden.com>). Every design on the site uses the *same XHTML code* to define the different areas of the page. By swapping out only the stylesheet, the appearance of the site changes dramatically.

Learning XHTML and CSS

There are many excellent resources, both online and offline, for learning XHTML and CSS. Here are some tutorials to get you started.

Introduction to CSS
<http://www.w3schools.com/css>

Introduction to XHTML
<http://www.w3schools.com/xhtml>

Many old tags have been deprecated

XHTML no longer contains several tags that address the appearance of a site. The FONT tag, which used to be the only way to set the font appearance on a page, has been removed from HTML. This is because fonts can be much more efficiently defined and updated using CSS. Similarly, the CENTER tag has gone away, to be replaced by CSS formatting.

Accessibility in XHTML

For the rest of this Chapter, we will use XHTML and HTML interchangeably; the basic principles are the same, and most of the differences are in the accuracy and consistency of the code.

Text

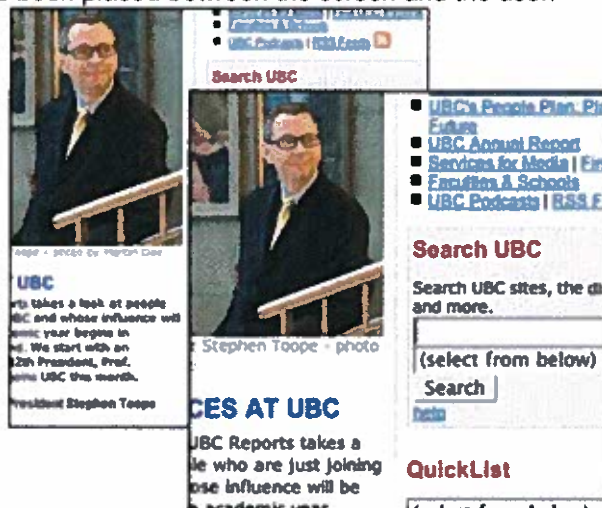
Text makes the World Wide Web go 'round. The greatest amount of content on the web is basic, plain text. Text is the most accessible media format there is - it's easy for all browsers and screenreaders to handle.

There's one big thing you need to be most careful of, and that is the **visibility of your text**. Aging users, people with poor vision, or even people using a small monitor may not see your site's text with the same clarity that you do. They may need to enlarge the size of the text to be able to read it better.

There are a few ways to do this. A **screen magnifier**, such as ZoomText, will make a screen behave much as if a giant magnifying glass has been placed between the screen and the user. An even simpler way is to use the text size settings in the browser to increase the font size on the page, as seen at right.

When you define the appearance of your text in CSS, you have a choice between absolute or relative font sizes.

- **Absolute font sizes** (pixels, points) should appear at the exact same size in every browser and every configuration. Text that is set to "12px" will appear as 12 pixels high. Designers often prefer absolute font sizes because they have greater control over the appearance of the text, and can dictate how much space a given block of text will occupy.
- **Relative font sizes** (percentages, "em") appear at a size relative to the user's font settings. Text that is set to "90%" will appear at 90% of the current text size. If the user changes their font size to "larger", the size of the text on the page will increase.



What's the implication here? **Use relative font sizes at all times.** Some browsers will allow absolute font sizes to scale up with the user settings, but not all. Your eyesight may be much better than that of some of your users, and what looks fine to you might cause problems for someone else. Make sure you give *them* the control of their screen.

Example

```
body, p {  
    font-family: Arial, Helvetica, sans-serif;  
    font-size: 0.9em;  
    color: #333333;  
}
```

This will make the text for a page 0.9 em, or 90%, of its default size.

Be careful with the **contrast and colours** of your text. Whether your text is light on a dark background or dark on a light background, you need to make sure there is enough contrast between the text and the background for users with weaker vision to

* required field

* Name

Address

distinguish clearly. Additionally, if any information is conveyed by colour alone, reinforce the information with another method. In the example shown, the required fields are marked not only by a change in colour, but by bold text and an asterisk.

The example below shows text that is hard to read even for users with good eyesight. The blue link text does not show up well on the yellow background.

Fiction:

- [The Assault](#), Harry MULISCH
- [Atonement](#), Ian McEWAN
- [Babel Tower](#), A.S.BYATT
- [Biographie de la faim](#), Amélie NOTHOMB
- [Bleeding London](#), Geoff NICHOLSON
- [But Beautiful](#), Geoff DYER
- [Centuria](#), Giorgio MANGANELLI
- [Christie Malry's Own Double-Entry](#), B. S. JOHNSON
- [Complete Works and Other Stories](#), Augusto MONTERROSO

Images

Alt text

There's a very simple, built-in way to make sure your images are accessible: use ALT text.

```

```

When a screen reader encounters an alt attribute, it substitutes the text for the image, reading the text out loud. In order to make this as useful as possible for your users, you should choose text that is appropriately descriptive of the image.

Include any details that are necessary to make the image make sense; don't bother with trivial descriptions if they don't add useful information.



Empty descriptions

There are some cases where an image does not require a description at all, or where a description would clutter the audio reading of the page. Graphics that are purely decorative but don't convey information, like the one at right, are the main culprits.



Spacer (or transparent) images are typically 1x1 transparent gifs that are used to control the layout of a table-based website by pushing elements of the site into place. If your site is entirely CSS-based, you won't really need these. If you are working on an older site, though, you may still be using them.

Decorative bullet graphics are often used in lists to illustrate a point. Here's something you DON'T want to do:

-  Marketing Plan
-  Promotion Plan
-  Licensing Plan

```
Marketing plan<br />  
Promotion plan<br />  
Licensing plan<br />
```

With code like this, a screenreader user will hear: "red bullet marketing plan blue bullet promotion plan yellow bullet licensing plan".

Even though you don't want screenreaders to attempt to describe these images, you still need to define their alt text, or the screenreader will read out the filename instead. The alt text on a spacer image or a decorative graphic should be empty, i.e. alt="".

Visually impaired users aren't the only ones to benefit from ALT text - you will too! By describing your images, you'll make it easier for search engines such as Google to index your content, and it'll be easier for other users to find the content on your site.

Long descriptions

Alt text is good for a short sentence, but sometimes a complicated diagram or graph cannot be thoroughly described in one line of text. When this happens, use the ALT attribute for a quick summary, and the LONGDESC attribute:

```

```

The longdesc attribute is the URL for another web page, which should contain a complete description of the image in question.

Imagemaps

Imagemaps are just as easy to make accessible: add the alt text to the AREA tag for each clickable area within the map.

Magnifying images

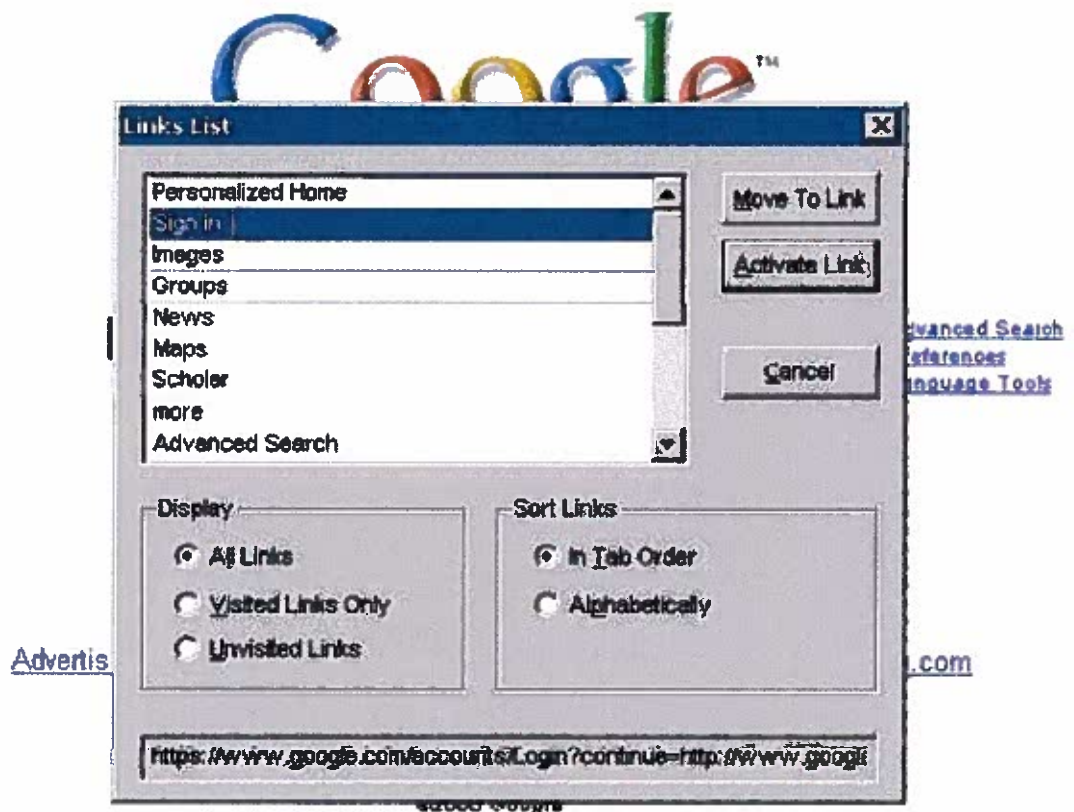
If an image may be hard to read or distinguish, offer the user an enlarged version of the image. Users with poor vision may not use a screenreader and so may not have access to the ALT text - presenting them with the choice to view a larger image will help address their needs.

Links

We've already talked about menus and navigation and the importance of thinking about links. Here are a few additional considerations:

- **Link size:** If the images are graphic links, are they big enough so that users can easily click on them, even if they have poor motor control in their hands?
- **Descriptive link text:** If your link text is taken out of context, will it make sense? Many screenreaders allow the user to pop up a list of *only* the links from the page, as seen in the Google example below. This is a useful way for a blind reader to navigate - unless your link text says "Click here"! Make sure your link includes enough text to clearly define the link, such as "Click here for the full schedule" or even "Full schedule".

On the web, links are usually underlined. Most web users are accustomed to clicking on underlined links. To this end, it's best not to underline anything that unless conventional style requires it.



- **Unique link names:** Similarly, if your link text is taken out of context, will a user see the same link text multiple times? Ten links that all say "Click here", but point to different pages, would be even more frustrating than one "Click here".
- **Link separators:** Link in a menu should be separated by more than just whitespace, for visually impaired users to better distinguish links from each other. Additionally, some older screenreaders incorrectly read adjacent links as the same link.

```
<a href="about.html">About</a> <a href="bio.html">Bio</a> <a href="contact.html">Contact</a>
```

This can be done either by using a separator:

```
<a href="about.html">About</a> | <a href="bio.html">Bio</a> | <a href="contact.html">Contact</a>
```

or by styling list items using CSS:

```
<ul>
<li><a href="about.html">About</a></li>
<li><a href="bio.html">Bio</a></li>
<li><a href="contact.html">Contact</a></li>
</ul>
```

The TITLE attribute

Similar to ALT text for images, the TITLE attribute can be used to make a link URL clearer. A person using a screenreader can set an option to read TITLE texts out loud instead of the link text. Most browsers display the TITLE text as a "tooltip", or small popup, that appears for a few seconds when the link is moused over.

The TITLE attribute can actually be validly applied to most HTML elements, but is best supported in the A tag.

Javascript and DHTML

Many people are fond of "drop-down" or rollout menus, which appear when the user mouses over a top-level category. For many users, they're a quick way to jump straight to the page they need.

Many of these menus create accessibility issues. Some are very sensitive to mouse movement and will "roll up" the instant the mouse drifts outside the box - which can be a serious problem for users whose hands cannot control the mouse precisely. In addition, some of the Javascript and DHTML code needed to generate these menus is not understood by screen readers, and will be ignored. This can prevent many users from using the menus at all!

This doesn't mean you can't use Javascript or DHTML, but if you are using it for important functions like navigation, be sure that you have a fallback plan for browsers without Javascript. You can usually test this yourself by turning Javascript off in your browser.

Popup Windows

Popup windows have their purposes:

- displaying extra information without making the user lose their place on the page
- letting the user open a link to another site that they can look at later
- advertising (often unwelcome)

Consider what happens when a screenreader encounters a new window. It will first announce that the new window has opened, and then shift focus to that window, reading out the new content. A blind user cannot quickly glance at the new window and put it aside for later; they must hear the content, decide whether or not it is relevant, and choose which window to continue reading.

Unexpected popups can also be a problem for users with learning disabilities, as the sudden appearance of a new window is distracting and can make them lose their place on the previous

page.

As a general rule, warn the user if a link will open a new pop-up window. Additionally, consider whether the pop-up window is absolutely necessary. Traditionally, links to external sites were opened in new browser windows. This is preferred by many, but it is better to let the user choose: nearly all browsers let you right-click a link to open it in a new window.



Tables

We've established that you shouldn't use tables for graphic layout, but that doesn't mean you can't use tables at all. Tables are indispensable for their original intended purpose: displaying data in an organized and legible format.

Sighted users can easily glance at a table, see where the row and column headers are, and find the piece of data they are seeking. But when a screen reader encounters a table, it reads it out in a linear fashion: row by row, each cell in order. If the table is very large, it's easy to lose track of which column you are listening to. And if the table is very complex, with merged cells that overlap multiple rows or columns, it may not make much sense when read out loud.

Schedule Results





























099 Schedule					
 	  Stop #2112 WESTBOUND E BROADWAY AT COMMERCIAL DR BAY1	 Stop #924 WESTBOUND E BROADWAY AT CLARK DR	 Stop #9052 WESTBOUND E BROADWAY AT MAIN ST	 Stop #9053 WESTBOUND W BROADWAY AT CAMBIE ST	 Stop #9054 WESTBOUND W BROADWAY AT WILLOW ST
 	9:10a	9:11a	9:15a	9:17a	9:19a
 	-	-	9:16a	9:18a	9:20a
 	9:12a	9:13a	9:17a	9:19a	9:21a
 	9:14a	9:15a	9:19a	9:21a	9:23a
 	9:16a	9:17a	9:21a	9:23a	9:25a
 	9:20a	9:21a	9:25a	9:27a	9:29a
 	9:22a	9:23a	9:27a	9:29a	9:31a
 	9:24a	9:25a	9:29a	9:31a	9:33a
 	-	-	9:32a	9:34a	9:36a
 	9:28a	9:29a	9:33a	9:35a	9:37a

Table headers

Every table should have clearly labeled table headers. Often developers have done this just by colouring the background of the header cells or making the text bold, but as we know, this visual information will be lost when run through a screenreader.

So how can we tell the browser itself where the table headers are? This can be done with the TH tag, which works exactly like the TD tag except it makes the distinction that the cell is a header. Plus, you can still style the TH tag using CSS to make the headers look however you want.

Caption and Summary

The CAPTION attribute gives all users a quick definition of the table. The SUMMARY attribute provides more detail for screenreaders.

```
<TABLE summary="The schedule for the westbound 99 B-Line, with stops at Commercial,
Clark, Main, Cambie, Willow, Granville, Macdonald, Alma, Sasamat, and UBC.">
<CAPTION>Schedule for the 99 B-Line</CAPTION>
<THEAD>
<TR>
<TH>...
```

Scope

The SCOPE attribute goes into a table header to tell the browser which header is associated with a given row or column. This helps remove ambiguity and allows the screenreader to provide the user more information about the given table. The two options are scope="row" or scope="col".

Complex tables

Tables with multiple layers of headers and categories can become quite complicated. XHTML does allow for further description of complex tables, which may be of interest if you have many data tables. You can read more about them at <http://jimthatcher.com/webcourse9.htm>.

Accessibility features

Most of the changes we've talked about will improve your site's accessibility without changing its functionality in any way. Now we're going to discuss a few things you can add to your site that will be of extra benefit to disabled users.

Skip to content

While many experienced screenreader users listen to web sites at very high speeds, there's still no audio equivalent to skimming the page. Sighted users can easily ignore any part of a website that is of no interest to them, or something they've seen before, such as the navigation.

One feature that will improve your website's usability is a **skip to content** option. This is a link, coded to appear invisible to sighted users, that screenreader users can click to skip any navigation menus that they've already encountered and don't need right now.

There are three steps to creating a skip navigation option.

1. Add an anchor link just before your main content starts:
``
2. Add a new class in your CSS:
`.skiplink {display:none}`
Now, anything that you assign to class "skiplink" will not be displayed in the browser.

3. Add this link right after the BODY declaration of your page:
`Skip over navigation`

Keyboard Shortcuts

The `accesskey` attribute allows you to predefine keyboard shortcuts to specific pages or form fields on your website. This is especially beneficial to anyone who navigates your site using only a keyboard, or whose use of a mouse is limited. Accesskeys are triggered by the user holding down ALT and pressing the specified key.

Simply define the key within an existing link to that page:

```
<a href="about.html" accesskey="1">About This Site</a>
```

Be careful not to override existing browser keyboard shortcuts that appear in the browser toolbar, such as F (File), E (Edit), V (View). To be certain, use only numbers as access keys; you are less likely to conflict with existing shortcut definitions. There is no automatic listing of what accesskeys are defined on a site, so you'll have to list the keys that you've defined either on a separate page of your site or next to the appropriate links.

There are a few conventional shortcuts:

- 1: Home page
- 2: Skip to main content
- 9: Feedback

Not all browsers support `accesskey` yet, but those that don't will simply ignore the attribute.

Summary

When making an accessible site, start by thinking about its design, structure, and content. Then, using correct XHTML and CSS – or a program that can generate this for you - build or modify the site according to the guidelines provided.

Chapter Five: Multimedia

In this Chapter, we will consider

- different types of multimedia
- challenges presented by each type of media

Chapter 5: Multimedia

Audio	
Video	Transcripts and Captions
Flash	
PDF	When to use PDFs Tags

For the purposes of this Manual, we will use the term "multimedia" to refer to audio, video, PDF and Flash: any content on the web that is not text, HTML, or a graphic.

Multimedia can create some of the richest and most engaging experiences on the web. For this very reason, it is also the most challenging aspect of web accessibility. The simplest rule to follow for rich media is: *provide an alternative*.

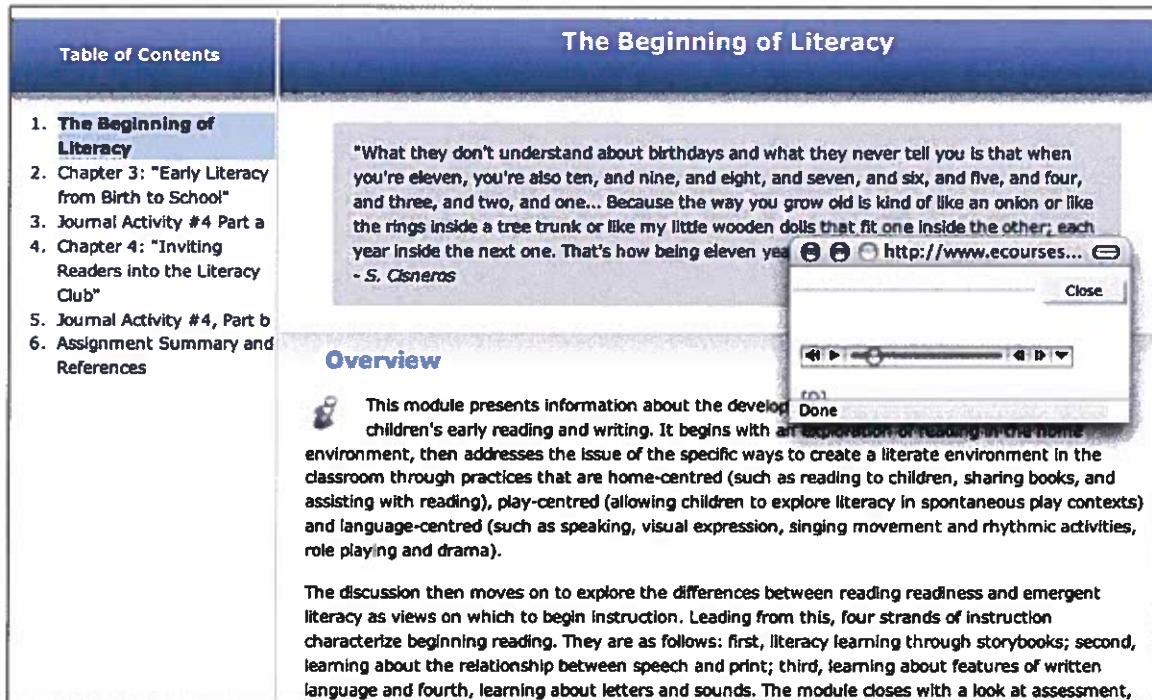
Remember! Different people have different learning styles; every time you present your content in a different medium, you increase the accessibility of your site.

Developing accessible sites does not mean making every type of media usable - it means making all the *information* available to everyone.

Audio

For audio, the accessibility alternative may be relatively simple; if the audio file in question is spoken word, it is sufficient to provide a text transcript. For music, provide lyrics and, if appropriate, a description of the piece and an explanation of its significance.

Audio can be used to benefit learning-disabled users. Consider offering a reading of key passages or especially difficult text.



The screenshot shows a web page titled "The Beginning of Literacy". On the left is a "Table of Contents" with six items, the first of which is "1. The Beginning of Literacy". The main content area features a quote from S. Cisneros: "What they don't understand about birthdays and what they never tell you is that when you're eleven, you're also ten, and nine, and eight, and seven, and six, and five, and four, and three, and two, and one... Because the way you grow old is kind of like an onion or like the rings inside a tree trunk or like my little wooden dolls that fit one inside the other, each year inside the next one. That's how being eleven year old is." Below the quote is an "Overview" section with a small icon of a person and text describing the module's focus on children's early reading and writing. A text player is overlaid on the page, showing a progress bar and a "Done" button. The URL in the browser's address bar is "http://www.ecourses...".

Video

When adding video to your site, accommodations need to be made for both vision and hearing-impaired users.

For visually impaired users, Audio Description (AD) of the contents of a scene is important. Audio Description is a narrator providing a spoken context for items that the viewer may not be able to ascertain without listening to the audio. A description for this image might read something like "A family walking in the rose garden".

For hearing impaired users, any key information provided in the video should be represented in the text equivalent. Perhaps in the picture there is a sign placed prominently that the viewer is



expected to read, or people in the video are reacting to a sound heard off-camera. These details affect the viewer's understanding of the material, and you need to ensure that all visitors to your site are able to get this information.

Transcripts vs. Captions/Subtitles

A transcript is one way that you can provide your audience with a second format for your content. Transcripts are easy, and can be created by anyone. If you are the creator of the video, chances are you have a script that you can provide. In some cases, a script may not need any modifications to be a full transcript. If you need to write a transcript from scratch, it isn't hard, but it can be time-consuming. Load up the video, and your word processor and get typing. Before long you'll have a transcript to publish.

A transcript usually consists of one file with the whole content of the video. On the other hand, captions and subtitles are synchronized with the video stream, and as such require more effort, and time to create.

Captioning vs. Subtitling

Subtitles are a textual representation of the speech in a video clip. The focus of subtitles is to state what is said, not what is audible. Subtitling does not attempt to provide information about other aural cues, such as a ringing doorbell.



Captions (pictured here) attempt to provide a textual representation of all the audio in a video clip. This may include speech as well as sound effects (for example, a ringing doorbell) and background music. Writing video captions can come down to a matter of style. As with everything else in accessibility, you need to use common sense when making decisions about how much has to be captioned. Be thorough without overwhelming the user with unnecessary details.

If you're looking to provide a base level of enhancement, start with a transcript of the video. For a more interactive approach, subtitling or captioning can greatly increase the video's comprehensibility for people who struggle with the language spoken. Reading the text while hearing the dialogue can be very helpful when learning a language.

Captioning is something that you can do yourself, but due to the amount of time necessary it may be more practical to hire a professional captioning company to caption your video. This can be expensive, but in the end you may find the price worthwhile. Video alternatives should be considered part of the cost of building and maintaining your site.

Open vs Closed Captioning

Closed captioning is a technology that an individual user enables, to see the captioning for a given video. Common applications of this are in: News broadcasting, and on VHS/DVD movies. With open captioning, the video's picture has the textual representation directly ingrained into it. Users cannot choose whether they see the captions or not; they are always enabled. A common application of open captioning is for videos captioned in another language.

Overall

The idea of captioning or describing video is to provide the user information they couldn't obtain in the original format. You, the content provider, need to be careful to not overload your viewer with useless information. For example, in a scene where two people are walking down the street talking about ice cream, an audio description of "There are 2 airplane jetstreams in the sky progressing from east to west" should be avoided because it doesn't give important information about the scene. Overloading your audience with useless information just masks what the clip was actually about. The same is true for captions/transcripts.

If you wish to show a clip which has dialogue in another language, consider captioning in your audience's primary language! By doing this, you can aid language comprehension for students that understand some of the primary language.

Flash

Caution: Avoid building your entire website in flash. Yes, you can make some visually impressive pages doing so. Yes, Flash sites can have a certain "cool" factor, unachievable with HTML. It simply remains that most Flash sites are not as accessible as HTML sites.

Like all other forms of multimedia, Flash can improve accessibility for some users and degrade it for others. It can be easier to demonstrate concepts with interactivity and animation than with text and images. A well-designed Flash demonstration can have enormous benefits for students, especially those with learning disabilities. Yet it can be a problem for users with visual or physical handicaps. Some problem areas include:

- Representing information only as graphics - see the discussion regarding images without alternative text
- Small buttons, or buttons that cannot be navigated to using the keyboard - users with physical disabilities may have trouble using the interface

Flash and screen readers

Since Flash generally does not present text in a linear fashion, it cannot be easily handled by screen readers. Blocks of text can change constantly over time, be randomized, and appear at any point of the screen. Users must also have an up-to-date screen reader that works with the current version of Flash.

When creating content in Flash for screen readers, keep the following questions in mind:

- Does the reading order make sense? Flash objects are read in the order in which they were created, rather than the order in which they appear visually on the screen.
- When an event occurs on the screen, does the screen reader start reading again from the start? You don't want to bombard the user with repeated information (recall the discussion on navigation in the XHTML/CSS section).
- Do you *need* to display your content in flash, or will a standard webpage do just as nicely?

Note: This doesn't mean you should *never* use Flash. It means that if your entire site consists of three buttons and a block of text, Flash may be overkill. If you want some special animations, consider making them in a Javascript-enabled HTML webpage. A screenreader will ignore the animations but still be able to read any text-based information.

Adobe offers suggestions and best practices for accessibility in Flash and other products on their web site at <http://www.adobe.com/accessibility/>

Slide-Show	Media	Slide-Show	Media
	Transcript Part 1 Audio Reading Part 1		Transcript Part 2 Audio Reading Part 2
	Transcript Part 3 Audio Reading Part 3		Transcript Part 4 Audio Reading Part 4
	Transcript Part 5 Audio Reading Part 5		Transcript Part 6 Audio Reading Part 6

Seen here: links to a series of Flash slideshows, presented with transcripts and audio readings for students with visual impairments or those who simply do not have Flash installed.

PDF (Portable Document Format)

The primary challenge of PDF files is to make sure that the text of your document is encoded as text, not as a graphic. If you scan a document onto your computer and directly output it to a PDF file, the contents of the file will be encoded graphically. If you want to create a PDF file from a document you have scanned, be sure to use Optical Character Recognition (OCR) software. OCR software converts graphical lettering to text. PDF viewers cannot analyze graphics for text, so this must be done when you are creating the PDF file. Fortunately, Adobe Acrobat 7 has OCR built in, and can handle this conversion for you.

Adobe Acrobat has been able to function as a screen-reader since version 6. So for the purposes of testing your PDF files, seeing what Acrobat says (literally) is the first place to check.

The PDF format is used frequently online, but often unnecessarily so. It is often used to avoid creating a webpage, or to ensure that the layout of the information is exactly as the designer wants it. In these cases, the information could be better conveyed in simple HTML, without forcing the user to download and view an extra file.

Of course, there are valid reasons to use the PDF format, which we will consider now.

Footnoting

HTML does not provide support for footnoting, or referencing. If you only need to cite one reference, including that information at the bottom of the webpage may be sufficient. But if you are working on a document that requires extensive footnoting, the PDF format may be a better solution.

Annotating Forms

If you require that other people fill out and return a form online, the PDF format has some extra features that may be useful. However, you should consider whether a web form with submission will accomplish your task just as easily.

Printing

The PDF format makes considerations for documents that are designed for reading on paper. HTML doesn't, as it was designed to be a web/online format. As a result, HTML doesn't have any concept of print margins, page sizes, etc. Even the most savvy web designers will tell you that multi-column web pages can be quirky at the best of times.

There's a difference between *wanting* and *needing* to format your document using multiple columns. If you just want to show it using multiple columns, but it is not crucial to the information in the document, go brush up on your XHTML/CSS skills, and stay away from PDF. However, there are situations where the columnar form and print format of the document is crucial, and in these cases usage of the PDF format is fine (e.g.: academic articles).

Specialized Notation

If you need to share a document with some specific notation (e.g. mathematics, or another language), there are some specific technologies you should consider before jumping to PDF.

In the case of mathematics, if you are working on a file with a couple fairly standard math notations in it, you may not need to use PDF; MathML might be enough. MathML is a specialized markup language developed by the W3C for displaying mathematics. The downside of MathML, is that your target audience must install the MathML fonts on their computer.

In the case of other languages, the Unicode character-encoding format may provide the characters you need. Fortunately, modern operating systems (Windows XP, Mac OS X) have support for Unicode built in.

If you need to display some other notation, PDF is probably a suitable choice, for two reasons. A) If you are using a particular symbol in one of the fonts on your system, the PDF is capable of directly embedding the font into your document. B) If you are using a symbol that is truly unusual, PDF may work well since it has roots as a graphical file format. The primary advantage of these other technologies is that the user does not have to load a different viewer to view your document. MathML and Unicode can be drawn natively in your audience's web browser.

Tagging PDF Files

Tags are extra information about the content of a document. Tags allow the document creator to add extra information about the content of your document. Some examples of things you can add to your document with tags are: specify alternative text for images, denote specific pieces of text as headings, and columnning. Tags are similar to attributes in HTML - they provide extra information about an item in the document.

Adding Tags in Microsoft Word (2000 or newer)

To add alternative text to a graphic:

- * Right click on your image
- * Format picture
- * Go to the Web tab
- * Type your text under "Alternative Text"

Specifying headings is also easy; just use the Word text style for headings. The added benefit for you, the document maintainer, is that now should you want to change the formatting of headers, you only have to change the formatting once. Using Word's styles is akin to using Cascading Style Sheets (CSS) to format HTML pages.

If you are working on a document which must be formatted in multiple columns, use Word's column function. Acrobat will automatically recognize the columning, and correctly generate the reading order for software such as screen readers.

Full procedures for tagging are beyond the scope of this manual. If you would like more information, Adobe provides a how-to guide on creating accessible PDF files (both from your initial source, and retrofitting) on their website:

http://www.adobe.com/enterprise/accessibility/pdfs/acro7_pg_ue.pdf

As with many other forms of accessibility, spending the time to increase the ease of use for disabled people improves the accessibility for other users as well. By adding tags to your PDF documents, now your documents are viewable on other devices, such as PDAs. Joe Clark wrote a very solid article on PDF accessibility, which discusses the appropriate usage of PDF files. It is available at: http://www.alistapart.com/articles/pdf_accessibility/

Summary

As with other facets of accessibility, it is a good idea to plan for accessibility when creating your content. It will save you time, money and effort. Retrofitting multimedia content for accessibility is always more effort than building your content with accessibility in mind the first time. Transcripts, flash tags, and PDF tags are perfect examples of this. The time and effort that it takes to make these available the first time is minimal. Going back and recreating transcripts, tagging flash or tagging PDF documents is not hard, but it can be time consuming.

Chapter Six: Testing Your Site

In this Chapter, we will discuss

- how to test your site for accessibility
- when to use an automated validator
- a basic accessibility checklist

Chapter 6: Testing Your Site

The Human Factor

Evaluation Checklists

Full chart
Quick checklist

Accessibility Checkers and the Human Factor

There are some useful tools available for testing the accessibility of your site. They will examine your code and look for items like missing ALT text or table headers, and make recommendations on improvements that will help your site meet each priority level. Accessibility checkers, such as Watchfire WebXact, can be an invaluable help.

You may notice that they will also issue a list of warnings, regardless of your website's actual accessibility results. Why is this?

XHTML/CSS Validators

If you are building your site from scratch as described in Chapter 4, you should test the validity of your code using an XHTML and CSS validator. This will help ensure that your site works well with all browsers, including screen readers.

XHTML Validator

<http://validator.w3.org/>

HTML Tidy

<http://infohound.net/tidy/>

CSS Validator

<http://jigsaw.w3.org/css-validator/>

There are simply too many accessibility standards that only humans can test. No software can tell you if your site's menu navigation is intuitive, or if the ALT text you have included is sufficient to describe the image. Use an accessibility checker *first* to make sure you have covered everything you can, and then work through the warnings it provides, looking at your site critically.

The best way to test your site for accessibility is to ask a disabled user to try it. Only a human, examining both the context and the content of a page, can fully assess your site's accessibility. It's hard, as a sighted user, to imagine navigating a website only by voice; as a user with full mobility, it's hard to imagine the frustration of trying to click on a link that is too small. If you truly want to know if your site is accessible, bring it to the people who experience the problems you are trying to address.

Evaluation Chart

We have included a checklist of the most common and significant accessibility issues that you should look for when evaluating your site. Some of these guidelines can be tested using an accessibility checker as mentioned above; others you will have to look at objectively and decide for yourself whether they are adequately met.

You can use this chart to evaluate an existing website before making accessibility changes, or to see how well you've done after "accessifying" your existing site or building a new one.

Category	Description	Vision Hearing Motor Cognitive	Notes	Rating (1-5)*
Structure & appearance	Navigation links and placement consistent on each page.	M,C		
	Text good contrast to the background	V,C		
	Each page has a unique descriptive title	V,C		
	Valid XHTML/CSS used throughout the site	V,M,C		
Images	All images have ALT text that either clearly describes the image, or in the case of decorative images, contains a space (alt=" ") to prevent the screenreader from describing the image.	V		
	Images that cannot be adequately described in ALT text (charts, graphs) are further described on a LONGDESC page.	V		
	Links in imagemaps also have ALT text	V		
Text & links	Fonts use a relative font size (em, %), not absolute (px, pt)	V,M,C		
	Heading tags (H1, H2) used correctly as headers, not to format font	V,M,C		
	Ability to skip navigation	V		
	Links separated by more than just whitespace	V		
	Colour not used to convey information, or reinforced by other visual cues	V		
	Underline not used on non-linked text	C		
	Link text does not repeat on the same page (eg. "click here") but is unique to each link.	V		
	TITLE attribute added to ambiguous links.	V		
	Lists use the UL/OL and LI tags, not bullet images	V,C		

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	Coding should not prevent user from changing colours with own stylesheets	V,C		
Tables	Tables used for data, not for layout	V		
	Table row or column headers indicated using the TH tag.	V,C		
	Table summary provided	V,C		
Forms	Forms can be navigated in the correct order using the TAB key	V,M		
	Each form field has an associated LABEL tag	V		
	Enough time given to fill out forms	V,M,C		
	Required fields noted as such before the form label, and marked with asterisk or bold	V		
Multimedia	Transcripts available for all audio	H		
	Transcripts or captioning available for all video	V,H		
	Content presented in Flash described in an alternative format as well	V,H,C		
	Avoid distracting animations, scrolling text	V,C		
	Links provided to download any necessary plug-ins	V,H,M,C		
	PDFs accessible or plain text made available	V		
	Content in applets and plug-ins is accessible or else not required	V,M,C		
	If alert sounds are used, reinforce the sound using visual notification	H		
Javascript	Site navigation still works with Javascript turned off.	V,C		
	Drop-down menus do not require difficult, precise mouse movement.	M, C		
General	Passes automated accessibility validator such as Watchfire WebXact	V,H,M,C		
	Site can be navigated by keyboard only	V,M		
	Notify the user if pop-up windows are to be used	V,M,C		
	External windows do not open pop-up windows	V,M,C		
	No autoplay of music, or ability to turn off music easily	V		
	If frames must be used, they are clearly titled	V		

	Page still usable with stylesheets turned off	V,C		
	Site includes search engine	V,M,C		
	Avoid distracting animations	V,C		
	Pages do not automatically refresh	V,M,C		
General Notes				

Rating scale

5. **Excellent.** Meets or exceeds the relevant accessibility guideline.
4. **Good.** Meets the guideline, but could be further improved for better accessibility.
3. **Incomplete.** Some effort has been made to meet the guideline, but not all instances of this item have been addressed.
2. **Poor.** Guideline has been inconsistently or incorrectly applied.
1. **Failed.** Completely ignored or unimplemented.

Quick Checklist

The following is a short ten-point checklist which you can use to help guide your site towards better accessibility. This is not a complete list, but draws ideas from Priority 1 and Priority 2 checkpoints.

Examine each of the elements of your site as described in the chart. Decide for yourself how well they meet the criteria, then give each item a rating. Low rated elements should be revisited and improved in order for your site to be considered accessible.

Rating scale

5. **Excellent.** Meets or exceeds the relevant accessibility guideline.
4. **Good.** Meets the guideline, but could be further improved for better accessibility.
3. **Incomplete.** *Some effort has been made to meet the guideline, but not all instances of this item have been addressed.*
2. **Poor.** Guideline has been inconsistently or incorrectly applied.
1. **Failed.** Completely ignored or unimplemented.

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	Description	Rating details	Rating (1-5)	Notes
1.	<p>Text alternatives</p> <p>Text equivalent provided for every non-text element, including: images, graphical representations of text and symbols, imagemaps, animations, applets and programmatic objects, frames, scripts, graphical buttons, audio and video.</p>	<p>5: Complete and correct alternative text provided for all elements.</p> <p>3: Alternative text available for some but not all elements.</p> <p>1: Alternative text is missing, incomplete, or incorrect.</p>		
	<p>Assists</p> <p>Vision, Cognitive</p>			
2.	<p>Text</p> <p>Fonts can be resized using the browser. Text is high-contrast.</p>	<p>5: Text is easy to read and resize</p> <p>3: Text can be resized, but may cause problems in layout when enlarged; some text may be hard to read</p> <p>1: Text cannot be resized, and/or is hard to read due to size, colour or contrast</p>		
	<p>Assists:</p> <p>Vision, Cognitive</p>			
3.	<p>Links</p> <p>Link text makes sense out of context and does not repeat</p>	<p>5: Each link has clear and unique link text</p> <p>3: Some link text repeats or is vague (eg. "click here")</p> <p>1: Links cannot be understood when taken out of context</p>		
	<p>Assists:</p> <p>Vision, Cognitive</p>			
4.	<p>Colour</p> <p>All information conveyed with colour is also available without colour, for example from context or markup.</p>	<p>5: Colour used appropriately</p> <p>3: Colour used to convey information, but the content has alternative explanation/description. (e.g. A pie-chart with the colour and the percentage).</p> <p>1: Colour used to convey information (eg. "click the red link")</p>		
	<p>Assists:</p> <p>Vision (colourblindness)</p>			
5.	<p>Distraction</p> <p>No screen flickering, refreshing or distracting animations. If pop-up windows must be used, user is notified in advance.</p>	<p>5: No flickering or distractions</p> <p>3: Some animations may be distracting</p> <p>1: Unexpected pop-ups; screen is distracting and chaotic</p>		
	<p>Assists:</p> <p>Vision, Cognitive</p>			
6.	<p>Clarity & consistency</p> <p>Clear and simple language used, as appropriate for site content. Navigation stays consistent across the site.</p>	<p>5: Content is written at the appropriate level for site visitors. Site is easy to navigate.</p> <p>3: Some content or menus may be confusing</p> <p>1: Language too difficult for site visitors to understand; menus change from page to page</p>		
	<p>Assists:</p> <p>Vision, Cognitive</p>			

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7.	<p>Data Tables Row and column headers identified. For complex tables, data cells are associated with header cells.</p>	<p>5: Headers complete and complex cells associated with headers 3: Incomplete or incorrect headers 1: No headers provided</p>		
	<p>Assists: Vision, Cognitive</p>			
8.	<p>Frames If frames must be used, all frames clearly titled.</p>	<p>5: Frames correctly titled 3: Some frames titled, or ambiguously titled 1: Frames used without titles</p>		
	<p>Assists: Vision, Cognitive</p>			
9.	<p>Plugins, applets & scripts Pages are usable when scripts, applets, or other programmatic objects are turned off or not supported.</p>	<p>5: Turning off plugin/script leads to fallback alternative 3: Turning off plugin/script loses functionality, but site is still otherwise usable 1: Site cannot be used without plugin/script</p>		
	<p>Assists: Vision, Cognitive, Motion, Hearing</p>			
10.	<p>“Last resort” If, after best efforts, the material cannot be made accessible, a link is provided to an alternative, accessible page that has equivalent information (or functionality), and is updated as often as the inaccessible (original) page.</p>	<p>5: Original pages adequate, or alternative pages provided when necessary 3: Alternative page provided, but not equivalent 1: No alternative pages provided when needed, or alternative pages provided when original pages could be made accessible</p>		
	<p>Assists: Vision, Cognitive, Motion, Hearing</p>			

Chapter Seven: Resources

During our research, we have collected a great number of online resources as guides and references. We hope that you will find them to be a valuable aid to your exploration of accessible course design.

Fundamentals

These sites are good general starting points when studying accessibility.

W3C Web Accessibility Initiative (WAI)

<http://www.w3.org/WAI/>

The Web Accessibility Initiative (WAI) works with organizations around the world to develop strategies, guidelines, and resources to help make the Web accessible to people with disabilities. They developed:

WCAG Guidelines 1.0

<http://www.w3.org/TR/WAI-WEBCONTENT/>

Accessify

<http://www.accessify.com>

News & articles, tutorials, discussion forum.

Dive Into Accessibility

<http://www.diveintoaccessibility.org>

Easy step-by-step guide to improving the accessibility of your site or blog.

Technical

Introductions to creating valid XHTML and CSS, and how to use it in the process of creating valid, accessible websites.

XHTML Tutorial

<http://www.w3schools.com/xhtml/default.asp>

CSS Tutorial

<http://www.w3schools.com/css/default.asp>

Zen Garden

<http://www.csszengarden.com/>

CSS Play: Experiments with Cascading Stylesheets

<http://www.cssplay.co.uk/index.html>

Creating Accessible Page Layouts

<http://www.utoronto.ca/atrc/tutorials/actable/index.html>

How and why to avoid using tables for layout.

PDF Accessibility

http://www.alistapart.com/articles/pdf_accessibility

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Editorial about specific purposes for which you should use PDF files, and reasons why for everything else you should leave it alone.

Flash Accessibility

<http://www.webaim.org/techniques/flash/>

IMS Guidelines for Developing Accessible Learning Applications

<http://ncam.wgbh.org/salt/guidelines/>

<http://www.macromedia.com/resources/accessibility/>

Tools & Validators

These handy assistants can be very useful for accessifying your site.

Watchfire WebXACT (previously known as Bobby)

<http://webxact.watchfire.com/>

"WebXACT is a free online service that lets you test single pages of web content for quality, accessibility, and privacy issues."

CSS Validator

<http://jigsaw.w3.org/css-validator/>

XHTML Validator

<http://validator.w3.org/>

Vischeck

<http://www.vischeck.com/vischeck/>

See what images and web pages look like to people with different types of colourblindness.

Lynx Viewer

http://www.yellowpipe.com/yis/tools/lynx/lynx_viewer.php

See what your webpage would look like in a text only web browser

Other

Developing sites for users with cognitive/learning disabilities

<http://juicystudio.com/article/cognitive-impairment.php>

CAST: Universal Design for Learning

<http://cast.org/>