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"Designing Accessible Websites for Blind and Visually Impaired"

Curriculum Unit 99.07.06
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Technology plays an important role in providing handicapped individuals with opportunities to increase their independence and become active members of the community. Computer technology allows blind and visually impaired individuals the opportunity to access the vast array of information on the Internet. This is an important step for a population that traditionally was restricted in accessing information. For instance, in the past, a blind person could not access current journals unless they were read aloud or translated into braille for the individual. Today, a blind person is able to independently and instantaneously locate current journal articles on-line with the aide of a relatively inexpensive screen reader or braille translator connected to a computer.

However, the advances in technology also creates many challenges for persons with visual handicaps. The design or format of a webpage, for instance, may determine whether this resource can be conveniently accessed by a blind person or be an exercise in frustration.

The handicapped population, therefore, must gain an understanding of technology so that they can contribute to the development strategies and propose solutions which will allow this population to use technology effectively.

This unit that will allow blind and visually impaired students and their sighted classmates to:

1. increase awareness of the development of technology

2. to gain knowledge and experience in using websites

3. to develop basic knowledge and use of HTML

4. to gain skill in understanding equal access issues for individuals with physical, cognitive, or sensory disabilities

5. to investigate various websites to determine how user friendly a site is for the visually handicapped user

6. to design an accessible website

The goals of this project include:

l. To make visually handicapped students and their sighted peers aware of the problems blind and visually impaired have accessing websites

2. To educate present and future web masters and web-designers regarding the needs of people with disabilities

3. To design a website that is accessible to the blind and visually impaired by creating an accessible website entitled "Homework Helper."

Development of the Curriculum

This curriculum will allow educators to assist their students in creating and using websites that are accessible to handicapped populations. This project will provide the guidelines for producing a simple website that is accessible to visually impaired and blind and other print-impaired users. More technical information can be easily be found on the web by locating the websites cited in the reference section.

The Internet provides an opportunity for blind and visually impaired users to get information on an equal footing with that of sighted peers. This project will allow my students to gain an understanding of the accessible websites to individuals with print impairments. This curriculum focuses on the problems that this population encounters when they attempt to use websites. By investigating problems students will be able to understand the needs of this population as they develop their own websites.

In addition, this curriculum will give students an opportunity to construct an accessible website that will

provide useful information on the services provided by the New Haven Public School Low Vision Department with links to helpful websites about low vision issues.

NOTE: This curriculum was written to assist blind and visually impaired students. However, the techniques used will benefit a wider audience of handicapped individuals that might be described as "print impaired". Print-impaired persons include the blind and low vision users. However, the term is not limited to individuals who experience sensory loss in their eyes. For instance, print-impaired people also include those who have limited or no use of their hands or fingers in order to turn pages of a book or to access a keyboard or mouse interface for electronic documents. People with cognitive disabilities (for example, dyslexia) are sometimes included within the print-impaired category. It's important to keep in mind the broader category of the print-impaired. By doing so, a wider population will be served by this curriculum.

Computer Technology and the Integration of the Blind

Computer technology and the internet are important in providing blind individuals with the opportunities to realize their talents and capabilities. In fact, if a blind person has proper training and opportunity, blindness can be reduced to the level of a physical nuisance.

The advancement of technology has greatly assisted visually impaired individuals in their efforts to be active members of society. Computers and adapted technology allow people to do word processing, accounting, financial planning and simple programming on their personal computers. Computers now also provide important job opportunities for blind people.

In addition, new advances in technology allows blind and low vision individuals to be connected to the internet with its vast array of information and interactive capabilities. And so, for the first time, this population can access the same materials as their sighted peers. It is important, therefore, that access to the internet be easy and convenient.

Designing an Accessible Website

Websites commonly use hypertext combined with multimedia to provide a huge network of educational, governmental and commercial resources. However, due to the multimedia nature of the medium, many print-impaired surfers cannot access some materials. They may encounter the following problems:

l. the inability to see graphics due to visual impairments
2. difficulty navigating sites that are poorly organized with unclear directions
3. difficulty in the use or availability of adaptive technology with computer to access the Web

Web Managers and Universal Design

Web page designers can do a great deal to ensure universal access to their sites. First, however, designers must be made aware that many users have very special needs. Individuals may be blind, visually impaired, physically disabled or have difficulty processing information. All these barriers prevent disabled individuals from gaining full and easy access to websites.

Accessible websites are sites that can be read by everyone whatever means is comfortable for them. Accessible websites do not need to be dull or unattractive but instead can be fully accessible with dynamic designs that provide not only content, but also visual appeal.

Potential Barriers

Design

Web page designers must consider many different situations during page design. Designing a well organized site is essential if it going to aid visually impaired and blind in navigating through information. Careful website design is also important because inappropriate use of HTML can render websites unreadable. Designers need to practice universal design so that sites can be easily used by everyone no matter what method they use to access the internet. Universal design will also ensure that anyone will be able to gain the same information from a website, regardless of their disability.

Designers must also understand that attributes which help one person may hinder another. Graphics, for instance, produces a barrier for blind individuals, but may make a concept more clear for someone who struggles to understand the content.

Improving Personal Access

Individuals can also do their part and take major steps to remove barriers by adjusting their browser preferences or options. For instance:

1. Web browser software contains an area where the user, can set preferences. For instance, in "Netscape Navigator" the user can select the font, set the size of text, the background color, the color to be displayed by hyperlinks.

2. Web browsers can be set so that they will not load images. This benefits individuals who uses screen-reading software with a voice synthesizer.

3. Macintosh users with the Apple System 7.5 text-to speech software installed, can have text to"spoken" by cutting and pasting text from a web site to Simple Text and choosing Command-H.

4. Windows users can choose pwWebSpeak as their browser. This is a "talking" browser designed for efficient WWW access by people with visual impairments, dyslexia, and learning disabilities.

5. Text-only browsers, such as Lynx (DOS), can be downloaded at : ftp://ftp2.cc.ukans.edu/pub/lynx, and used in conjunction with screen reading software.

Guidelines

Guidelines have been developed by several groups and organization to assist web page writers in the development an accessible webpages. These guidelines discuss accessibility issues and provide accessible design solutions. These suggestions should be used as a guide when developing and revising Web pages to ensure that they are accessible to a diverse audience.

Web Content Accessibility Guidelines

1. Make documents clear and simple
2. Maintain a simple, consistent page layout throughout the site
3. Provide context and orientation information.
4. Provide clear navigation mechanisms.
5. Keep backgrounds simple with good contrast
6. Use standard HTML
7. Design large buttons
8. Provide equivalent alternatives to auditory and visual content
9. Don't rely on color alone.

10. Include a notes about accessibility

11. Include short, descriptive ALT attributes for all graphical features on your page
12.Include menu alternatives for image maps to ensure that the embedded links are accessible
13. Create tables that transform gracefully. (1)

The following suggestions will greatly assist access for people facing vision barriers.

1. Designing screen with little clutter
2. Leave considerable space around all items
3. Avoid placing more than one hyperlink on any one line.
4. Avoid tiled backgrounds; text can become obscured.
5. Avoid dark or bright colored backgrounds; high contrast between text and background is desirable.
6. For each page which contains images, provide a text-only alternative page. This alternative page can then be "spoken" with screen reading software.
7. Include text descriptions for images (which can be "spoken" by those using screen reading software). The letter "D" is placed next to each image to indicate to the user that there is an image present and that a
describes of the image which can be "spoken" with screen reading software is available.
8. With images, utilize the ALT attribute with IMG tags, in order to provide a descriptive phrase which will appear as alternatives to images in text-only browsers (i.e. Lynx).
9. Auditory cues might help an individual using screen-reading software, such as outSpoken from Berkeley Access. It allows explanatory text to be placed on a web page so the person could hear the explanation with the use of the screen reader. (2)

Guidelines For Web Page Accessibility

The National Federation of the Blind provides guidelines to ensure maximum accessibility and usability to web pages for persons who are blind. A summary of these suggestions follows:

1. Avoid the use of multi-column presentations or tables.

Multi-column text or HTML tables make the page difficult or impossible to read with most access technology for the blind. A major problem is that, unless otherwise instructed to do so, this technology reads one entire line at a time across multiple columns instead of reading each column separately.

A major problem is that this technology, unless otherwise instructed to do so, reads one entire line at a time across multiple columns instead of reading each column separately.

2. When encoding hypertext links on your web page, enough words in the link must be included so that it can stand alone

When browsing a web page using speech or Braille access technology, the Tab or Shift-Tab keys are used to move from link to link.

When links read "click here," "this," or "click this," the page may be difficult to comprehend by the blind user.

It is helpful, therefore, when the link text can stand on its own. For instance, a word or phrase that describes the purpose of the link is very helpful.

3. Separate adjacent links

Hypertext links are typically indicated visually with highlighting. The blind user needs to know which pieces of text are in hypertext links and which are not because if two adjacent links are separated only by a carriage return, some screen access programs will incorrectly treat these as a single link.

4. Alternative, short text descriptions should be provided for all images

Blank characters, images, or bullets can be used but should not be placed next to a carriage return. It is important to use textual descriptions or identification to learn the meaning of a graphic.

5.Avoid using images as hypertext links.

Images are difficult for visually impaired and impossible for blind so don't use them as hypertext links. (2)

CAST / Center for Applied Special Technology

The Center for Applied Special Technology (CAST), is a not-for-profit organization

founded in l984. The mission of CAST is to expand opportunities for people with disabilities through innovative uses of computer technology. Bobby is a web-based tool developed by CAST to analyze web pages for their

accessibility to people with disabilities. Bobby's analysis of accessibility is based on the World Wide Web Consortium's Web Content Accessibility Guidelines.

Bobby will analyze a web site to determine problems that might hinder access by disabled users. This free service is simple and is an excellent first step to ensure accessible web page design.

To check websites simply type in the URL of the page to be examined and click "Submit." Bobby analyzes the website and reports on the accessibility and browser compatibility. In addition, a Bobby Approved icon will be presented to identify a website that is user friendly for the disabled.

Bobby also provides suggestions and guidelines that are helpful to for low vision and blind user. Their guidelines include the following:

> l. Provide text translations for images, animation and video
> 2. Summarize graphs and charts
> 3. Ensure that information conveyed with color is also available without color
> 4. Identify changes in natural language of a document's text and text equivalents of non-text content such as captions
> 5. Clearly and logically organize content
> 6. Provide alternative content for features that may not be supported such as applets and plug-ins (3)

Blind Users / Equipment

To ensure it will translate the information correctly,.a number of pieces of equipment must be considered when designing a webpage. Blind users often utilize a synthetic speech synthesizer to vocalize the on-screen data. Blind people many also use a refreshable braille display (attached to their computer) to convert ASCII character streams into braille and then transfer it to a braille display.

Other devices used by blind and visually impaired individuals to access the web include: hard-copy Braille embossers, Braille translation programs (software that converts print into Braille), audible screen review programs, reading machines (devices that scan a printed page and translate text into spoken words), scanners, optical character recognition systems, refresh able Braille Displays, Braille note-taking devices, and raised-line drawing equipment.

Visually Impaired Users

The needs of people with low vision problems vary depending on how the eye condition affects their vision.

Therefore, websites need to be flexible in design so that they can adjust the text and color settings to suit their needs.

For instance, many can read standard size text while others need enlarged text and use screen or software magnifiers to assist them in enlarging print. Highly contrasting colors aid many low vision readers while others can only read yellow text on a black background.

'Access technology,' which is installed in computer allows visually impaired individuals to read webpages. Synthesized speech software reads the content of webpages aloud and braille software outputs the text to a retractable braille display.

Making the Web Accessible for Blind and Visually Impaired

There are a number of groups and agencies, both public and private, working on web accessibility. The Rehabilitation Act Amendments of 1998 established a time line for incorporating access requirements into Federal procurements by August 2000. In addition, the Attorney General has established guidelines for agencies to conduct a self-evaluation of their electronic and information technology (4)

Also, the Center for Information Technology Accommodation (part of the Office of Information Technology at the General Services Administration) is addressing accessible web design by establishing an interagency working group focusing on Universal Access.

Also, the Web Accessibility Initiative (W3C) established by the World Wide Web Consortium has developed guidelines for accessibility: (5.)

Websites Reviewed

A number of websites were reviewed to determine how difficult they are to access. In general, sites that are devoted to serving people with disabilities are likely to be accessible.

American Printing House for the Blind (APH), is a company devoted to creating products and services for people who are visually impaired. Their website is an excellent example of a page that is easy to access and use.

APH's website present very few pictures and those are present have a title and description of what is pictured. The beginning page has a short description of the organization. The next page is an index of the various sections on the site. This index is presented in a single column on the left side of the page. This allows blind users to scan quickly down the list and locate the section they need.

APH Website --(www.aph.org)

HTML>

HEAD>

META NAME="keywords" LANG=en-us CONTENT="APH, federal quota program, products for the blind, custom braille, low vision aids, Louis database of accessible materials, braille books, large print books, books on tape,

museum tour, factory tour">

META NAME="description" CONTENT="Founded in 1858, The American Printing House for the Blind, Inc. (APH) is the world's largest company devoted solely to creating products for people who are blind and visually impaired.">

TITLE>American Printing House for the Blind/TITLE>

STYLE TYPE="text/css">

!--

BODY { background-color: white;

color: black }

A:link: { color: blue;

text-decoration: none }

/HEAD>

BODY>

img src="rwbhome.jpg" width=600 height=90 border=0 alt="American Printing House for the Blind">

hr align="CENTER">

A HREF="frhdann.htm">IMG SRC="fhshare.jpg" WIDTH=473 HEIGHT=111 VSPACE=2 ALT="Share your ideas for Fred's Head Database!">/A>

UL>

LI>A HREF="about.htm">About APH/A>br>

LI>A HREF="prodlife.htm">Products/A>br>

LI>A HREF="services.htm">Services/A>BR>

LI>A HREF="visit.htm">Visit APH: Museum and Plant Tour/A>BR>

LI>A HREF="federal.htm">Federal Quota Program/A>br>

LI>A HREF="involved.htm">Get Involved/A>br>

LI>A HREF="research.htm">Research & Education/A>br>

LI>A HREF="contact.htm">Contact APH/a>

/UL>

A HREF="http://www.aph.org:8765/?qc=">IMG SRC="smallse.jpg" ALT="Search our site" WIDTH=201 HEIGHT=23 BORDER=0>/A>BR>BR>

A HREF="louis.htm">IMG SRC="louhome2.jpg" HSPACE=5 ALT="Louis Database of Accessible Materials for People Who Are Blind or Visually Impaired" WIDTH=368 HEIGHT=52 HSPACE=5 VSPACE=5 BORDER=0>/A>

HR>

ADDRESS>IMG SRC="logocirc.gif" ALT="APH logo" ALIGN=MIDDLE>

Copyright ©1998 American Printing House for the Blind, Inc.BR>

A HREF="http://www.cast.org/bobby">IMG SRC="bobby.jpg" ALT="Bobby approved">/A>

IMG SRC ="acclgsm.jpg" ALT="Web Access Symbol (for people with disabilities)" HSPACE=10>/ADDRESS>

/BODY>

/HTML> (6)

Problems Sites

Other sites are not as easy for blind and visually impaired people to access with their speech readers and other adapted technology.

TWA, American Airlines, and other airline companies present webpages that may be difficult to access. Columns, colors, and photographs make it challenging to locate information. Pictures and graphics are not described so readers will be presented with no data for those areas. There is no index listing the various topics that are in this site. Instead they present busy layouts with numerous pictures and text scattered around the page. Such layouts may result in confusion and frustration for the blind user.

The following is a commercial website that posses a number of problems for blind and visually impaired users attempting to gain information from this airline on the internet.

[SCHEDULES & RESERVATIONS][FREQUENT TRAVELER INFO][ABOUT TWA][GETAWAY VACATIONS][HOT DEALS]

[TWA] [Image]

[airport information] [travel agents][passenger services] [TWA cargo services] [site info]

[Image]

[Welcome to TWA.com]

[Hot Deals] [Book a Flight] [FLIFO]

[Hot Deals] [ImEnd Up Miles Ahead with two new [Image] [FLIFO]

Aviator promotions!

Trans World [Image]Extra miles for Privilege Get arrival and

Specials. Special departure gate

fare discounts card holders information for

each week to [Image]Earn Privilege card flights.

various locations status 50% faster

around the world.

[Breaking News] [JD Power] [Mileage]

[Breaking News] [Image] [Image] [Mileage]

Frequent Flyer magazine/J.D.

TWA Labor Power and Associates 1999 Check your

Negotiation Update Customer Satisfaction Aviator

Breaking News Study--U.S. Flights.™ Study Miles

conducted among frequent

airline travelers who completed

6,250 individual flight

evaluations. Short flight is

defined as less than 500 air

miles.

[iXL - San Francisco]

Designed and [Image]

Developed by, [Search]

iXL-San Francisco,

Inc.

Privacy Policy

Schedules & Reservations | Frequent Traveler Information | About TWA |

Getaway Vacations

Hot Deals | Airport Information | Travel Agents

Passenger Services | TWA Cargo Services

Site Info | Contact TWA (7)

Guide to Writing Accessible HTML

Hyper text Mark-up Language

The Hyper Text Mark-Up Language (HTML) is comprised of a series of different elements such as titles, images and hyper links. HTML protocol provides a flexible and easy medium that can be used to produce a wide array of different kinds and styles of documents.

In the early days of the internet, most browsers such as Lynx were text only. Thus disabled individuals, many for the first time, had access to information from around the world. However, graphical browsers and multi-media features and the freedom by authors to create documents began to limit the sites that were readily accessible for some such as blind and visually impaired people.

When using HTML code web designers must be aware that those who use screen readers are gaining the information one piece at at time through their sense of hearing (serial sense). This is very different from the way sighted individuals gain information from a printed page. Individuals without vision problems can scan the page and understand the structure as a whole. (parallel sense)

The HTML writers can assist visually impaired by presenting an outline of the structure at the beginning of the page, where the screen reader begins. In addition, they should include important hints along the way.

Images

Screen readers can only handle text. Pictures convey vast amounts of information that is inaccessible to screen readers. This leads to serious problems at sites where all the textual information is contained in graphical form.

To deal with this problem websites use an Alternate Text (ALT Text). This is a very brief description of the image. This text is displayed in place of the image when the image loading has been turned off.

Labels (short text groups placed just after an image in the document) can also be used to help everyone understand the image.

Another solution to the problem with graphics is to use a "Text Only" version of a Document. This is a parallel

page that can be accessed by users who are unable to make use of the information contained in an image. This text version should include all the same functionality and content as the original page.

Text

Text is the most accessible and widely used medium for conveying information since it can be readily interpreted by screen readers, braille displays, printed out, etc.

However, authors must be careful about the way they format their pages because screen readers do not always alert users to line breaks, new paragraphs, new pages, centering or spacing used by sighted individuals to process and comprehend printed text.

For example, sighted people would have no problem understanding that the script at the bottom of the page, detached from the main text, is a footnote. However, the screen reader would read right on through causing confusion for the reader.

Problems That May Be Encountered

Visual Cues

Visual text cues-- (indentation, horizontal lines, and page breaks) are often ignored by screen readers which run the separate elements together.

To solve this problem the following should be considered:

1. Use tags to separate different paragraphs, footnotes or other structures. For instance, tags can be used for navigation buttons and page information to reduce confusion.

2. Use ALT Text for graphical page separators or headers. ALT Text can provide page information and give structural cues that divide the page into meaningful pieces.

3. Avoid horizontal lines since they can be confused for text entry lines in forms by the Lynx browser.

Lists

Sighted readers can easy identify a vertical lists in a written text. However, screen reader users lack the some very vital information necessary to make sense of lists. They have difficulty: 1. understanding when the list starts and where it ends 2. When each list item ends 3. Distinguishing whether there are sub lists and 3. how many list items are present.

Website designers can avoid these problems by considering the following:

1. Lists should be labeled with a tag at the start such as a Listname

2. Number each of the choices so the user can enter the list with an idea of its total length. This also aids the user since they can remember the number of the items that they are interested in. The numbers also break up the text so that each item can be individually perceived.

3. Sub-lists can be represented alphabetically.

Screen Readers

Screen Readers produce audio translations of text from other programs. Screen readers act as intermediaries between the application and a voice synthesizer. The voice synthesizer actually produces the sounds that are interpreted as speech.

This allows blind and low vision individuals who cannot see monitors to use computers.

There are several major problems with screen readers.

1. An important problem challenging screen readers is the lack of understanding the page. Screen readers are not able to recognize what is important and what is useless. Instead everything is outputted in a sometimes ambiguous stream.

2. Screen readers perform many operations simultaneously with the other applications running on the system. High workloads result and lead to program interactions.

3. The screen reader must make important changes to the computer in order to gain access to the text output before it is displayed on the monitor. Unfortunately, these modifications sometimes cause problems.

Browsers

Browsers are programs such as Lynx, Netscape,and Mosaic. Their function is to request and display documents from remote servers on the World Wide Web. The use of screen readers with certain browsers can cause problems. For example, the screen reader may misinterpret various structures thereby rendering the page meaningless. Each programmer should test their pages on various browsers to ensure that information is displayed properly.

Each browser interprets and deals with information differently. Lynx, for example, is a text based browser and does not display images. However, even in cases where two browsers support the same element they may treat the information differently. For example, Mosaic shows the Alternative (ALT) Text while loading an image but Netscape does not. This means that information can be distorted or even absent depending on the browser used.

Hyperlinks

Hyperlinks are the pieces of text that call new documents when selected. Hyperlinks are usually highlighted. Hyperlinks need to be clearly marked for people with visual disabilities.

Sometimes hyperlinks are meaningless for blind users. This is due in part because web designers sometimes take short cuts in designing pages. They may construct a link by using of text and a hyper link. For instance, designers may write a sentence such as: "Click here to learn about .... If "click here" is the hyper link the sighted user has no a problem. However, for people using screen readers that are configured to jump from link to link, " click here" means nothing.

This can be avoided by making the meaningful words in the sentence into the hyper links. This will allow a user who is skipping from link to link to get an idea of the choices available. It also will prevent the use of meaningless commands.

Buttons

Buttons are used as an alternative to simple text links. Buttons enhance the look of a page and also helpful to people with low vision a larger target.

However, sites utilizing buttons by themselves are a problem for persons with visual disabilities.

Many sites, utilize clickable buttons to provide the user with a better idea about their destination. When an active image is included on the button, Lynx users will simply see the word "image" but will not known what a location it represents. The solution to this problem is to include ALT Text which describes the function. In addition, it is often helpful to add an external text label in square brackets.

Image Maps

Image maps are graphics that have been designed to be clickable. Selecting different areas of an image map will instruct the browser to load different pages. For example, by clicking on different areas of a map travel information can be obtained for that location.

Image maps should have a text listing of all the options available in the image map. This text listing should be located either above or below the map or on a linked page. It may, in fact, be best to construct a text-only alternate page parallel to the main image mapped page.

There are serious problems for people with visual disabilities.

1. Image map elements are not supported by many text based browsers. Lynx, for instance, does not support the image map element so the information is unavailable.

2. Often the information showing where to click an image map is contained within the image. People using

screen readers and other access devices that are designed for graphical user interfaces are presented with problem since what matters is where the image is selected, not simply that it is selected.

3. The image often contains words or graphical instructions within the image that the screen reader does not have access to.

4. The clickable surface must be navigated by a mouse making selections on the basis of what the image looks like.

It is important when designing sites that each hot spot on an image map element should have an alternate text field added. Browsers could be modified to Tab through the image map hot spots reading out the Alternate text and making image maps completely accessible.

Summary

This curriculum examines many of the barriers faced by blind and visually impaired attempting to gain access to information on the internet. It summaries the suggestions and guidelines that have been produced by various groups and organizations interesting making websites accessible.

This curriculum attempts to provide teachers and students guidance in their attempts to understand the problems blind and visually impaired individuals must overcome. In addition, the information and the sources cited will aid HTML authors as they attempt to increase the accessibility of their sites.

LESSON #1---Review of Websites

Project Description:

Low vision and blind students partner with sighted peers to write reviews of selected Web sites.

Objectives

Students will research, write and edit

Students will learn about the resources available on the Web

Students will be introduced to computer technology as a tool to create, compose, communicate and publish

Procedures

l. In small groups at the computer, work with students to teach the basics of navigating the Web. As an example, do a basic search of several Web sites.

2. Together with small groups, visit a few sites you have preselected. Explain the basics of using your browser to navigate the Web.

3. Hold a brief discussion. What makes a Web site good or bad? As a class, develop a list of criteria to use in judging the Web sites.

4. Schedule children in 30-minute intervals at the computer with your supervision to visit sites for review. Discuss the contents of the sites with the children as they navigate.

5. Assign children to write reviews of 3 selected sites each. The reviews must include:

      A. A brief description of the contents of the site
      B. An evaluation of the site

6. Exchange reviews with other teams

7. With your supervision, have the children visit interesting-sound sites reviewed by other teams in the classroom. Do they agree with the reviews ?

8. Collect all of the reviews and create a directory for your school of interesting Web sites that are handicapped accessible: Distribute your directory to all teachers.

9. Publish the results on the school Web site.

10. Have the students create an assessment tool for reviewing the sites.

Discuss:Is the site easy to use? Is it interesting? Easy to navigate? Does it follow the guidelines for accessibility set by the National Federation of the Blind?

Subject: Computer technology, language arts

Grade level: Grades 7 -12

Time frame:

Week 1-2-- Teach about the Web

Week 3-4-- Develop assessment tools

Week 4-5-- Research sites and write reviews

Week 5-6-- Create directory and Web site

How students will benefit:

Students will learn to analyze a web site to determine how user-friendly the site is for blind and visually impaired users.

Requirements:

All participants must: Critically examine a web site and write a discussion of the site.

Materials Needed: Computers with Web access

Children's Resources:

Online Kids A Young Surfer's Guide To Cyberspace, Preston Gralla, John Wiley & Sons, Inc., New York, l996.

Homepage An Introduction to Web Page Design, Christopher Lampton, Grolier Publishing, New York, l997.

Dave's Quick 'n' Easy Web Pages, Dave Lindsay, Bruce Lindsay, Erin Publications, Calgary, Canada, l999

Teacher Resources: Net Lessons: Web-Based Projects for Your Classroom, Laura Parker Roerden

Lesson #2

Students are introduced to the tools and etiquette of email by corresponding with keypals and maintaining a personal journal about their observations

Objectives:

Students learn to conduct correspondence via email

Students learn email etiquette

Students develop reflective writing skills

Procedures:

l. Post a Call for Collaborators soliciting keypals partners for the project

2. Based on responses, match each student with a keypal from another school

3.Each student writes an initial brief biography including: first name, age, pets, school interests, and hobbies.

4. Teacher consolidates information into one message and emails information participating school. Call the participating school to verify the information you receive.

5. Students begin journals in which they describe their experience with email correspondence.

6. Organize students into teams. Once a week, students read their journals to each other and discuss what they are learning

7. Continue to exchange messages and journal writings for at least 4 weeks

8. To conclude project, students write a goodbye message and a final journal entry about the project.

Timeline:

Week 1: Post Call for Collaborators soliciting partner schools

Week 2: Email procedures to all registered schools

Week 3: Exchange keypal messages. Write journal entries and discuss.

Week 4: Write goodbye message and final journal entry. Discuss final journal entry.

Subject: Language Arts

Grade level: Grades 7-12

Activity types: Keypals

Activity level: Beginner

Time frame: Ongoing

Materials Needed: Computer with email access

Lesson #3

Students create an accessible Homework Web Page on the school Website, so that parents and students can find details about that night's homework assignment

Objectives:

Students become more invested in their homework assignments

Parents become active members in their school assignments

Blind and visually impaired students will have access to Homework page

Procedures

1. Explain the project. Students and teachers together will create a place on the school's Web site where students and parents can find out the night's homework assignment. The center will be updated by students on a daily basis.

2. Teach students the basic of HTML. (See The Macintosh Internet Server Cookbook at http://web66.coled.umn.edu/Cookbook/MacContents.html) for tools and complete instructions for creating your site.

3. Create a schedule and process for a team to update the homework center daily with the class assignment. They will collect homework and tips to include on the site.

4. Supervise students updating the Homework Home Page site.

5. Check web assessability guidelines to determine if site is user friendly to disabled

6. Submit page to The Center for Applied Special Technology (CAST), to determine if the page is accessible.

Subject: Computer technology

Grade level: Grades 7-12

Activity types: Web Publishing/ Community Connection

Time frame: Ongoing

Materials Needed: Computer with e/mail Web access

Footnotes

l. "Web Content Accessibility Guidelines": World Wide Web Consortium (W3C), 1999. www.w3.org/TR/WAI-WEBCONTENT/.

2. "Guideline for Accessibility," National Federation for Blind, 1998, p.1

3. "Accessibility Guideline" Center for Applied Special Technology, l994, p.1

4. "The Workforce Investment Partnership Act," P.L. 105-220, August 7, 1998.

5. "Web Content Accessibility Guidelines": World Wide Web Consortium (W3C), 1999. www.w3.org/TR/WAI-WEBCONTENT/.

6. APH.org

7. TWA.com

Annotated Bibliography

Teacher Resources

Net Lessons: Web-Based Projects For Your Classroom, Laura Parker Roerden, 1997, Songline Studios, Inc. and O'Reilly & Associates, Inc., Sebastopol, CA Second Beginner's Guide to Personal Computers for the Blind, Diane L. Croft (Editor), National Braille Press, l997 A well-organized primer, this book presents an excellent summary of the problems blind individuals face when they attempt to access the internet. Web Style Guide : Basic Design Principles for Creating Web Sites, Patrick J. Lynch, Sarah Horton, March 1999, Yale University Press This book provides an interesting discussion of the overall process of defining the objectives and users of your Web site. It clearly illustrates how to make a site interface welcoming and efficient. High-quality illustrations show how to design for overall style and professional appeal Access to Information : Materials, Technologies, and Services for Print-Impaired Readers, Tom McNulty, Dawn M. Suvino, Amer Library Assn Editions, Booknews, Inc. , Portland, Or,

1993. This book outlines the diverse ways in which information can be made accessible to blind and visually impaired individuals. It provides a crash course in computer literacy, audio output systems, materials and technology for low-vision readers, as well as programs and services. Increasing Access to World Wide Web Sites for Blind and Visually Impaired Computer Users, Dena Shumila and Jan Richards, l997, National Braille Press. This is an informative book for individuals interested in exploring the design of websites that are accessible to blind users. The book discusses in detail the cooperation needed by screen reader developers, Web browser manufacturers, and HTML writers wishing to construct accessible websites. Children Resources

Online Kids A Young Surfer's Guide To Cyberspace, Preston Gralla, John Wiley & Sons, Inc., New York, l996. Homepage An Introduction to Web Page Design, Christopher Lampton, Grolier Publishing, New York, l997. Dave's Quick 'n' Easy Web Pages, Dave Lindsay, Bruce Lindsay, Erin Publications, Calgary, Canada, l999 Resources

Essential Net Novice Websites : Bright Starts for Bright Minds, a Webpointers Guide Kitty Williams and Robin Lind,1999 This is a well-written book which provides the novice with the information needed to construct a website that is interesting and easy to use. The Non-Designer's Web Book : An Easy Guide to Creating, Designing, and Posting Your Own Web Site, Robin Williams, John Tollett (Contributor), l998. Peachpit Press

This is a full-color guide for aspiring Web designers. The authors first explain how to browse and search the Web and then discuss how to plan and post a Web site. Basic design principles are introduced in this beginner's guide to creating appealing webpages.

The Alliance for Technology Access Web (http://www.ataccess.org/design.html) This site provides information on assistive devices, software, and the process for gaining access to websites by individuals with vision, hearing, and cognitive barriers. AWARE--(http://www.hwg.or/resources/accessibility/six principles.html)

--designed by the HTML Writers Guild provides six principle of Web design.

This site for Web authors is an introduction to web design that provides describes each principle as well as provides technical information.

The Microsoft site --(http://www.microsoft.com/enable/dev/web_guidelines.htm) This site provides guidelines for web page designers including suggestions on: constructing accessible websites without giving up usability or appeal, testing a accessibility, and providing alternate pages non-accessible pages. The IBM site (http://www.austin.ibm.com/sns/accessweb.html). This site has a section titled "Special Needs Systems" which includes features such as: a checklist for accessibility, tools for accessibility , links to additional resources and information on the W3C Web Accessibility Initiative (WAI). "IBM Home Page Reader" IBM Special Needs Systems. www.ibm.com/sns.

IBM's talking Web browser for blind and visually impaired users.

"Java accessibility guidelines and checklist": IBM Special Needs Systems. www.austin.ibm.com/sns/accessjava.html. This site contains detail guidelines for the Java environment. "Software accessibility guidelines": IBM Special Needs Systems. www.austin.ibm.com/sns/accesssoftware.html. This site contains general software guidelines. "Towards Accessible Human-Computer Interaction":mEric Bergman, Earl Johnson, Sun Microsystems, 1995.mwww.sun.com/tech/access/updt.HCI.advance.html. This paper discusses accessible user interfaces. "Experiences Implementing Web Accessibility Guidelines in IBM": Phill Jenkins, IBM, 1997. www.austin.ibm.com/sns/phillj.htm. This paper covers disabilities issues and older general accessibility guidelines. "List of Checkpoints for the Web Content Accessibility Guidelines": World Wide Web Consortium (W3C), 1999. www.w3.org/TR/WAI-WEBCONTENT/full-checklist.html. A checklist for Web content developers. Each checkpoint in the guidelines appears in this list, organized by priority and concept. "Techniques for Web Content Accessibility Guidelines": World Wide Web Consortium (W3C), 1999.

www.w3.org/TR/WAI-WEBCONTENT-TECHS/. This document includes techniques and examples that HTML and CSS authors may use to implement the guidelines and meet the checkpoints described in "Web Content Accessibility Guidelines". "User Agent Accessibility Guidelines": World Wide Web Consortium (W3C), 1999.

www.w3.org/TR/WD-WAI-USERAGENT/.

These guidelines cover the responsibilities of the browsers. "Authoring Tools Accessibility Guidelines": World Wide Web Consortium (W3C), 1999. www.w3.org/TR/WD-WAI-AUTOOLS/. This document provides guidelines to Web authoring tool manufacturers or developers. The purpose of this document is two-fold: to assist developers in designing authoring tools that generate accessible Web content and to assist developers in creating an accessible authoring tool user interface. Center for Accessible Technology http://www.el.net/CAT/access1.html '

Provides excellent information on adapting web browsers for accessibility.