No Special Equipment Required

The accessibility features built into the Windows and Macintosh operating systems make computers accessible for students with special needs.

By Walter H. Kimball, Libby G. Cohen, Deb Dimmick, and Rick Mills

Subject: Accessibility, special needs

Audience: Teachers, teacher educators, technology coordinators, library media specialists, administrators

Grade Level: K–12 (Ages 5–18)

Standards: *NETS•S* 1; *NETS•T* I (http://www.iste.org/standards/)

High school social studies teacher Cara Elena is teaching an interdisciplinary unit on mountains of the world. Students have begun to investigate how local tourism can be balanced with the protection of mountain environments and cultures by focusing on the Blue Mountains of Australia.

Cara Elena asked student teams to pretend they are members of the World Conservation Union, the world's largest conservation organization, and to develop a plan that considers natural resource conservation and local community involvement.

One student in the class, Zeke, has limited vision because of the effects of juvenile diabetes. He has difficulty seeing text and objects on the computer monitor. Cara Elena, using the Accessibility Wizard on a Windows computer, helps Zeke use the screen magnifier and adjust the size of fonts and objects, screen resolution, and contrast. Zeke is now able to contribute to his team as the students develop their plans.

Eighth grader Tracy is intently focused on a problem that she and the other members of her small group were trying to solve. Tracy's teacher, Duane Bunker, e-mailed a word problem to his students: find a secret location and the treasure hidden there. Each team was asked to read directions to the location, find it on a map, and communicate accurate directions to other team members.

Tracy has a reading disability. She has difficulty understanding written language. When presented with word problems, she is unable to read the text to solve the problem. Tracy used her Macintosh's built-in PlainTalk text-to-speech feature to read this electronic text aloud so she can receive the same information as her fellow students.

The proliferation of computers and other electronic learning devices has made knowledge and communication accessible to people with a wide range of abilities. But you do not always need to install and use special software programs or purchase separate equipment to make computers accessible. Many accessibility features are readily available in the operating systems (see the table on p. 14). A first step we can take is to make ourselves and our students aware of the built-in options immediately available on our computers.

Useful Features

Both Windows and Macintosh computers have accessibility options to help with many different special needs. We've grouped them to help you decide which are most important for your students. (*Editor's note:* You can also find Web sites to help you make your computers accessible under Resources on p. 15.)

There are different ways to set these options. The Windows Accessibility Wizard asks questions about accessibility needs and configures utilities and settings. Depending on the version of Windows, you can select options for persons who are blind or have difficulty seeing the screen, persons who are deaf or have difficulty hearing sounds, and persons who have difficulty using a keyboard or mouse. Once you start the Wizard, you must continue to the end for the settings to be put in place. When you select a category (e.g., visual, auditory), you see the menus that relate to it. Get to the Accessibility Wizard through the Start menu, under All Programs/Accessories. Mac OS X's Universal Access control panel (accessed under System Preferences) works in much the same way, but you do not need to run a full wizard

to ensure that your settings change—just make your choices and accept them as needed.

You can also use the Windows and Macintosh control panels to change specific settings. When we describe the specific options, we list the control panel you need to use.

Solutions for Visual Impairments

For students with visual impairments, choices may include adjusting scrollbar and window border size, desktop icons, contrast, and size and color of the mouse cursor and its blink rate. The small size of characters and icons and fine differences in shades of color make using the computer difficult for some people. Permitting larger border sizes, sharper color contrasts, and larger cursor size solves this problem.

If you choose to change these settings in Windows XP outside of the Accessibility Wizard, you should start by opening Accessibility Options in the control panel and using the Display tab. Here you can set contrast and colors to highlight the screen display. The high contrast tab enables high contrast colors to be used for backgrounds and fonts (e.g., black font on white background, white font on black background) to increase readability. Then you can use the Display control panel to change the size of the icons on the desktop, lower the screen resolution to enlarge all objects on the computer screen, and customize the colors. In Mac OS 7–9, use the Monitors control panel to change the resolution and the Appearance control panel to change the color scheme and type size. OS X users can open the Universal Access control panel to make these types of changes.

Both Windows and Macintosh computers include utilities that magnify portions of the screen to increase their visibility. In Windows,

use the Magnifier, under Programs/ Accessories/Accessibility. It follows mouse, keyboard, or text editing input to display a magnified portion of the screen. Mac OS X's Zoom feature magnifies the entire screen. Access Zoom from the Universal Access control panel. In Mac OS 7–9, the CloseView control panel is listed under the Apple menu. The Close-View control panel is not automatically included in Mac OS 7–9 system software, but may be downloaded free from Apple.

A blinking cursor can help people who need the flashing cursor to better see it on the screen. In Windows, find the slide bar to set the speed of the cursor in the Cursor Settings screen of the Accessibility Wizard or choose Mouse in the control panel. In Mac, find the cursor setting under the Apple menu in Control Panels, General Controls.

For students who rely on sounds to get information from computers, you can attach sounds to events, such as

file saving, file printing, and receiving mail. Use the Sounds and Audio Devices control panel in Windows. On OS 7–9 Macs, select the Sound tab in the Appearance control panel to turn on a soundtrack for various actions. Use the Universal Access control panel to make the necessary changes in OS X.

You can also set the computer to read the text of alert boxes. On Windows machines, open Narrator, under Accessories/Accessibility. You can then choose the different things you want Narrator to read. On Macs, use the Speech (OS 7–9) or Universal Access (OS X) control panels to turn on Talking Alerts. You can use the control panels in both operating systems to choose different voices and change the speed of the voice. In OS 7–9, you can also use the PlainTalk English Text-to-Speech (TTS) feature, which uses a digitized voice to read electronic text.

Finally, ToggleKeys enables a computer to provide sound cues when

the locking keys—Caps Lock, Num Lock, or Scroll Lock—are pressed. For students with limited vision, the indicator lights for these keys are not adequate signals. Turn on ToggleKeys in Windows through the Keyboard tab in the Accessibility Options control panel. We are not aware of a way to do this on a Mac.

Solutions for Hearing Impairments

Computers are very visual in their basic operation, which produces far fewer limitations for people with hearing impairments, than say, visual or motor impairments. However, sound-based alerts, such as a chime when you hit a key too many times for the computer to process, can be ineffective for students with hearing impairments.

If the student has some hearing, you might simply turn the volume up. In a classroom, however, this option might disrupt the rest of the class. In Windows, the SoundSentry allows you to change computer set-

Built-In Accessibility Features of Different Operating Systems

Feature	Mac OS 7–9	Mac OS X	Windows 95–2000	Windows XP	Disability Helped
Accessibility Wizard	No	No	Yes	Yes	Visual Hearing Mobility
Magnification	CloseView	Zoom	Magnifier	Magnifier	Visual
Contrast	Yes	Yes	Yes	Yes	Visual
Display	Yes	Yes	Yes	Yes	Visual
Text-to-Speech	AppleWorks PlainTalk	Universal Access AppleWorks TextEdit	No	Yes	Visual Learning Disabilities
Voice (Speech) Recognition	No	Basic	No	Basic	Mobility Learning Disabilities
Visual Alert	No	Flash Screen	SoundSentry ShowSounds	SoundSentry ShowSounds	Hearing
Audio Alert	Yes	Yes	ToggleKeys	ToggleKeys	Visual
StickyKeys	Yes	Yes	Yes	Yes	Mobility
Repeat/Filter Keys	Slow Keys	Slow Keys	FilterKeys	FilterKeys	Mobility
Mouse	Clicking Speed Visual Tracking Blinking Rate	Clicking Speed Visual Tracking Blinking Rate	Clicking Speed Visual Tracking Blinking Rate	Clicking Speed Visual Tracking Blinking Rate	Mobility Visual
MouseKeys	Yes	Yes	Yes	Yes	Mobility
Shortcut Keys	Yes	Yes	Yes	Yes	Mobility
Serial Keys	Yes	Yes	Yes	Yes	Mobility

tings to generate visual warnings, such as a blinking title bar or a screen flash, in place of sounds. When selected, the ShowSounds feature allows software programs that usually convey information only by sound to display text captions or informative icons. In Mac OS 7–9, when you use the Sound control panel to mute the alert volume, the system flashes the menu bar for sound-based alerts. OS X users will want to use the Universal Access control panel to use visual rather than sound-based alerts. You can also set alerts in application programs to be visual rather than auditory.

Solutions for Mobility Impairments
Students with impaired mobility may have trouble using the keyboard or mouse effectively.

To help these students use the keyboard, you can turn on Sticky-Keys and FilterKeys (Slow Keys on the Mac). These functions help with different issues. For example, some computer commands require you to simultaneously press two or more keys. Holding down two keys simultaneously presents a barrier to using the computer for students who don't have fine motor control. When a shortcut requires a key combination (e.g., Ctrl+V to paste on Windows computers), StickyKeys permits you to press one key at a time instead of pressing them at the same time. In Windows, access this through the Accessibility Options Keyboard tab. On a Mac running OS 7–9, open the Easy Access control panel to turn on Sticky Keys. In OS X, use the Universal Access control panel.

And, some students who don't have good fine motor control will strike keys repetitively. FilterKeys can slow the rate at which a key repeats when keys are pressed so that inadvertent repeated keystrokes are ignored. In Windows, turn Filter Keys on in the Keyboard tab of the Accessibility Options control panel. In Mac OS 7–9, use Easy Access to turn on Slow Keys; you can also set the level of delay, from short to long. In OS X, open the Universal Access control panel and use the Keyboard tab.

You can also set repeat delay and repeat rates for key presses. Repeat delay means there is a delay in the amount of time that elapses when a character repeats after a key is pressed. Repeat rate refers to the speed at which a character repeats after a key is pressed. Use the Keyboard control panel on both Windows and Mac for these settings.

For students who have trouble controlling the mouse, you can set the computer to allow students to use the keyboard instead of the mouse. In Windows, you can set this in the Mouse control panel or by pressing the Num Lock button. On an OS 7–9 Mac, open the Easy Access control panel and turn on Mouse Keys. You can set the speed with which the cursor moves when the number keys are pressed. On OS X machines, turn on Mouse Keys in the Universal Access control panel.

Finally, to help students who can manipulate the mouse but have trouble holding down the mouse button, you can set the computer to drag and highlight without holding the mouse button. In the Mouse control panel in Windows, turn on ClickLock to allow users to press the mouse button, then highlight without holding it down. The same effect can be accomplished on both Windows and Mac using the mouse and shift key. Click at the beginning of the desired selection. Shift-click at the end of the selection. Everything between those two points is selected.

Conclusion
In addition to the customization features described in this article, computer operating systems and software programs allow you to select your own fonts, character sizes, colors, volume controls, and other features. You may not think of these features as pertaining to accessibility, although those of us maturing with changing eyesight and hearing, for example, are quickly coming to the realization that these adjustments are helpful as we start to fiddle with them for ourselves. It is important for teachers and students, with or without disabilities, to be aware of the options and settings available so they can establish computer settings that best enable them to learn.

Resources
Alliance for Technology Access: http://www.ataccess.org
ALLTech: http://www.alltech-tsi.org
Apple—Special Needs: http://www.apple.com/disability/
Microsoft Accessibility: http://www.microsoft.com/enable/

Walter Kimball is a professor in the Teacher Education Department at the University of Southern Maine. He is the project director of Virtual Assistive Technology University (VATU), an online certificate program in assistive technology.

Libby Cohen is the executive director of ALLTech at The Spurwink Institute and Professor Emerita at the University of Southern Maine. She is a member of the World Wide Web Consortium's Web Accessibility Initiative Education and Outreach Working Group.

Deb Dimmick is the senior assistive technology specialist for ALLTech. She has an undergraduate degree in communication disorders and a master's degree in special education. Deb absolutely loves learning about and working with technology that improves the lives of people who have disabilities.

Rick Mills is a project manager in ALLTech at The Spurwink Institute. He has an undergraduate degree in communications and a master's degree in educational technology.

setsig *Cindy Anderson and Joan Thormann, representing ISTE's Special Interest Group for Special Education Technology (SETSIG), contributed to the development of this article.*