

Purchasing an Accessible Computer

MDE-LIO Assistive Technology Team

Overview

Many factors need to be considered when the acquisition of a computer for a student with blindness or a visual impairment is being planned. The first consideration is the person's capabilities. Will they need a larger monitor to deal with low vision or a keyboard with more prominent tactile features to help with keyboarding? The second issue to be addressed is the environment in which the device is to be used. For example, is portability an issue as when the computer is to be accessed at home and school? Finally, the question of what tasks need to be accomplished by the student needs to be examined before the specific assistive technology can be implemented.

It is suggested that the purchase of the computer be done after an evaluation has been performed. The assessment will consider the above factors and others such as the probability of future needs if the visual parameters change. This evaluation can be arranged by the school or possibly by a state agency.

Equipment

The following suggestions are general in nature and should not be considered a solution that will fit all needs. It is usually the case that student will be using the computer in different classrooms or using the device both at school and home. Therefore, a laptop computer is a good choice. The larger the screen with the best resolution (at least 1920 by 1080) in most low vision situations is a preferred choice. If a larger screen is needed, an external monitor can be used. For students with no functional vision, the sound output of the laptop is the main factor. The keyboard of most laptops, however, are poorly designed: The keys are cramped together and the function keys are not designed to be used with screen readers. An external keyboard is usually required.

The specifications of the computer are an important issue. Adaptive technology, whether it is a screen reader or magnification, demands more from a device than typical use. The memory, which is the ability to perform many tasks at the same time, is expressed as RAM. A minimum of 8 GB is recommended. The storage space used to store files, media, and programs should be at least 256 GB. The best performance is found in a solid-state drive (SSD), which has no moving parts. An HD, or hard drive, can be used as well and has the advantage of providing more storage space at a lower cost than an SSD. Finally, the processor, or "brain" of the computer, should be an Intel i5 processor or better. Other lower-end processors have not been found to be effective or usable.

There are several good brands of computers that can be purchased. Major brands include:

1. Lenovo
2. Dell
3. ASUS
4. ACER
5. Hewlett Packard
6. Apple

These companies have both a consumer and business product line of computers. Lenovo's consumer product is the Ideal pad, and the business product is the ThinkPad. Dell offers the Latitude and the XPS, which is their business line. The business lines will have better-grade hardware than a consumer device. One might consider buying directly from the manufacture, because the latest models will be available. The local stores usually stock older models with a limited choice of customization.

Operating Systems and Software

The operating system (OS) depends on the tasks that a student will be asked to perform. An OS is the basic instructions given to the computer to perform its functions.

I. Microsoft Windows

The latest Microsoft Windows system is Windows 10. Although not every large organization is using it, support for the older OS, Windows 7, will end in 2020. Windows systems, commonly called PCs, are used by most colleges, along with the Microsoft Office Suite for coursework.

The Chrome OS is used by a great number of K–12 schools. The accompanying Chromebook is a low-cost laptop that school districts have found to be very adaptable for students. However, a Chromebook is not as customizable for use by persons who are Blind or Visually Impaired. It does have magnification, color filters, and a text to speech function. The screen reader is called ChromeVox. These laptops have very little storage space as they are intended to be used with a Wi-Fi connection, and most file storage is done on a remote server (i.e., cloud storage). The Chromebook can be purchased with a touch screen, which can access apps from the Google Play store. The hardware requirements are somewhat different from the one suggested above. The processor, RAM, and storage are less critical, but buying a laptop in the middle price range is more desirable because purchasing one at a lower price point will not provide the best performance. Google Suite is the default productivity application and contains a word processor, spreadsheet, and presentation program.

II. Apple Mac OS

Another type of system commonly used is the Mac OS. This system is used by computers produced by Apple, Inc. Unlike with other manufacturers, Macs do not come in separate business and consumer lines. Rather, they are considered a business computer throughout their product line.

Apple computers are found in some schools and colleges, but not to any great extent in business settings. Apple offers desktop systems and laptops. The lower-cost laptop line is the MacBook Air, which offers a smaller screen size and longer battery life. The MacBook Pro offers more ports and larger screen sizes. Apple's desktop line has the iMac and Mac mini. The iMac is an all-in-one machine with various sizes of screens (21- to 27-inch screens) and an integrated keyboard. The Mac mini provides only the console and monitor. The keyboard, and mouse must be purchased separately.

The Mac OS comes with a built-in screen reader and magnification features. Unlike a PC, no additional access technology is needed. It integrates well with an iPhone or iPad. The productivity suite is free to download to the device and contains Pages, a word processor; Numbers, a spreadsheet program; and Keynotes, a presentation program. The Microsoft Office 2016 suite can also be used on a Mac with VoiceOver, a text-to-speech reader and default accessibility tool for the Mac.

Accessibility Software

I. Microsoft Windows

Magnification software is valuable for those who have a large amount of functional vision and even for students using screen readers. These applications can magnify elements of the screen, provide color and contrast enhancements, and provide tracking to center the focus in the middle of the viewing area. In addition, the mouse pointer and text cursor can be optimized in various ways.

Magnification programs can be used without speech or with speech/reader functions. The choice will depend upon the degree of magnification needed and if the student can read longer text items visually or needs a reader function for efficiency or comfort. If the student has less functional vision but would benefit from the ability to locate certain elements, magnification programs can be paired with compatible screen readers. The decision should be guided by an accessibility assessment performed by a professional.

ZoomText is a magnification app originally produced by Ai Squared and is now a part of Vispero. It can be used on a PC. The app has all the functions mentioned previously and provides for a great degree of customization. In its latest version, ZoomText can be paired with Jaws 18 or later versions of the JAWS program.

A relatively new product is Fusion, offered by Vispero. It was designed to meet the needs of students who may progress from a low vision situation using magnification to a need for a less visual approach with a screen reader. The program comes with ZoomText, JAWS, and Fusion, which are loaded to the computer. The user can run a magnifying app, a screen reader, or the Fusion application, which combines magnification and a screen reader. In this configuration, ZoomText handles the visual parameters and JAWS handles the reader/speech functions.

All three types of operating systems have a native magnification function. They may be useful for those needing a small degree of magnification. However, there is less contrast or text resolution, and tracking is far less implemented than third-party programs such as ZoomText.

II. Screen Readers

Screen readers are programs that read the content of a computer screen to a user. These programs allow for reading of text, access to app controls, and navigating web elements. There are three categories of text-to-speech readers:

- Paid
- Open source
- Built-in apps

Paid Screen Readers

One of the most popular paid screen readers, made by Freedom Scientific, is JAWS (Job Access with Speech). The program has been available for the PC since before the Windows 95 operating system. It is highly customizable, with some choices including different voices in various languages and speech engines, editing/formatting features, and types of navigation. JAWS is updated every year to keep pace with new developments in Windows and the Microsoft Office Suite.

Open-Source Screen Readers

An example of a free open-source screen reader is Non-Visual Desktop Access (NVDA). NVDA has been developed and used for at least ten years. The developers depend on grants and contributions to continue to support NVDA. Although it is not as feature-rich as JAWS and has less direct technical support, it can be used on a separate thumb drive on multiple computers without installing the program on the computer itself. Various add-ins and features can be added to the base program, which can be downloaded from the NVDA website (nvaccess.org). The site also offers training manuals, which are well-written, for purchase. The manuals can assist in learning the application's basic features as well as working with Microsoft Word and Excel. The program can provide an alternate screen reader if the primary one fails.

Built-in Screen Readers

The main native or default screen readers are Narrator for Windows, ChromeVox for Chromebook, and VoiceOver for the Mac. Macs and Chromebooks are not able to run any screen reader other than their default applications. VoiceOver, which is also used by the iPhone and iPad, is very accessible and usable. It has excellent support by Apple, which offers an accessible help desk. A drawback to the Mac version of VoiceOver is that multiple keys are required to perform some operations.

ChromeVox is less developed than VoiceOver but can perform most needed functions. ChromeVox tutorial videos are available on YouTube for those who need help.

Narrator has been aggressively developed in the last few years, and it seems to be moving closer to a full function accessibility tool. It can be used to help set up a new computer and as a back-up when the primary screen reader fails. The [Microsoft website](#) offers several tips for using Narrator as well as a support section.

Best Computers for Accessibility

The computers below were picked by MDE-LIO's Assistive Technology Team as being the best for accessibility.

All of the computers are business class, except for the consumer-class Dell Inspiron and Chromebooks. Business class provides for a higher grade of hardware and ease of repair, especially for the ThinkPad line.

Dealing directly with the manufacturer generally allows for the newest computer and the ability to customize the device. However, this is not always possible. An estimated retail price is included with each computer below.

Apple computers are much more expensive than comparable Windows PCs, but they come with excellent support and a very usable built-in screen reader and magnification features with high-resolution screens. Windows is progressing with built-in accessibility features but is not quite as far along as Apple.

I. Chromebooks

1. ASUS Flip C101 10-inch convertible laptop, \$286 at Amazon
2. Samsung 3 11.6-inch laptop, \$300 at Samsung.com
3. Acer Spin 2-in-1 15.6-inch laptop, \$360 at Best Buy

II. Windows

1. Lenovo ThinkPad E580 15-inch laptop, \$611 at Lenovo.com
2. Dell Latitude Vostro 14 Model 5000 laptop, \$850 at Dell.com
3. Dell Inspiron 14 7000 laptop, \$700 at Dell.com

III. MAC

1. MacBook Air 13-inch laptop, 8 GB RAM with upgrade to 256 GB storage, \$1,400 at Apple.com
2. MacBook Pro 15-inch laptop with touch bar, 16 GB RAM with 256 GB storage, \$2,400 at Apple.com

Operating Systems and Software

Many factors need to be measured before a purchase of a computer. The first step in the process is a thorough evaluation of the student by an accessibility expert. Factors such as the student's capabilities, environments, and the tasks to be completed need to be assessed before specific technology can be applied and purchased. This will prevent frustration and unnecessary costs.