

## Purchasing an Accessible Computer

### Authors:

Joe Todd, MDE-LIO Assistive Technology Team Instructor  
Pat Love-Sypho, MDE-LIO Education Consultant

### Overview

Many factors need to be considered when planning to buy a computer for a student who is Blind or Visually Impaired (BVI). The first consideration is the student'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 is the environment in which the device will be used. For example, is portability an issue if the computer is to be accessed in an educational setting? Finally, the question of which tasks the student needs to accomplish must be examined before assistive technology can be used.

Purchasing a computer should be done after an evaluation has been conducted. The assessment will consider the above factors and others, such as the probability of future needs if the student's visual parameters change.

### Equipment

The following suggestions are general in nature and should not be considered solutions that will fit all needs. We can assume students will use the computer in different classroom environments or will use the device at both school and home. Because of this, a laptop computer is a good choice. A larger screen with the best resolution (at least 1920 by 1080) is preferred in most low-vision situations. If the student needs a larger screen, an external monitor may be used. For students with no functional vision, the laptop's sound output is the main factor. Most keyboard 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.

An important issue is the computer's specifications. 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. A hard drive (HD) 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.

Several good computer brands exist on the market. Major brands include:

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

These companies have both consumer and business product lines. 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. Business lines will have better-grade hardware than consumer product lines. Local stores usually stock older models with limited customization.

## Operating Systems and Software

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

### Microsoft Windows

The latest Microsoft Windows system is Windows 11. Support for the older OS, Windows 10, will end in 2025. 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 individuals who are BVI. 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.

### 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. The keyboard, monitor, 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 suite can also be used on a Mac with VoiceOver.

## Accessibility Software

### Magnification

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 on the degree of magnification needed, and if the student can read longer text items visually, or if they need 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 assistive technology assessment performed by a teacher of the visually impaired or an assistive technology specialist.

ZoomText is a magnification app that was 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, also 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.

### 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 and intuitive paid screen readers, made by Freedom Scientific, is Job Access with Speech (JAWS). 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](http://nvaccess.org) (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 features for 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](http://microsoft.com/en-us) (microsoft.com/en-us) offers several tips for using Narrator, as well as a support section.

## **Conclusion**

Many factors need to be measured before purchasing a computer for a student who is BVI. The first step should be a thorough evaluation by an assistive technology expert or teacher of students who are visually impaired. Factors such as the student's capabilities, environments, and anticipated tasks will need to be assessed before a specific technology device can be applied and purchased. This will prevent frustration and unnecessary costs.