EBooks and Accommodations

Is this the future of print accommodation?

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EBooks are forms of electronic text containing many features that can be classified as accommodations. The eBook itself has three different components: an eBook file, software to read the eBook, and a hardware device to read it on, such as a computer, laptop, or handheld device. EBooks are available through online libraries, bookstores, or can be created from common forms of electronic text with readily available programs. Ebooks are often available free. Accommodating features that some eBooks currently have include ease in portability, lightweight (in comparison to other texts), adjustable text size, highlighting, bookmarking, note taking, interactive dictionaries, and even reading aloud. By using these features instructors can create pre-accommodated eBooks for student reading that can include items such as advance organizers and reading guides. The article includes a description of how a sample book was adapted, along with locations for resources.

EBooks and Accommodations

Reading is considered to be one of the basic activities in all educational situations, and as such it is one of the most common activities requiring accommodations or modifications for special needs students. Electronic text and the eBook are tools that can provide many possibilities for assistance with reading. Consider using eBooks for students with special needs by taking advantage of eBook's abilities and functions that are already built in and creating methods for additional accommodations. EBooks are an effective resource to meet the needs of many students.

EBooks

The term eBook is often used as a general category descriptor for the three parts needed to use eBook. The hardware of an eBook, often called a reader or eBook reader, can take the form of a portable reading device, a handheld computer or other PDA on which the book files are stored. It can also be a desktop or laptop computer that is running a software program that displays the "book" on its screen. The reader software, which is often built into the operating system of many handheld computers, is a program that displays the book file on a Personal Computer (PC) or reading device, and provides navigation controls, annotation features and other display functions. The electronic book files, are data files that make up the content of the book. The eBook file, which is read by the software and displayed on the device, contains all of the document's text, pictures, and other information.

Today there are many online libraries and online bookstores that distribute, for sale or for free, electronic books, documents, articles, newspapers and other forms of text (Figure 1). These text documents are usually downloaded through the internet to the reading device. While various competing formats of eBooks exist, the capabilities of eBook readers and the creation programs for creating eBooks have developed and improved. Initially an eBook was a single web page (usually pure text) that was read by scrolling. Today's eBooks, some of which are still published in "classic" pure text or HTML formats, have exceeded that single long scrolling page design, and can present the text in a much more user-friendly style. These newer eBooks and readers

Figure 1. Blackmask, an online library (www.blackmask.com)

can display book content page by page in a standard portrait orientation, allow users to adjust text size, remember where the user stopped reading, allow readers to take notes within an eBook, add color highlights, automatically look up words on a page, and may even read the book aloud. To read eBooks no longer requires an active internet connection as the eBook files can be stored and read on laptops, handheld devices, and desktop computers. The variety of readers and the ability of eBooks to be stored on handheld devices allow readers (the people) to access eBooks anywhere. It is possible for a person to carry his or her own personal library in a pocket for access anytime, storing the eBooks on a computer chip (Figure 2).

According to CAST (Center for Applied Special Technology), in order "to reach learners with disparate backgrounds, interests, styles, abilities, disabilities, and levels of expertise," educational materials should be flexible and adaptable for all learning styles (1998). The modern eBook and reader appears to meet those conditions. Studies have identified advantages for struggling readers in using electronic text technology applications because of the nature of electronic text over paper-based text (Reinking, Labbo, McKenna, & Kiefer

1998). Electronic text can provide scaffolding advantages for students that include voice output, interactive dictionaries, and note taking to assist in achieving learning success (Anderson-Inman & Horney 1999). Limitations inherent in standard paper-based print text can present barriers for dyslexic and visually impaired students. The use of eBooks makes information more accessible to students with disabilities; material in digital form offers many advantages and accommodations for students with or without disabilities.

EBooks: Educational Applications

Using eBooks for reading is often no different from using paper based material.

Figure 3. Single page display when maximized to full screen.

The electronic text can take many forms, including books, documents, articles, reading lists, and reference files. The eBook files can be distributed to students through storage media, such

Figure 2. Library feature displays all currently available books on a device

Figure 4. Microsoft Reader

Figure 5. Adjusting font size and appearance to most comfortable setting.
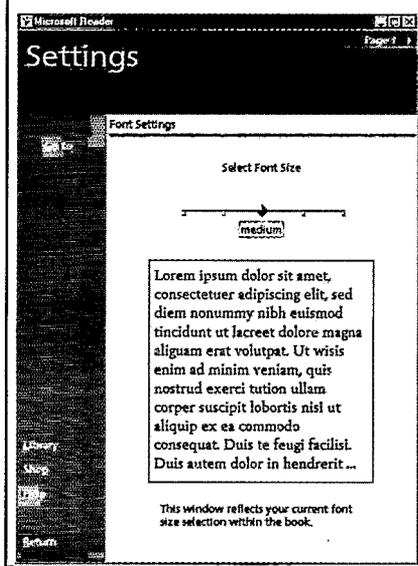
as floppy disks and CD-ROMs or sent directly to students through e-mail or made available online through the internet. Teachers can compile electronic versions from newspapers, journals, books, documents, and notes and easily convert them into eBook formats using conversion software.

Many textbook publishers are now making electronic text versions of their books available, which can be then used with special needs students. Many classes require reading books, other than "textbooks." In an analysis of Florida's high school literature reading list, it was found that over forty percent of the books on the list were currently available as eBooks, many of them at no cost. There is also a growing trend in education to move from textbooks to that of real world authentic information sources, such as primary sources in social studies and trade books in language arts. For these purposes, eBooks are already available, For example in social studies, the CIA's world fact book (www.cia.gov) contains information on every country in the world today, and all of the inauguration speeches of every United States president are available as eBooks at Blackmask (www.black-mask.com). For language arts, all of Shakespeare's works and other works of classic literature are available, along with numerous out-of-print works and

special collections, such as the University of Virginia's E-Book Library collections of African American, Native American, and women writers.

There are numerous advantages to creating the eBook files. First, once the material has been converted to the eBook format it cannot be changed by a reader, keeping the book files clean. While the book file can not be changed, eBook readers create associated files that track and display where a reader is reading in the book, allow note taking and highlighting, displaying the material in a portrait format that is easily read, and even go so far as to block out the rest of the screen, which may be acting as a distractor (See Figure 3). The next advantage is file size, as eBook software programs and book files were designed to work on handheld computers, keeping file size down. An example of the size issue can be readily seen by comparing file sizes of the classic *Tarzan*, by Edgar Rice Burroughs. As a pure text document *Tarzan* has a file size of 469 kilobytes, as a MS Word document the same book takes up 1.04 megabytes (1040 kilobytes), but as an eBook in the MS Reader lit format it only occupies 237 kilobytes. Because of the smaller file size it is possible to store more books in a given amount of computer memory. Within the classroom environ-

Figure 6. Adding a bookmark to an eBook to return to specific pages (the red flag on the page edge)
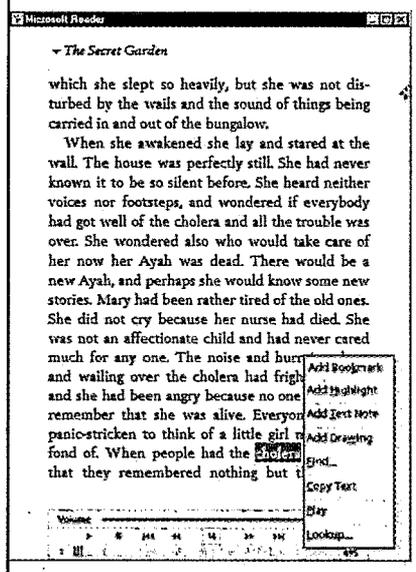
ment, it is necessary that students have access to desktop, laptop or handheld computers. With their current size, battery, memory, and display technology, the use of handheld devices adds a degree of mobility and access to texts and references that was never before possible. Many handheld computing devices can now run for over 10 hours on one charge, weigh less than 2 pounds, and can carry gigabytes of storage. Even in situations where students do not have access to handheld, eBooks can be used on desktop or laptop computers. The eBooks and readers allow

Figure 7. Using the text-to-speech feature.
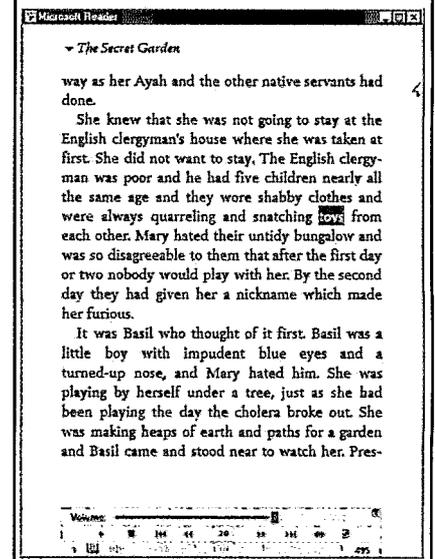
the creation of personal reference libraries for students, allowing constant access to educational resources.

EBooks come in a variety of formats, some of which are specific for certain computer platforms and hardware devices while others are cross-platform. HTML or text based eBooks can be used in standard browsers where users can adjust text styles, sizes, and colors. With HTML or text it is possible for students to search within the eBook and to copy-and-paste selected text to other programs. Other formats include Adobe PDF, Rocket, Palm, MS Reader, Mobi, and eBookMan.

EBooks: Making and Finding

Many tools are available at no cost that can convert existing electronic text mate-

rial into eBook formats. One application available as a free download is a plug-in for Microsoft Word that allows users to convert any document from Word to the MS Reader lit format. Another program, ReaderWorks, will also convert documents, text, web pages, and books into the lit eBook format (OverDrive 2002). Programs are available for the other eBook formats as well.
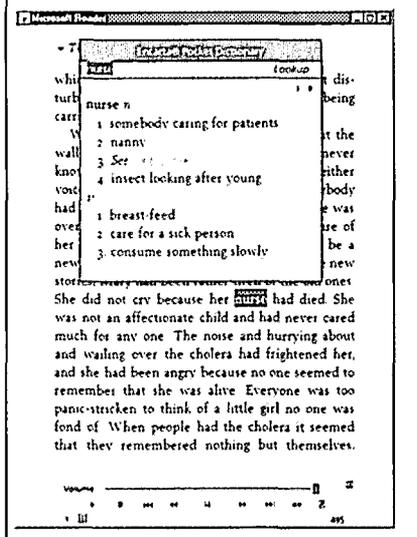
Currently there are numerous online libraries and bookstores that freely distribute or sell eBooks. The books range from public domain, copyright free texts that include classic literature, government works, science, and philosophy to current bestsellers. Michael Hart, the director of Project Gutenberg, an online free library that stores books in text format, predicted that, "The number of e-books available for free download on the Net will pass 20,000" (Rose 2002) and that in the "next 10 years that number will increase to 18,000,000 eventually covering virtually every work in the public domain" (Hart, 2002).

EBooks: Advantage Features

The model of eBook that I have found to have the greatest number of features for ease of use and most advanced in interactive abilities is the Microsoft Reader eBook (Figure 4). MS Reader uses a display format called "ClearType" which makes text displayed on a screen look like words in a printed book (Microsoft 2001). Some other features of MS

Reader include a graphic that displays a location within the book and a navigation system that remembers where the user stops reading and the last place that was viewed allowing for instant return. The text is adaptable allowing users to select from a variety of sizes and font styles to set the most comfortable display for the user. The MS Reader eBook also creates an annotation file that stores reader-created bookmarks, highlights, drawings, notes, interactive dictionaries. It also allows for searching within the book for specific words and

Figure 9. Multiple color highlighting.
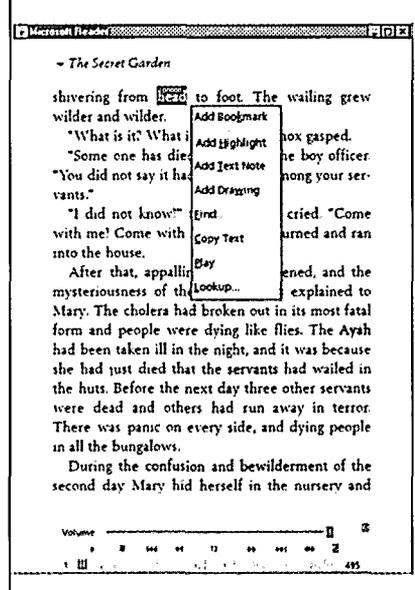
phrases. Along with these interactive features, the page display of the eBook itself is well designed, including margins to increase reading comfort, and a portrait page layout that displays a whole page at a time (no scrolling), with the option to black out the rest of the computer screen. While this eBook program may be the most user-friendly eBook available today, other similar formats are sure to follow.

EBooks have features that traditional paper books do not. Users can control the look and feel of the eBook by changing the size of the text (Figure 5), writing and saving notes, highlighting text, bookmarking pages (Figure 6) and adding drawings. Another advantage is the size and weight of the eBook. The amount of text in an eBook takes no additional

space and adds no additional weight to the book, making handheld reader versions highly accessible due to their portability. The only limit to the number of books that can be put into a reader is the amount of memory available. Recent studies have found that the average middle schooler's backpack weighs over 20 pounds (Petracco 2001), and many students with physical impairments are unable to carry that amount of material. The ability to carry books, references, notes and other resources electronically allows users to make better use of the information, along with the additional just-in-time learning advantages of options like the interactive dictionaries.

EBooks: Built in Accommodations

Ebooks can serve as an accommodation for a student with special needs, providing the tools, techniques, and support system for the student to work around the limitations related to his or her disability. Handheld devices are touch screen-based with eBook keys usually controlled with a single finger or stylus, which may be needed by students with physical disabilities. Many formats, such as MS Reader for the desktop or laptop also have text-to-speech capabilities, and manufacturers are currently developing handhelds that have the same features (Figure 7). Research on students with reading disabilities found that comprehension improved when

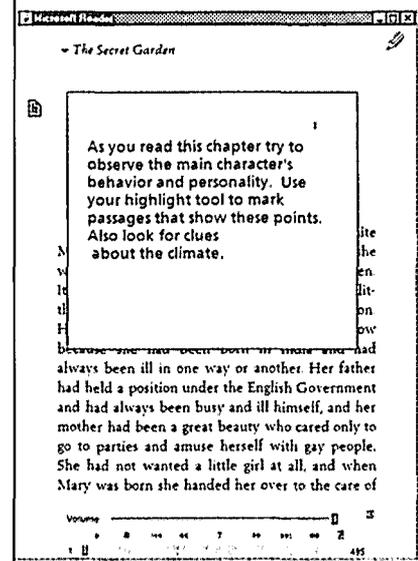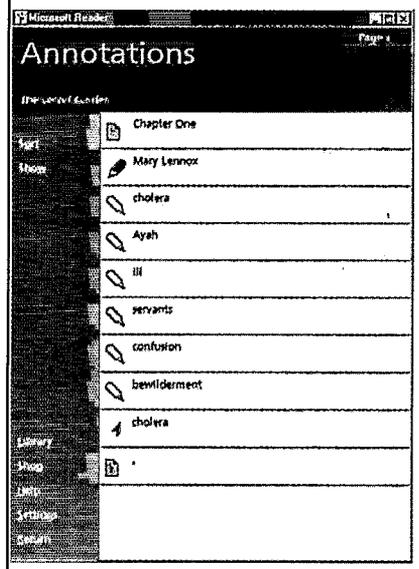**Figure 10. Placing notes or comments within an eBook.**

text-to-speech is combined with reading (Leong, 1995; Montali & Lewandowsi, 1996; Raskind & Shaw, 2000). Users can control the speed at which the eBook is read. Research findings suggest that student control of text-to-speech speed while they read increases performance. Findings state that some students benefit from a slower text-to-speech reading speed, while others comprehend better at faster rates (Skinner et al., 1995).

A component of the text-to-speech feature is synchronized highlighting of the text being read. Speech with highlighting can aid the student in recognizing the structure of written language. Students can also highlight words that they find difficult to decode, and have the program say the word aloud. Spoken word support has been found to improve reading comprehension for students with reading difficulties (Wise & Olson, 1994). The highlighting feature has the additional advantage of assisting students in learning proper scanning techniques for reading, as the highlight starts at the top right and then progresses across and down the page, then going to the next page and starting again. This "page turning" effect is usually not available in other document formats, such as web pages or word documents, where the highlight moves down the page but then

remains on the same line location as the text moves up.

An additional feature is the interactive capabilities of an eBook. The ability to highlight text sections, take notes, or even add drawings can increase a student's comprehension of a given work. EBooks can have interactive dictionaries that allow users to select any word within the eBook and get a definition instantly, have the definition read aloud, or look up an instant translation to another language (Figure 8) This can help students who are developmentally or language disabled. The ability to change the displayed text size can provide a necessary accommodation, as larger text size can assist students who have vision problems or motor disabilities that affect eye movement.

EBooks: Creating Accommodations

Using an annotation file, an instructor can pre-highlight sections of an eBook (in multiple colors) to assist readers (Figure 9). Advance organizers or notes can then be created to assist with reading, where notes may provide clues, hints, questions, or guides (Figure 10). It is possible to create and add concept maps as drawings into the annotations file. Instructors can create specialized dictionaries that use simpler language, context, or foreign languages, to identify this dictionary as the current interactive dictionary. If you are creating an eBook you can include extra blank pages to display extra images, concept maps or notes. Once you have created an annotation file for the eBook on your computer you can distribute it along with the book file so that special needs users will have the annotations when they start reading their eBook. This file can be distributed as often as needed to as many users as desired.

EBooks: Sample Accommodation

To exemplify the process of creating an eBook with accommodations, a recent project in which a book was adapted for a special needs student is presented. The project involved adapting a book from the state required reading list, *The Secret Garden*, by Frances Hodgson Burnett. The book is often used as multidisciplinary text for language, science, and health.

When adapting the book, I first faced the question of whether I wanted to create an eBook file or use files that already existed. As the book is in the public domain and therefore copyright free, I found numerous copies available in the eBook format from online libraries such as Blackmask (www.blackmask.com), that distributes eBooks in multiple formats including the MS Reader format that I desired. While all the copies of *The Secret Garden* eBooks I found were usable, they didn't contain all the features I wanted to include. Instead, I decided to create my own version by downloading a text-only version of the book and then adjusting the book with a web page editor program. Adding a small amount of HTML code to the book file allowed me to insert page breaks to cause each chapter to start at the top of a page.

A new eBook was created to add a few additional sections and components. In several chapters I added pictures in the public domian from a variety of sources to create an associated image for the chapter, and created concept maps for the characters and storyline. A readers' guide and story outline file were also created to be associated with, but not inserted in the text. The program ReaderWorks was used to create the eBook lit file. This process also created a "clickable" hyperlinked table of contents for each chapter, image and associated file. Using the table of contents a student can quickly jump to any chapter or call up in a "pop-up" window the associated reader guide, outline, or any of the concept maps that had been created. With the book in the eBook format, additional
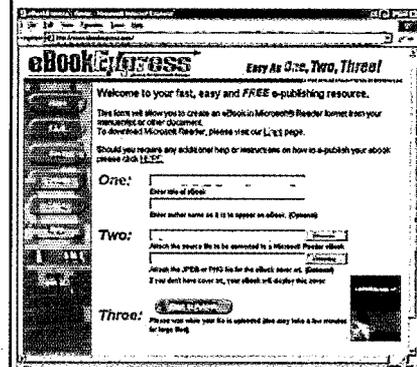
Ebook: Resources

Microsoft's Reader, interactive dictionaries, and text to speech engine are available from Microsoft Corporations at http://www.microsoft.com/reader in the download section. This section also includes the MS Word plug-in that can create MS Reader files from Word doc files or HTML files.

MS Reader is usually included as part of the operating system of handheld devices that run operating systems based on Windows, including Windows CE and Pocket PC.

ReaderWorks standard is available at http://www.overdrive.com. An online version of ReaderWorks called eBookExpress is available at http://www.ebookexpress.com/ where you can upload a document file (.DOC, .RTF, .HTM/.HTML, XML, .TXT, .WPS, .WPD, .WRI and ASCII as source files) to the site, it is converted and then it is made available as an eBook (.lit) file for you to download (Figure 12).

You can download the eBooks and annotation file that I created for The Secret Garden at http://www.drscavanaugh.org in the educational resources section.

modifications were developed. For each chapter I highlighted passages or components where the special needs student might have difficulty. Highlighting sections in different colors provided additional direction. I also added an advanced reading organizer for the chapter that the student would read before starting the chapter, and a set of summary questions at the end of the chapter were added. Questions were added to the book as annotations and were indicated on the page with a non-intrusive mark in the page margin. When the annotation mark is clicked or tapped, a pop-up window appears with the content. Students can add their own notes, questions and answers to the note box. I also added bookmarks for passages that related to specific topics, such as science. Students, while reading the book, can add their own bookmarks to indicate pages where they wish to return or will need assistance for discussion later. The collection of annotations, both instructor and stu-

dent created, becomes an associated file that students can access through a hyperlinked "annotations table of contents" any time they wish (Figure 11). Students receive the associated annotations (.ebo file) with the eBook file (.lit file,) and these files are placed on the student computer hard drive in the My Library and Annotations folders within the My Documents folder. This process allows the teacher to keep a master copy of the eBook file and distribute as many copies of the book and its annotation file as needed to the students, and to share the file online with any other student or teacher who wishes the modified eBook.

Conclusion

Today's eBook technologies have features valuable for learners with various abilities, languages, and special needs. The unique features and capabilities of eBook technology can provide accommodations such as variable text size, text-to-speech, and interactions that many students need to be successful with text-based materials. The availability of this text format is increasing and many consider that electronic text will be the future of print. Today's desktop, laptop, or handheld computers with eBook software can assist teachers to provide their students with access to text information that utilized features of universal access design concepts, and text that provides for increased interactivity with the text itself.

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