
The Accessibility of E-learning Systems for Disabled

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Abstract

This paper provides an overview of conditions which discriminate the use of regular e-learning systems by disabled individuals. It also offers information about solutions on the side of provider and teacher which can be categorized as software or application solutions and hardware or assistive technology solutions.

Key words

Disability, Disabled, E-learning, Accessibility, Assistive Technology, Education

JEL Classification: J10

Introduction

Nowadays many teachers, assistants, trainers and practitioners at secondary and university educational institutions and departments of company education realize that e-learning applications need to be available for students and employees with disabilities. They, however, find it hard to make this really come true. In this article we focus on the main factors contributing to the situation and provide an overview of the solutions.

1 Disability prevalence

In 1981, the WHO estimated the worldwide disability prevalence rate at 10 %. This estimate was modifying in 1992 to 7 % for industrialized countries and 4 % for developing countries (Bohman, 2010). Developing countries usually report much lower disability prevalence rate. One reason for the gap between developing and industrialized nations is a matter of interpretation – higher sensitivity to disability issues in more developed countries, other is caused by higher mortality among children with disabilities in developing countries, and the extended life expectancy in many industrialized nations which allows time for more people to reach advanced ages and develop age-related disabilities.

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2 E-learning and e-learning market

E-learning is often used as a unifying term to describe the fields of online learning, web-based training and technology-delivered instruction (Seale, 2006)

The market power of e-learning is strong and growing – according to Global Strategic Business Report worldwide revenues in the e-learning market exceeded \$17.5 billion in 2007 and were expected to exceed \$52.6 billion by 2010. A previous report published similar numbers for the U.S. alone, estimating the 2006 U.S. e-learning market at \$16.8 billion, and predicting a rise to \$52.3 billion by 2011. These recent estimates represent a significant increase from earlier estimates of worldwide e-learning revenues of \$2.1 billion in 2000 and \$5.0 billion in 2001 (Bohman, 2010).

3 Disabilities and e-learning

In the last few decades, there is a significant rise of digital format usage and e-learning systems for training in the workplace and for educational purposes in general. On the positive side, digital formats present the opportunities for people with certain types of disabilities to access instructional content independently, while non-digital formats have generally required the intervention of another person. In many cases, special assistive technologies (e.g. specialized computer software or hardware) are necessary to accommodate the needs of the person with the disability, but once these are in place, the person can use the computer without help from another person. On the negative side, digital content is not automatically accessible to people with disabilities, or to the assistive technologies they use. If the developer does not purposely make the content accessible, it will likely present at least a few difficulties for people with disabilities. In some cases, the content is completely inaccessible.

Ensuring the accessibility of e-learning requires interdisciplinary intervention in multiple areas, including computer science, usability and human-computer interaction, interface design, instructional design and management, policy and protocols, assistive technologies, community consumer advocacy, and end-user training.

4 Disabilities and e-learning problems and solutions: an exploratory study

A research by Fichten (et al, 2009) investigated the main problems disabled students (of many Canadian postsecondary institutions) experienced when studying an e-learning course.

The most common impairment (41 %) noted by students was a learning disability, followed by mobility impairment (23 %), ADD/ADHD (21 %), psychological/psychiatric disability (17 %), health or medically related impairment (16 %), deaf or hard of hearing (13 %), difficulty using hands and/or arms (12 %), visual impairment – low vision (11 %), neurological impairment (11 %), speech or communication impairment (3 %), blindness (2 %).

One hundred thirty-nine students who participated in the research (62 %) indicated that they required adaptive technology (i.e., adaptive hardware and/or software) to use e-learning effectively (e.g., software that improves writing quality, screen reader, dictation software). The adaptive technology used in the order of frequency of usage was: Software that helps with writing (e.g., Inspiration, WYNN), Software that reads what is on the screen (e.g., JAWS, ReadPlease), Scanning and optical character recognition (OCR – both specialized products for students with visual impairments, such as Open Book, and general use products such as OmniPage), and Voice dictation software (e.g., Dragon Naturally Speaking), Software that magnifies what is on the screen, Large screen monitor, Adapted mouse, Adapted keyboard, or Refreshable Braille display.

The U.S. national study found that averages of only 42 % of academically oriented high school students with visual impairments were using the high-tech assistive technology. The study also found that the use of assistive technology significantly predicted the likelihood of youths eventually getting paid jobs (Kelly, 2011).

5 Disability and assistive technology

Different disabilities require varied assistive technology, attitude, and accommodations in order to make e-learning systems available for wider range of disabled individuals. In following paragraphs (Georgia Tech Research Corporation, 2006) we mention the most frequent disabilities and clarify what can be done to make e-learning more accessible.

5.1 Individuals with learning disability

According to the National Institutes of Health, one in seven Americans has some type of learning disability. The most common types of learning disability involve difficulties with basic reading and language skills. Approximately 80 % of students with learning disabilities have reading problems.

Many specific learning disabilities exist – each with its own set of limitations and requirements. Still some general suggestions for accommodations include:

- Keep to the display of information uncluttered and/or the layout consistent from one page to the next.
- Minimizing and making clear references to spatial information and/or directions in text-based material.
- Utilizing search databases that allow for spelling errors, either by accommodating spelling approximations and/or suggesting alternative or intended spellings.
- Defining organization and expectations in method of format of data presentations, such as a course outline, assignment or project directions; or webpages with clear or marked navigational links and menu bar.

- Offering programs, software, etc. that support any of the assistive technologies implemented by individuals with learning disabilities, such as audio-taped books or talking browsers.

5.2 Individuals with mobility impairment

A study by the National Center for Education Statistics shows mobility impairments is the second most common type of disability among students enrolled at 2-year and 4-year postsecondary educational institutions. The term mobility impairment refers to an expansive range of disabilities from stamina limitations to complete paralysis and include, but are not limited to, disorders of the skeletal, respiratory, neuromuscular, cardiovascular, and pulmonary systems. Some of the most common causes for mobility impairments include spinal cord injuries, cerebral palsy, multiple sclerosis, and muscular dystrophy.

Individuals with mobility disabilities will demonstrate a wide range of physical abilities and thus, will use an array of assistive technology devices and software to facilitate computer access. Some may use alternative technology while others may be able to use standard input devices, but lack the fine motor control required to select small buttons on the screen. Examples of alternative technology include:

- Use of a joystick, trackball, speech input.
- Keyboard adaptations, such as a tongue touch keypad, key guards, and alternative keyboard software applications. Be aware that some alternative keyboards (i.e. Intellikeys) plug into the serial ports of any computer, while other devices (i.e. Unicorn Expanded Keyboard) require additional equipment.
- Acceleration techniques that allow the user through keystrokes to input a predefined shorthand version of a word or phrase which is expanded by the computer into words. Some programs such as Word and Excel provide the option to create "Macro Commands".
- Word lists or word prediction where the initial letter(s) of the words enters dynamic menu of word choices is presented. The user then selects the desired word, rather than typing each letter.

Individuals with mobility impairments may encounter a variety of access barriers. Time limited actions, such as timed tests, time-responsive webpages, and live text-based interaction are particularly problematic for individuals who have slow input methods or little to no control over their arms or hands. Similarly difficult are devices and tasks requiring significant physical effort or repetitive actions as well as technology that do not offer or support keyboard alternatives or shortcuts.

5.3 The blind individuals or individuals with low vision

Blindness or low vision is likely to occur in the student population. Approximately 45 % of individuals with severe low vision or blindness have a high school diploma. At least 2.5 million Americans who are blind or have low vision use computers.

Many individuals who are blind or have low vision may use assistive devices such as screen readers and enlargement utilities to help facilitate computer access. Some

types of software programs and/or computer monitors may be incompatible with these devices.

The blind individuals access information in several ways:

- Refreshable Braille display that print screen text line by line.
- The computer equipped with screen reader software or talking word processor that translates and reads with a synthesized voice text material.
- The text browser such as Lynx or simply turning off the graphics-loading feature of a graphical browser Internet Explorer.
- The speech recognition program, also called voice recognition, that allow giving commands and entering data using one's own voice.
- The alternative media audiotapes, Braille printouts, electronic text, tactile drawings, and audio descriptions.

The individuals with partial or low vision

The great quantity of reading material generally necessary in education classes makes it difficult for individuals with partial or low vision to meet the requirements. Individuals with partial or low vision may use magnification software to enlarge screen images, which causes only a small portion of a page to be visible at a time. Poor contrast with text colour, inconsistent layout, and cluttered pages can create confusion. Even with enlarged text, individuals with low vision may experience eyestrain, headache, nausea and/or other undesirable effects if required to read a large quantity of material and time. Small to medium-size text, decorative fonts, italics, and single-spaced lines of text are problematic as are formats that have less than 1 Inch margins, distracting background, or text overlaying graphic content.

6 Benefits of e-learning for disabled

The Disabled students using e-learning are usually enthusiastic about the benefits of e-learning. The most popular response, noted by over 40 % of students (Fichten, et al, 2009), was the availability of online course notes. Students also noted the benefits of information anywhere and anytime and the availability of other online course materials. Students also noted that e-learning allows them to work at their own pace, to study from home to communicate with peers and professors easy.

There are many reasons to support e-learning form of education for disabled students (and not only for them) and employees. According what was mentioned above, many accommodations might be needed to allow disabled students to make real use of the e-learning education. It depends on the provider and teacher if they really make effort to create necessary system and hardware setting.

Conclusion

E-learning systems and applications provide disabled students with an opportunity to benefit from its increased time and location availability. The real use of e-learning educational systems for disabled is however dependent on accommodations made by system provider and accommodations in hardware or assistive technology which can be made by provider, school, company, teacher, or even the student himself. The lack of knowledge and experience of all parties can hinder the process and therefore instruction and information on this topic might be very beneficial and help to resolve the barriers.

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