Effective e-learning approach for Students with Learning Disabilities

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Abstract - This paper describes an approach to create accessible contents for e-learning objectives dedicated to people with Learning Disabilities. In the present century, the differences between normal and people with Learning Disabilities become more obvious due to rapid growth of digital information technologies. Contrary to what some people think, this difference is not about their body deformity or disability to hear or talk. The difference is just in their accessibility level to digital information through computers and networks. Information and communication technology (ICT) provides great opportunities to improve the quality of learning process of people with Learning Disabilities. In this paper, we discuss a technique to facilitate human and computer interactions. Using the proposed technique, e-learning contents will be more accessible for people suffering from arm muscle disorders, Parkinsonism also.   Parkinsonism is a disease. The people who are suffering from this disease will have neurological problems. This disease is also known as Parkinson's disease.

Key words: Teaching for specially cared children, Parkinsonism, Pedagogical issues, learning theories, learning design, barrier-free learning, Learning Management Systems, Learning environment, Technology for specially cared students.

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1 INTRODUCTION

The World Health Organisation defines Health as 'a state of physical, mental and social we-being'

Learning disability is a general term that describes specific kinds of learning problems. A learning disability can cause a person to have trouble learning and using certain skills. The skills most often affected are:
- reading,
- writing,
- listening,
- speaking,
- reasoning, and
- Doing mathematics.

Learning disabilities (LD) vary from person to person. One person with learning disabilities may not have the same as another is having. One person may have trouble with reading and writing, however, another may have the problem of un-destanding mathematics and the third one may have the problem of understanding what others are telling him.   Children with learning disabilities can be high achievers and they can be successful, if provided relevant help.

For students with disabilities, the many facets that e-Learning offers more opportunities than ever before. For example, visual learners were able to benefit from applications in PowerPoint and Flash Multi-Media technology.

Access to information and communication for people with disabilities through modern technology is acknowledged as an important requirement. People with disabilities need to use information and communication technologies as much as everyone. Within the higher education and further education, they are confronted with the use of virtual learning environments (VLE), learning management systems (LMS), web-based trainings (WBT) and other e-learning applications and educational technologies. These technologies have to be accessible in order to enable people with disabilities to take part in education and the life-long learning. Some may have visual restrictions and therefore use a keyboard with Braille display or speech output systems like screen reader. Others may have physical disabilities, and use keyboard with switch access instead of mouse or keyboard, or they have cognitive and neurological disabilities, making it hard for them to concentrate, to understand complex navigation structures or to read complex text.

While there are many different disabilities that can affect the use of computers and the participation in e-learning, seven main groups of disabilities can be distinguished in order to make e-learning and educational technology accessible for all:

- Visual disabilities
- hearing impairments
- Physical disabilities
- Speech disabilities
- Cognitive and neurological disabilities
- Multiple disabilities
- Aging-related conditions.

According to Rolf Schulmeister, e-learning can be used to overcome certain barriers in learning.

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There are four barriers that can be overcome:

1. Time barrier: E-Learning can be used to by the learners to allot their time, to learn when they want to learn. You can also enable them to travel back and forth in time, making it possible to examine the development larvae of flies in fast motion or to view fast events in slow motion.

2. Space barrier: In traditional learning settings all learning objects like books, laboratories or media have to be present where the learning takes place. In e-learning, learning objects can be distributed all over the world, made accessible to learners via internet. Such virtual learning object are for example virtual laboratories for chemistry or physics, a virtual patient or an simulated organ for future physicians or even virtual field trips to places all over the world. By using virtual learning objects real objects can be made accessible to more students, who otherwise could not afford for example a trip to the ancient pyramids of Egypt. E-Learning allows learners to access rare resources and expands their learning space.

3. Analog-digital barrier: Digital content offers the possibility to combine different media such as video, audio, text and images. This enables learners to interact with digital content, using different digital media for their learning process more easily than analogue media. Computers can be used to make media accessible for people with disabilities, enabling them to work with media which have not been accessible for them before or only with support of other people.

4. Norm barrier: One of the biggest advantages of e-learning is that norm barriers can be overcome, resulting in a growth of learning opportunities for all people. E-learning allows a more individualised and personalised learning. For people with disabilities, it can expand the scope of learning opportunities.

Only accessible content for learning, accessible communication between all learners and accessible construction of personal as well as shared knowledge can lead to expanded learning opportunities for people with disabilities.

2. TECHNOLOGY AVAILABLE FOR SPECIALLY CARED CHILDREN

Visual learners are those who see concepts in pictures. Visual learners prefer to use diagrams, pictures, study notes, handouts and movies to see the information they are learning.

Auditory learners benefit from hearing material. Lectures, discussion and music work well for them. Many teachers use auditory textbooks for these learners to listen to either during class or as homework to maximize their learning style. Alternatively, another student can read the textbook to the auditory student or make the tapes as an inexpensive alternative for a service project.

Another application available is **Speakable Items** that allows visually impaired or learning disabled students to operate the computer through voice commands so they can access the same curricula as others. Eg. Speech synthesis and voice recognition.

Auditory learners could benefit from online classrooms with auditory lectures, **Podcasts** for students, as well as live chats. From a blended-approach perspective, some online programs offer both auditory lectures, as well as PowerPoint slide presentations. Also, live chats (both auditory and visual – i.e., Elluminate, Horizon Wimba, etc) offer more opportunities for a variety of learners.

Portable word processors give students an alternative mode for taking notes and word processing. Most of tehm have interface directly with a printer.

Alternative Keyoards are the primary input device currently available with computers; there are a variety of alternative solutions for students to respond to the needs of lessons. The IntelliKeys keyboard provides a larger surface area for students who have difficulties with motor control. The Little Fingers keyboard, as it sounds, provides smaller keys for smaller hands, while the BAT One-Handed keyboard provides full keyboard access for students with the use of only one hand.

Overlays, is a variety of keyboard are available for a variety of special needs such as Braille, larger images of keys, and special functions that can be programmed into the computer using special software.

Mouse Alternatives are the other primary input device is the mouse. A range of mouse alternatives is available to help provide a less restrictive environment for students inputting information for lessons. These alternatives include scroll wheels and track balls [with large balls] that make it easier for students who have difficulty with motor control to handle the mouse.

HeadMouse is another type of mouse is a head mouse that tracks a student's head movement to activate and control the computer application program.

Touch Window provide a mouse alternative by allowing students to directly touch the screen to activate and control the computer application program.

In some cases individuals with severe motor disabilities cannot operate any type of adapted keyboard or mouse. In these cases, a computer can be operated with a **Switch** used in conjunction with a software scanning program. Switches come in all shapes and sizes and are designed for multiple access points on the body, including hand, foot, head, eyebrow, and mouth.

Word Prediction Software is designed to reduce the number of keystrokes an individual needs to type a word. For ex-

ample, when the initial letter of a word is typed, the program generates a list of possible words based on previous user history and the context of the sentence. If the desired word is displayed, the user only needs to type the number in front of the word to complete the word.

Fortunately, Microsoft offers a variety of "Ease of access features" such as slowing down the keyboard's repeat rate, using long pointer trails, and using a large black pointer, magnification devises, among others.

Hands free Touchpad controls the mouse cursor, easy to do left and right click, and scroll with an economical alternative for people who are unable to use their hands. Just plug it in and start using it, works on all computers. It is simple to use and takes no special training and comes with everything included. Extra large touchpad, flexible clamp-able arm, swivel end for fine adjusts, and special bags to cover it.

Snoezelen: It is a Dutch Therapy founded by Mr. Ad Ferheul in the late 1970's in Holland and it is introduced worldwide. It is a multiple sensory activity that is focusing on the five primary senses organized in a sensory world creation.

Snoezelen is an excellent therapy in a safe, comfortable environment with nice, proper, soft stimulus. The five senses (taste, feeling, smell, hearing and vision) will be discovered and experienced. The most important ingredient of the Snoezelen Therapy is the attitude. The right attitude is more important than any material or technique. During Snoezelen, the child is free to explore or relax. In a Snoezelen room, the child is expected to respond to this sensory world in his own special way. The teacher is no longer a teacher but more a companion. The Snoezelen environment should be safe and non-threatening giving the child a sense of freedom.

Snoezelen is used for the therapeutic gain, motivation encouragement, pain reduction, anger management, stress relief, or simply for recreational pleasure and relaxation. It offers a wealth of benefits. It gives teachers and parents an opportunity to give a better communication, more understanding of each other and build up trust in their relationship with the child. Snoezelen is a wonderful experience to enjoy and share a place that gives new balance and energy.

It has been estimated that 40% to 70% of individuals with mental retardation have diagnosable psychiatric disorders. The following is the table showing the Levels of Severity of Mental Retardation.

Table – 1. **Levels of Severity of Mental Retardation.**

LEVELS	IQ	PERCENTAGE OF MENTALLY RETARDED POPULATION
MILD	50-55 TO 70	85
MODERATE	35-40 TO 50-55	10
SEVERE	20-25 TO 35-40	3.5
PROFOUND	20-25	1.5

Nowadays, e-learning benefits from the fast growing Information Technology and Communication to empower education and create very sophisticated environments. However, little attention has been devoted to making these technologies accessible to people with various disabilities. In this context, we are working to create a barrier-free learning environment for students with disabilities.

3. CREATING ACCESSIBLE E-LEARNING TECHNOLOGY

The Internet allows rapid and easy distribution of Web-based trainings, of all the material to the learners and simplifies communication between learners and tutors. An e-learning-scenario can therefore be described as an arrangement consisting of three parts:

1. Content: material ranging from simple text to complex multimedia and Learning object.
2. Communication: Everything from face-to-face to chat & discussion boards, communication can either be one-to-one, one-to-many or many-to-many, being synchronous (For example a chat) or asynchronous (e-mail or Discussion-boards).
3. Construction: learners work with different materials, taking notes, writing essays, doing presentations or work together on a project.

Making e-learning and educational technology accessible means that all these three parts of the three-component-model must be taken in consideration and made accessible. Creating accessible materials starts with text documents, presentations and other documents that can be provided to the learners. Although creating accessible content for e-learning is not the same as creating accessible Web content.

Accessible content must take four design principles into account:
1. Perceivable:
   a. Provide text alternatives for any non-text content so that it can be changed in to other forms people need such as large print, Braille, speech, symbols or simpler language.
   b. Provide synchronized alternatives for multimedia.
   c. Create content that can be presented in different ways (for example, spoken aloud, simpler layout, etc.) with out losing in formation or structure.
   d. Make it easier for people with disabilities to see and hear content including separating foreground from background.
2. Operable:
   a. Make all functionality available from a keyboard

    b. Provide users with disabilities enough time to read and use content

    c. Do not create content that is known to cause seizures

    d. Provide ways to help users with disabili ties navigate, find content and determine where they are.

3. Understandable :

    a. Make text content readable and under standable

    b. Make Web pages appear and operate in predictable ways

    c. Help users avoid and correct mistakes that do occur .

4. Robust :

    a. Maximize compatibility with current fu ture user agents.

While these guidelines are intended for Web documents, these design principles and the detailed guidelines can be applied on the creation of accessible e-learning content as well.

    • Text documents: Whether we provide essential texts in the formats of Microsoft Word- or OpenOffice.org-Writer, always we must make sure that the documents are well structured, all images are provided with an ALT-Text and the contrast of colours used within the documents suit the needs of people who are colour blind.

    • Presentations: Microsoft PowerPoint and OpenOffice.org Presenter can be used to create presentations that are at least partially accessible. Again it is important to start with a well structured document, using page layouts and document templates, providing text alternatives for images and using proper font sizes for images.

    • Video, audio, multimedia: Any time-based multimedia presentation must be provided with a synchronized equivalent alternative (eg, captions or auditory descriptions of the visual track) with the presentation. In case, we use a video to exemplify a statement, we provide captions as text version of spoken text as equivalent alternatives for people who are deaf or hard of hearing and auditory description of the most important visual events for those who are blind or partially sighted. Pod casts or other audio must be provided with a transcript as an equivalent alternative.

    • If we use programmatic objects like a virtual laboratory or other simulations, these objects also have to be accessible. Whether these objects are written in Java or Flash, most of the current Web-based technology can be made accessible.

3. INNOVATIVE OPPORTUNITIES

Since the beginning of time, only the strongest of students were educated first.

Today, more than one fifth of disabled e-Learners require voice or speech recognition software to communicate with computers and 28% require other technology to assist with the physical manipulation of information. Yet only few respondents said they were seeking ways of improving access for those with learning difficulties, notably dyslexia.

Dyslexia is a specific learning disability that is neurological in origin. It is characterized by difficulties with accurate and/or fluent word recognition, and by poor spelling and decoding abilities. These difficulties typically result from a deficit in the phonological component of language that is often unexpected in relation to other cognitive abilities and the provision of effective classroom in struction. Secondary consequences may include problems in reading comprehension and reduced reading experience that can impede growth of vocabulary and background knowledge.

Half the respondents thought e-Learning would offer users with disabilities more opportunities to learn. Most respondents were very positive about the potential benefits of e-Learning for people with disabilities, only about a third are actively developing an understanding and awareness of current research and practice. From the survey, it appears that most people still believe modern e-Learning involves merely reading off a screen. In fact, e-Learning technology has now evolved into a set of interactive multimedia applications. It promises to help many a disabled person attain the education they richly deserve.

5. OUT OF TECHNOLOGY BOUNDARY

The range and multitude of disability impairments indicate the complexity of the problem. It is even more confounding when we realize that not every individual presents every symptom, symptoms vary in intensity within individuals and within time frames, and an individual may have two or more disorders confounding the issue. It seems an impossible task to take on each symptom as a unique instructional problem to solve; or to take each individual with his or her unique set of symptoms and try to design instruction for each. Universal Design for Learning (UDL) provides a framework to approach the problem of designing accessible materials for learners with disable impairments. Universal design comes from the field of architecture. Universal design (UD) is a design principle developed by Ron Mace, but similar concepts have evolved and been expressed in other countries. Products, buildings, services and environments developed in accordance with the principles of UD are usable by all people without the need for adaptation or specialized design, regardless of age, abilities or circumstances. While UD is an approach with implicit support for the use of people with disabilities, other people benefit, too. Sidewalk curb cuts, for example, have once been de-

signed to make sidewalks and streets accessible for people using wheelchairs, but are also beneficial for parents with prams or kids on bicycles. The same goes for low-floor busses or captions on TV, the latter being useful for everybody watching TV in a noisy environment.

6. SUMMARY & CONCLUSIONS:

This paper has focused on the problems of students with Learning Disabilities and the available tools and facilities available to overcome many of them. The help of digital information through computers and networks have made the present world access to all communities irrespective of their abilities and disabilities.

Using e-Learning tools, all the materials are available to the learners and communication between learners and tutors. Learning management systems (LMS), Web-based trainings (WBT) and other e-learning applications and educational technologies are simplified and made user friendly. These technologies have to be accessible in order to enable people with disabilities to take part in education and the life-long learning. Based on the type of disability, we can use text document or presentations or audio/video or multimedia type of tools for disabled students. Future technologies should be able to bridge the gap totally between normal students with the Learning Disability students.

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