

DESIGN OF A VIRTUAL LEARNING ENVIRONMENT FOR ROMANIAN PATIENTS WITH DYSLEXIA

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Abstract: The main objective of this paper is bringing into your attention the problem of patients with dyslexia, aphasia or brain injury and how an e-Learning software can help in recovery of this patients. Dyslexia alters the life of millions of children and adults worldwide and has serious educational, psychological and social consequences. Approximately between 5% and 10% of the school-aged children show a type of deficiency in communicating or learning process, with repercussions in absence rate and school abandonment. Our works aims at carrying out research, design and implementation of a virtual learning environment (VLE), for rehabilitating patients with cognitive disabilities, in order to re-integrate them into the educational and socio-professional environment. In this paper we present a multimedia and interactive learning environment for the benefit of patients with dyslexia.

1 INTRODUCTION

The European Dyslexia Association estimates that about 10% of the population suffers from this disease. This disability makes difficult the acquisition of the printed words, either on paper or in electronic format. Despite the fact that such a high percentage of the world population suffers from dyslexia and this has become a more and more acknowledged issue nowadays, it continues to cause serious problems in the process of education and integration into the work environment.

The European Union is making efforts for improving the quality of life for persons with special needs, for promotion of rights and ensuring an active participation of these persons in the society.

Our goal is to create a computer-based environment where the dyslexic individual in Romania may develop and reach their full potential. The permanent increasing of costs, the uneven and non-equitable offer of healthcare services has lead to growing interest for rendering the medical practice more efficient through techniques of treatment optimization. Unfortunately, the dyslexic recovery requires a long period of time in which the patient must carry on the therapy by all the available means. By continuing therapy at home, using an e-learning

platform, it is possible to reduce costs of hospitalizing, movement, or the honorary of the therapist and at the same time high-quality services are ensured.

2 e-LEARNING AND DYSLEXIA IN ROMANIA

Although this paper would appear to be about the specifics of how to develop an eLearning environment of support to the dyslexic individual, it is important to set this within a framework of understanding of the problems, and how to support the individual in Romania, national and institutional legislation and policies.

Dyslexia represents an inability in performing reading, writing, spelling and language development and may be caused by a combination of deficiencies at the level of auditory and visual processing, working memory, storage and retrieval in the lexica (word banks). Also, dyslexia is a difficulty in the acquisition of literacy skills that is neurological in origin. It is often assumed that people with dyslexia, can think “out of the box” in pictorial and abstract terms. The manifestation of dyslexia in any individual will depend upon not only individual

cognitive differences, but also the language used (for instance, the vowels in Romanian are similar but not identical with those of other languages).

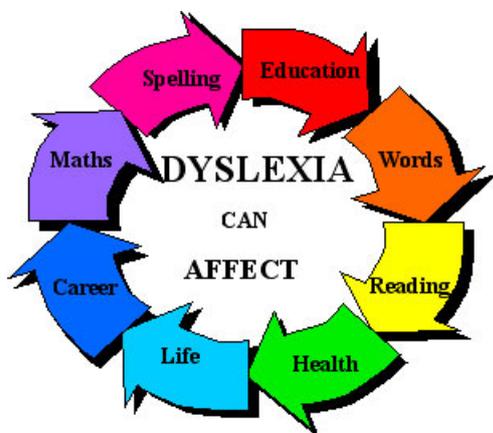


Figure 1: Involvement of dyslexia.

In Romania, like in most legislation across Europe, dyslexia is not covered specifically, but comes under the umbrella term of disabilities. Romania currently has no policies with respect to dyslexia, and is struggling to come to terms with disability policies and inclusive education, particularly with respect to our entry into the EU in 2007. Preoccupations in this field do exist at the level of logopedic and physical and rehabilitation medicine in the health system. Even though the use of technologies for learning has been implemented in Romania for several years, at this moment there is no integrated system in Romania to allow therapy carrying on in the family environment.

In this context, our research is a response to some society challenges and its implementation will allow the dyslectic persons to continue their therapy within their family. The product constitutes an eLearning platform dedicated to the implementation of logopedic therapy methods, for subjects in treatment units or at home.

E-learning has been defined by the EU as “the use of new multimedia technologies and the internet to improve the quality of learning by facilitating access to resources and services as well as remote exchanges and collaboration.” There is much evidence to support the benefits of using of multimedia interfaces for patients with communication and learning disabilities. The multimedia resources extend their attractiveness and suggestiveness. An eLearning software also introduces dynamic elements which allow a personalized feedback. E-Learning also enables a greater degree of mobility to the people, who are

now able to reach learning materials from almost anywhere and at anytime depending only on the computer and/or network availability.

For patients with learning and communication disabilities, it is important for the system to be adapted to their specific needs. Enabling technologies can greatly enhance a patient's ability to access e-learning, but it is vital to match the right technologies with both the user and the tasks to be undertaken.

3 MATERIALS AND METHODS

Our VLE is a multimedia and interactive environment, where dyslectic patients may progress by means of computer-based virtual environment which respond with a specific reaction to a given action of the subject. This eLearning system provide patients access to a suite of software programs to teach them basic/essential skills needed for everyday life. We present a method of improvement (not substitution) of logotherapy for some neurologic affection through a virtual learning environment.

3.1 The Components of the e-Learning System

The system is built around a central system which ensures: (A) Connection to patient; (B) Two directional communication patient–system and administrates; (C) Application programs for recovery; (D) Databases; (E) User interfaces.



Figure 2: A basic structure of the eLearning system.

3.1.1 VLE Design

The virtual learning environment is running on Windows Server 2003 with IIS 6.0 and SQL Server 2003. Through http protocol it ensures patient connection to central system (A). The two-directional communication patient-system (B) is done by means of classical audio-video devices (monitor, speakers, microphone, webcam, etc).

The VLE also provides personalized, role-based work environments for all users involved in recovery process: patients and therapist. It contains a number of work environments for users groups and can be customized easily to provide users with the precise content that they need to do their jobs. And, because access to the application can be ensured via Web browsers, users can retrieve information at any time, from any location.

Name	Description
 Afazie	Tulburare in mecanismul psihic al vorbirii
 Alalie	Dificultati de vorbire
 Balbismul	Bbalbaiala - tulburare a vorbirii
 Disgrafie	Dificultati de scriere
 Dislalie	Incapacitatea de a pronunta concret anumite sunet
 Dislexie	Tulburare a achizitiei normale a lecturii si a limbajului
 Rotacism	Dislalia consoanelor, cu specific a consoanei "R"

Figure 3: Samples of work environments for users groups.

The VLE has a skinning architecture which provides a clear separation between design and content, enabling patients to change the look and color of interfaces without requiring any specialist knowledge of development in HTML, ASP.NET, CSS, Ajax, etc.

3.1.2 The Recovery Module (RM)

The application programs for recovery (C) constitute the core of the system and are based on *recovery module* (RM). RM represents an electronic version of conventional logopedic methods used in rehabilitation medicine. The methods implemented in RM will be based upon the existent objectives from face-to-face therapy. Exercises have been designed, developed and implemented for: (1) comprehension of sound formation and face mimic for vowels, consonants, syllables, logatoms and consonantic combinations (video sequences showing the therapist's mouth); (2) reading, writing, speaking at level of letter, word, expression, phrase, paragraph, image (description); (3) reading, writing, speaking in a given context (journals etc.); (4) memorization of geometrical shapes and colours; (5) action comprehension; (6) comprehension of digits (numerical, monetary values, date and time); (7) significance comprehension and memorization of traffic signs; (8) comprehension of categories; (9) comprehension of questions; (10) language development through synonyms, antonyms, homonyms; (11) comprehension, memorization and

execution of instructions; (12) comprehension of spatial instructions (left-right, up-down); (13) assisted reading exercises; (14) games for cognitive stimulation (colouring, puzzle, memory).

All exercises from RM will have several degrees of difficulty and personalized feedback (depending on patient response to the proposed theme). The application interactivity is given by the multitude of possible reply types: the patient may speak, write, describe, pick up from a list (text or images) or can move the objects on the screen using the mouse.

A Web application server hosts the RM applications using ASP.NET and Web Services components of the .NET Framework version 2.0.

Applications for recovery support browser-based access using Microsoft Internet Information Services version 6.0 (at least). Also, each application for recovery is available as an .exe file which can be downloaded from the private section of the eLearning system and it run on local computer.

3.1.3 User's Management

The eLearning platform use SQL Server 2003 for user's management and for their access rights. It supports the following features: identification of all key users and their content management roles; the ability to assign roles and responsibilities to different content categories or types.

Programs for database (D) allow design and development of eLearning platform for:

(a) Patients databases (PDB) – for evidence of dyslexic patients (personal data, type of affection, therapy methods, progress, degree of integration in school or socio-professional environment);

(b) Content Database (CDB) – for digital storing content useful in recovery (text, images, graphics, audio and speech signals, video sequences) .

The database communicates with the application using the ADO.NET component of the .NET Framework v2.0.

3.1.4 User Interfaces

User interfaces (E) represent the means of communication of the patient/therapist with the informatics system. They can act as: (a) *Patient interface* (PI) – by which the patient has access to the recovery modules. The interface constitutes a friendly means of communication, easy to understand and it is adaptable depending on the affection type, level of education and age of the patient; (b) *Therapist interface* (TI) – represents the support for therapy personalization. This interface will permit the therapist to use his knowledge and

experience by implementing his own recovery methods. Through this interface, the therapist will store the data regarding the patient evidence (in PDB) as well as multimedia data – images, video and audio sequences (in CDB).

3.2 Using e-Learning as a Tool for Patients Recovery

Synthetically, the benefits of recovery modules are: (1) from the viewpoint of persons with cognitive affections: RM will constitute the support for the correction of reading, writing coordination and logic mistakes; they receive information using symbols and multimedia technology; they can test their knowledge and can have a quick and personalized feedback (2) from the therapist point of view, RM will offer support for the application of own knowledge and experience in the development of a personalized therapy, offering at the same time an objective evaluation of the patient's progresses;

Briefly, the benefits of eLearning system are: (1) therapy sessions designed for every type of deficiency and personalized for each patient with regard to age, level of education; increasing motivation through therapy based on real-time feedback; (2) support offered for recovery at home – we may speak about individual recovery, difficult to realize in classical recovery (face-to-face). Patients carry on therapy in their own rhythm, being totally independent of any clinic, a therapist or a schedule; (3) by collecting data (initial, intermediate and final) an objective monitoring of progress is ensured;

From a clinical study by Dr. Katz & Wertz, computers can be powerful clinical tools and below are the results of the study which provide that speech therapy software helps patients regain speech & language.

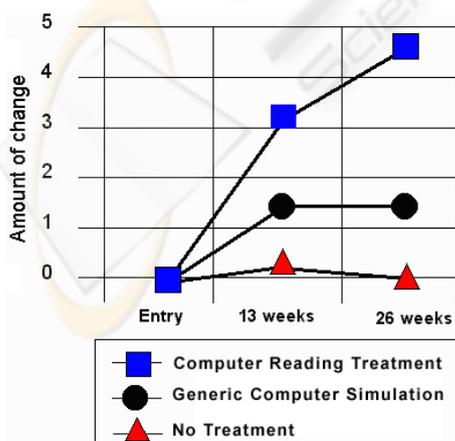


Figure 4: Efficacy results.

4 RESULTS AND DISCUSSIONS

Until now we have developed an e-learning platform made up of the following components: (1) an eLearning platform for patient's management and their rights; (2) a recovery module (RM) which is interactive and multimedia software for rehabilitation process of dyslexic person.

This is only a stage and our research will focus on improvement of health of patients with cognitive affections through implementation of conventional methods used in logopedy in an integrated system which also allows remote monitoring and therapy (similar to telemedicine systems).

5 CONCLUSIONS

There are many ways to acquire in order to develop and integrate on an even more competitive employment market. These ways refers to: development of spoken language, comprehension of symbolic representation, grapho-motor abilities, sequential abilities, development of phonologic, orthographic and semantic stockage.

The current use of traditional educational methods leaves apart many persons, especially those suffering from dyslexia.

While the traditional learning methods have failed in dyslectic persons, it is believed that the development of an informatics system for dyslectic persons would largely contribute to their rehabilitation progress and to relieve their difficulties in adapting to the demands of present society and to the strong competition for jobs on the employment market.

REFERENCES

- Smythe I., (2008). *Provision and Use of Information Technology with Dyslexic Students in University in Europe*, Retrieved from <http://www.welshdyslexia.info/minerva/book.pdf>.
- Katz, Richard C., & Wertz, Robert T. (1997). *The Efficacy of Computer-Provided Reading Treatment for Chronic Aphasic Adults*. *Journal of Speech, Language, and Hearing Research*, (Volume 40, pp 493-507, June 1997).
- Draffan E.A. (2003). *Dyslexia, Technology and e-Learning*, Retrieved from http://www.techdis.ac.uk/index.php?p=3_8_20