

EDUCA – COMPUTATIONAL ENVIRONMENT FOR DESIGN AND SHARING OF THE ACCESSIBLE EDUCATIONAL MATERIALS

Cristina SANTOS¹, Cristiane ELLWANGER² e Maikel LOSEKANN³

¹ Universidade Regional Integrada do Alto Uruguai e das Missões, e-mail

² Universidade Regional Integrada do Alto Uruguai e das Missões, e-mail

³ Universidade Regional Integrada do Alto Uruguai e das Missões, maikellosekann@hotmail.com

SUMÁRIO

This paper describe the main characteristics of the EducA – an environment to support of the design, management and sharing of the accessible pedagogical materials. The EducA provides resources adaptability and adaptively interface to maximize the user interaction process with the environment.

PALAVRAS-CHAVE: *Accessibility, Disabled Person, Assistive Technology, Adaptable Interface*

1. INTRODUCTION

Several reasons have motivated educators to use a variety of teaching practices. Among them stands out the integration and inclusion of learners with special needs in regular classroom, which requires adjustments to the educational procedures to receive and adequately accommodate such learners.

In this context, merits attention the use of computational resources to support educational activities, since it is already established their effectiveness when associated with school activities, presenting itself as a valuable tool that facilitates the construction of knowledge (COLL; Monereo, 2010). However, the development of inclusive practices combined with the use of technologies requires knowledge of various aspects related to the design of educational materials that can be used to the greatest extent possible, for all learners. This has generated unease that many educators do not feel adequately prepared to deal with the particularities of learners with disabilities. In this sense, the area of Human-Computer Interface (HCI) aggregates several contributions, since it provides concepts and methods which maximize the interaction process, breaking the barriers of accessibility, when used consistently.

This fact it provided the development of EducA whose goal is to provide a set of tools, combined in a single environment, to assist the creation, management and sharing of accessible educational materials and resources that come from adapting interface so that people with disabilities can interact effectively in the environment.

This article describes how the concepts from the field of HCI have influenced the development of the environment EducA mainly in compliance with the accessibility requirements. The paper is organized as follows. Section 2 presents the main theoretical assumption that has based modeling and design of the proposed environment. Section 3 presents an overview of the environment EducA, emphasizing the main features of the environment. Section 4 describes the forms of interaction provided by the environment. Section 5 presents some partial results and describes the main tools being used for the implementation of the initial prototype of the environment. Finally, section 6 presents the conclusions and perspectives for expansion in the scope of the environment.

2. EDUCATIONAL CONTENT IN VIRTUAL ENVIRONMENT

When it comes to educational content to people is very difficult to classify them as being educational or not. To Illera (2010) although any Content (information encoded, formatted and presented in the media) could lead to an educational interaction what is perceived in traditional pedagogical discourse and in the context of the classroom is a constant commitment of teachers in transforming and retransform such content to tailor them to their students in order to facilitate the learning process, and changes in educational content called "didactic transposition" (Chavellard, 1991) or even of recontextualization (Bernstein, 1990).

One of the basic principles of application and / or educational environments is related to the design of the user experience / student, which aims to influence their learning (Illera, 2010). Therefore, Mayer (2001) points out that not only the structure or shape of a specific content is important, but also how the learner incorporates such content from their interaction towards them. In this context digital assistive technologies emerge facilitating the interaction of learners with educational content at any time and place (mobile digital assistive technologies), regardless of the capabilities and limitations that learners may have.

Given the above and their relevance, such theoretical assumptions are being considered both in modeling as the design of the digital environment EducA.

3. OVERVIEW OF EDUCA ENVIRONMENT

In the context of learning, information and knowledge should be received by all learners, regardless of the format in which it is transmitted. For there are no discriminations against the constraints imposed by physical disabilities, sensory, cognitive or even caused by factors extrinsic to the individual, the information necessary for the learner to perform a given task should be prepared in advance and not only adapted when there is a specific case . This means that you can create content for all, with special attention to the specific needs of each user profile. Thus, we can summarize three main reasons for producing accessible content: (a) provide access to the content to all people, including people with disabilities, regardless of the type of limitations, (b) facilitate navigation and understanding of content to more people, giving more visibility to their content and, (c) the accessibility of systems seen as added value, benefiting all learners / users. In this sense, the aim to EducA the design of an environment that derives from flexibility for both educators and for learners, providing resources for production, management and sharing of accessible educational materials, assisting the teaching-learning process.

From the point of view of the educator, it has at its disposal a number of tools, easy to use, allowing several tasks within the scope of the environment. Among these are: development of digital materials, including written text, image, sound and video, with the aid of an authoring tool and a recommendation system, data management, including storage and retrieval of materials produced and sharing documents with learners; administration of courses that provides, among other possibilities, creating new courses and linking

learners to courses designed and customized interface that allows the user to change certain features explicit environment with a view to tailor it to their needs and desires.

It is important to mention that the task of linking learners to courses designed is of paramount importance in the context to which it proposes to EducA, since this task involves specifying certain characteristics of each of the apprentices, among which stands out the existence or without a disability. This information, in particular, is used by both the authoring module as materials for adaptation module interface.

For the authoring module information about the existence of learners with disabilities, as well as the type of disability, has great significance, because it is through the process that will be enabled recommendation regarding the use of accessibility rules to documents under construction. That is, if any learner visually impaired total, for example, the module author recognizes the need for activation of the rules that make the documents available for that kind of audience. Thus we have the automatic check of the profile of learners linked to each course so begins the process of document production and activation of specific rules that meet that group. In the end, there is a document tailored to the needs and / or particularities of apprentices. It is noteworthy that only one document is generated, providing access to all kinds of users (with or without visual impairment). With that seeks to develop a project as close to the precepts of universal design.

Moreover, the information is used by the adaptation module interface allowing identification of the user profile at the time that it accesses the system, adjusting the interface as needed. Given that the set of recommendations varies according to the type of disability, the environment makes use of a knowledge base that implements distinct accessibility rules aimed at visually impaired people total, partial or colorblind.

From the perspective of the learner, it has a set of tools that allows the performance of tasks such as, for example, record information on the schedule provided by the environment, access to complementary activities provided by the educator; access to classroom content, achievement assessments, among others. By accessing the environment by specifying username and password, the learner interacts through an interface adapted to your needs. This subject is addressed in the next section.

4. THE INTERACTION IN EDUCA ENVIRONMENT

To view the content in a complete and consistent, both for visually impaired users, and for those who do not have this deficiency is one of the challenges that drive the use of adaptive interfaces in the interface module of the environment. These interfaces are generated from the characteristics of each user's profile, allowing the definition of accessibility options for improving the GUI and interaction.

To provide the necessary adaptability, the environment in its architecture includes an interface module responsible for identifying the user profile and the adequacy of the interface. To do so, this module comprises three components: (1) Component Identification User Profile (IPU), (2) Component Adaptation Interface (AI) and (3) Component Generation Learning Objects (GOA); interacting the suitability for final interface to be available in the environment in accordance with the characteristics of each user.

The method used to identify the user profile is of paramount importance in the development of an interactive application adaptable, because it is through him that the relevant information will be obtained that will define the specific interface to be available. EducA the environment, the user profile is obtained by collecting explicit information on which it is made available to a questionnaire, where the educator provides the characteristics of learners.

Among the attributes of the learner to those that have greater relevance concern the existence or not of visual impairment and to what degree (low vision, blindness, color blindness). This information is extremely important, because from them will be mapped rules for adjusting the interface environment. The information provided through the questionnaire are interpreted by the IPU component, which forwards the request to the component AI activation of accessibility options, thus creating learning objects adapted to be made available, allowing the modification of the environment in the interface module. It is important to mention that the environment also allows the user to make their own settings in the interface according to their preferences, providing resources for the use of a custom interface and affordable.

Both the characteristics of the user as the last setting performed by the same are stored in the system, which avoids the need to configure the user interface to access each new environment.

According to the proposal, when the user performs the access environment, accessibility options are activated automatically according to the degree of visual impairment user, may be: (a) total, in which all options are disabled accessibility (b) low vision, in which the interface is displayed zoomed 120%, (c) color blindness, in which the interface is displayed in colors with high contrast and, (d) none, in which the accessibility options are presented. Activation or not these features in the user profile aims to present content consistently, without thereby displaying unnecessary options to the user. In case the user has complete visual impairment, all options are disabled accessibility, since the user will not use these options. Already visually impaired user to partial blindness or low vision is, accessibility options are activated, so that the user interfaces to modify the environment to make it more pleasing in his sight. When the user has no visual impairment, all the accessibility options are available for activation, making it possible to even change the interface of the environment according to their preference.

To validate the method adopted by environment interaction is developing a prototype that implements the instrument to collect data about the user, with a view to defining the profile of users as well as the other components in the architecture of the environment, responsible for promoting adapting interface. A more detailed description of the implementation aspects is presented below.

5. RESULTS: PROTOTYPING ENVIRONMENT

For the display of the content in the EducA environment, the WCAG 2.0 guidelines are followed the W3C (WWWC, 2008) that aim, from a set of recommendations to make Web content more accessible. Such recommendations include providing alternatives for time-based media, as part of awareness of the content; make all features available on the keyboard, thus making content operable; help users avoid and correct mistakes, to make the content understandable, and maximize compatibility between current and future user agents, including assistive technologies, in order to make robust content. They can still be found, according to recommendations in the guidelines WCAG 2.0.

Knowing that visually impaired users total access to the environment, use screen reader software is an effort focused on the implementation of the environment, so that it is organized to the point that the screen reader detects only the contents of the environment, not showing well, snippets or options amid the contents, which could come to confuse the user.

To develop the prototype of the environment, we opted for the PHP programming language along with CSS (WWWC, 1994). It is worth mentioning that the environment was developed using the reference model AHAM (Adaptive Hypermedia Application Model) (De Bra, 1999), to serve as the basis for the development of interactive educational applications. With the development of prototype realized is the necessary requirements for the process system software features which follows the spiral model (Boehm, 1988).

It is worth mentioning that the implementations made so far are being validated with the end user, in particular, people with visual impairments. This approach to the target audience of the environment has become possible due to the participation of these activities in the institution promoted by the project InfoAcesso (Santos, 2011) which aims to digitally literate people with visual impairments. With regard to decisions related to pedagogical issues of the environment, there is the prospect that they are developed by a multidisciplinary team involving members area of education and computing. Furthermore, it is believed that the interaction method provided by the environment able to automatically change their behavior according to its context and adapt to the user's needs, promotes several benefits for the user since it presents itself as a promising attempt to overcome the current problems that permeate discussions about the necessity of designing systems, tools, models, methods, procedures and theories able to address, in a competent manner, the issue of access to knowledge of the Brazilian citizen, breaking technological barriers that prevent the interaction (SBC, 2012).

6. CONCLUSIONS AND FUTURE WORKS

Overall, this paper has presented the main characteristics of Environment Educa, emphasizing how the concepts of area IHC may influence the development of tools that promote ease of interaction, including people with visual impairments. It is important to mention that Educa characterized as a resource to support the teaching process that has as great advantage, the possibility of its use by teachers who wish to produce digital materials accessible even without these they have experience and / or knowledge about the accessibility rules that must be included in the generated documents. Furthermore, Educa characterized as a digital environment that assists interaction between sighted people and not seers, including even people with color blindness or low vision. It is noteworthy that this first stage of development seeks to eliminate barriers for people with visual impairment, however, there are prospects that if you want to expand and incorporate new rules in environments, enabling the production of accessible materials and access for people with other types disability.

As contributions to the development environment Educa they can be described according to the impact in different contexts. On the one hand, educators have at their disposal a set of tools that let you create and/or adapt their teaching materials through automatic recommendations made by the environment and thus can provide the contents of its educational activities to all students. Moreover, learners are benefited by means of adapting the user interface so that, whether or not some sort of limitation, may access the teaching material prepared by educator.

In short, we intend to develop an environment that provides tools to help, in fact, the interaction between teacher and student in the teaching-learning process and to be recognized as an assistive technology to promote digital inclusion opportunities for persons with disabilities visual.

7. REFERENCES

(BERNSTEIN90) BERNSTEIN, B. On pedagogic discourse em B. Bernstein, class, Codes and Contro, vol. IV. London: Routledge, 1990.

(BESSA01) BESSA, Olavo F.M. A agradabilidade do espaço urbano construído da cidade de Alfenas(MG): uma abordagem ergonômica, Rio de Janeiro, PUC-Rio, 2001.

(BOEHM88) BOEHM, B. "A Spiral Model of Software Development and Enhancement" - IEEE Computer, vol.21, 5, May, pp 61-72, 1988.

(CHEVALLARD91) CHEVALLARD, Y. La Transposition didactique. Grenoble: La Pensée Sauvage, 1991.

- (COLL; MONEREO10) COLL; MONEREO e colaboradores. Psicologia da Educação Virtual: aprender e Ensinar com as tecnologias da informação e da comunicação, Porto Alegre: Artmed, 2010.
- (CULLEN96) CULLEN, Gordon. Paisagem Urbana, Lisboa, Edições 70, 1996.
- (DE BRA99) DE BRA, P. and Houben, G. J. and Wu, H. (1999) AHAM: A Dexter-based Reference Model for Adaptive Hypermedia. In: Proceedings of 10th ACM Conference on Hypertext and hypermedia, Germany, February 21 - 25, 1999pp.
- (ILLERA10) ILLERA, J.L.R. Os conteúdos em ambientes virtuais: Organização, códigos e formatos de representação in: Psicologia da Educação Virtual: aprender e Ensinar com as tecnologias da informação e da comunicação, Porto Alegre: Artmed, 2010.
- (MAYER01) MAYER, R.E. Multimedia Learnin. New York: Cambridge University Press, 2001.
- (SANTOS11) SANTOS, C.P.; ELLWANGER, C.; SAUSEN, C.R; et al. Projeto InfoAcesso: Informática para Portadores de Deficiência Visual. V Congresso Brasileiro de Extensão Universitária. UFRGS, Porto Alegre, 2011.
- (SBC12) SOCIEDADE BRASILEIRA DE COMPUTAÇÃO: Grandes Desafios da Pesquisa em Computação no Brasil. 2006–2016. Disponível em: <<http://www.sbc.org.br/>>. Acesso em 12/04/2012.
- (WWWC08) WORLD WIDE WEB CONSORTIUM. Web Content Accessibility Guidelines WCAG 2.0, 2008
- (WWWC94) WORLD WIDE WEB CONSORTIUM. Cascading Style Sheets. 1994.