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A tool to facilitate including accessible content in Moodle to the person with visual impairment

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Abstract

Virtual Learning Environments (VLEs) are changing the old ways of teaching and learning and provide support to the modalities of semi-presental or distance education. However, the platforms used for Distance Learning (DL) do little to ensure education for all and without barriers. In endeavoring to make a contribution to inclusive DL, this article presents and discusses the results of an applied research study on the development of a tool for the Moodle platform that aimed to facilitate, for those designing content, the inclusion of accessible content, thus allowing greater use of a course for the visually impaired.

Keywords: Accessibility, Distance Education, The Visually Impaired, Moodle, VLEs

1. Introduction

Web accessibility is a field of study that has been incorporated into the Brazilian Project for Digital Inclusion, to enable people with special needs, to have access to citizenship. Art. 47 of Dec. 5296, requires public administration bodies to ensure that their electronic portals and sites guarantee accessibility such that people with disabilities can use them to the full, thereby guaranteeing them access to all information held [1]. Technological advances which include computing and Information and Communication Technology (ICT) contribute to integrating and reducing distances between stores of information and the people who need them, and also helping them to obtain new skills, a key element in the knowledge society. However, people with disabilities depend on all information contained in

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ICTs being converted into hearing and touch stimuli, a fact that grows in complexity in that the conversion of static and dynamic images into audio is a complex and as yet embryonic process, but one that technology seeks to include.

In formal education, the popularization of the Internet and its ability to act as a vehicle to deliver text, audio and images have been gradually changing the practices of teaching and learning, mainly by establishing open communication between the participants. They, according to modern theories of learning, best take ownership of knowledge when they share it with members of their group or community. The traditional forms of presential learning take place in a physical location where students and teachers come together and in which information is transformed into knowledge. This is unlike Distance Education (DE) in which learning does not occur because learners are physically present, but because they taking part by using the communication technologies available.

Distance education, which a few decades ago was based on printed materials, TV and radio, is, today potentially more communicative and structured thanks to the internet, which is a very efficient tool for this form of sharing. The growth of this modality in recent years is staggering. This is more because of the evolution of technological resources than because of the economic/financial aspects. Especially higher education degree courses have been the ones that have been most benefitted, and there has been a significant increase in the number of students. According to an item of news published on the website of the Brazilian Ministry of Education and Culture - MEC (2011), in 2008, 708.000 enrolments in higher education were made in the distance learning mode, an increase of 96.9% compared to 2007 [2]. Currently in Brazil there are approximately 300 accredited institutions that offer undergraduate and postgraduate distance learning courses, a fact that favored the recent spread of higher education to the interior of the country [2]. This phenomenon justifies research studies that target building Virtual Learning Environments (VLE) that may encourage their being used by a larger number of people, including those with some form of disability.

The new modalities of distance education have changed the traditional way of teaching and acquired their own identity and are today deemed as *e-learning* and *m-learning*. They provide, according to Tarouco [3] in addition to synchronous and asynchronous access to the system, the use of different media and are making distance learning more useful.

The role and share of the Internet in distance education has grown significantly, a fact that requires educational institutions constantly to adopt appropriate technologies and it is in this area that the issue of accessibility lies. This subject has been regulated by the World Wide Web Consortium (W3C), which lays down guidelines for access to the network [4]. However, DE is supported on platforms that also need to be adjusted to the pedagogical demands, technological constraints and particular characteristics of learners' special needs. So, including people with disabilities in the educational, professional and social media, apart from being mandatory under Brazilian legislation, constitutes an act of social justice, since it extends a prospect of independence to such people. Education, in this case, places them on an equal basis with people who do not have disabilities. Creating the pedagogical and technological conditions to satisfy learners' educational needs is the response that a School can make to fostering social, cultural, economic and ethnic diversity among its students, without thereby automating teaching.

In the context of this theme, this article is aligned with the policies for social and digital inclusion in Brazil when it reports some of the research that expands the rights of citizens to education. This paper addresses the development of a tool implemented on the Moodle 2.0 platform to facilitate the provision of content targeted on being of service to the visually impaired. What motivated the authors to undertake this research, which resulted in the need to promote adaptations to the Moodle platform, was their work on designing accessibility in VLEs, which was funded by CAPES-AUX-PE-PROESP 1026/2009.

2. Why Moodle

There are several platforms available that give support to virtual learning environments (VLEs). Technological and pedagogical outlines are embedded in them which can be used to develop educational methodologies, using channels of interaction on the Web, which are suitable for offering support to educational activities in a virtual environment. Mapping the currently most widely used platforms for distance education courses in Brazil was the

topic of a study conducted by Gabardo, Quevedo and Ulbricht [5]. An analysis emerged from this research in which the different features and potentialities of these platforms were expressed. By continuing this work, this study sought to deepen this analysis with a view to identifying the features that are most appropriate for accessibility.

In line with the proposal made by Gil [6], a case study with intentional sampling was opted for within the parameters set by Gil, who recommends analyzing between four and ten objects of research as being ideal. As he states, analyzing less than four may well result in only a low level of information being obtained, while more than ten can lead to information overload. Thus this study opted to select eight platforms, these being the ones most cited in research sources and used by Higher Education Institutions (HEI) in Brazil. The following platforms were chosen: TelEduc AulaNet, Amadeus, Eureka, Moodle, e-Proinfo, Learning Space and WebCT. In order to ascertain their differences, analysis criteria were established, namely: distribution, pedagogical principles, collaborative learning, interactivity, multimedia, usability and accessibility.

The comparative study showed that the platforms developed for virtual distance learning environments have gaps in their construction and/ or presentation. There is disparity between them with regard to their supply of tools for collaborative learning, as well as in relation to their interactivity. Some platforms present more resources in one or other modality. Although they may emphasize the possibility of using multimedia systems, their sites do not give clear information on the resources available. The one that is least included is the item of accessibility.

Given this background, as there was no platform that could meet all the demands, especially the requirement of accessibility, the Moodle, AVA Modular Object Oriented Distance Learning, was chosen. This is a free platform and adopted by many universities all over the world. The aim of developing it is to manage learning and collaborative work in virtual environments. Moodle enables online courses, working groups and learning communities to be created and managed. Currently the community involved with Moodle consists of 56.566 registered sites in 212 countries with 4.914.209 users and 46.151.117 teachers, which gives an idea of the coverage and use of this environment [7]. Another factor that led to choosing this platform is its importance for the Open University of Brazil - UAB, a CAPES-MEC project, for which Moodle has been adopted.

3. Project for Changing the Moodle

The objective of the project was to change the inner workings of the open source and free Moodle 2.0 system in order to facilitate creating content accessible to the visually impaired. The basic architecture of the solution proposed enabled the way content is displayed to be customized as a result of the student's profile. For an application such as this, the Moodle environment has the following requirements: an HTTP Server with PHP support and a MySQL Database 5.0.25. The technical prerequisites for clients are the following items: a browser that supports Cookies and JavaScript and a screen reading system. After satisfying the settings, it was necessary to make changes needed to be made in the environment so that it included an intuitive interface with the mandatory insertion of alternative content and would have a low impact both on the original Moodle code and its Database.

It is practically impossible for a totally blind student to understand a concept that is displayed in an image on a computer screen. Thus the solution proposed is based on the idea that multimedia content should be presented differently to students with disabilities [8, 9]. In order that the contents of a multimedia element (moving images, tables, text, static images, graphics and audio) are assimilated by someone with a visual impairment, content should be presented in an alternative way. W3C recommends above all that an equivalent associated with all non-text content is supplied; images should have the alt-text attribute; audio and videos should display transcripts; and animations should be described in text. IMS GLC [10] distinguishes between equivalent and alternative contents. An item of content is defined as being equivalent when it is identical to another item, but supplied in a different modality: for example, a text available in audio and the same text associated with a file to be printed in Braille. As to alternative content, this is a broadening of equivalent content and is supplied in a different way, but with the same ultimate goal of learning. In the vision of W3C, equivalent text is accountable for the same functions and covers the same information as non-text content [9]. The environment should ensure the content specialist is obliged to include

alternative forms for each of the concepts presented through different media.

We chose to store the characteristics of the user's disabilities in the database so that, at the moment when the construction of the course page is presented to the user, the environment in the server is able to attach details of the disabilities so that, as a result, a decision can be made on how to present multimedia content.

Besides the changes proposed in the environment, there was a need to standardize the use of certain tools, for example, the text editor to be used by a blind user. The text editor to be installed, configured and modified, in this research study, is TinyMCE (<http://www.tinymce.com/>) [11], which was chosen because it has free, open source code, is widely used and plug-ins are available. The operation of the text editor was changed in order to oblige the user to insert the alternative contents of media such as images and videos. Another issue considered was the language of the Moodle platform. Version 2.0 is not yet fully translated into Portuguese. Thus, the translation was done, and the source code of Moodle and the TinyMCE text editor were changed. The other changes implemented in the Moodle environment in order to provide accessibility, are presented in the following items:

a. Student Registration and Editing:

The Moodle system already has information about using screen readers. The name of this field was changed to "Visually impaired person". The default content of these fields should be "Unmarked". The changed interface for creating and editing users is illustrated in Fig. 1.

The image shows a screenshot of a Moodle user registration or editing form. The form contains several fields: a dropdown menu for 'Ao editar o texto' (set to 'Usar o editor de HTML (Apenas IE 5.5 ou posterior)'), a dropdown for 'AJAX e Javascript' (set to 'Não: use características básicas da web'), a text input for 'Cidade/Município' (filled with 'Curitiba'), a dropdown for 'Selecione um país' (filled with 'Brasil'), and a dropdown for 'Zona de fuso horário' (filled with 'Hora local do servidor'). Below these is a section titled 'Deficiencias' containing two checkboxes: 'Visual' and 'Audtiva'. A blue arrow points from the text 'Choose a disabilities' to the 'Deficiencias' section.

Fig.1: Insertion of new users (Source: Author)

This change was implemented as follows:

- ∞ Creation of the category of customized fields for "Disabilities" and two obligatory fields, "Visual" and "Hearing";
- ∞ Hiding the "screen reader" option;
- ∞ Changing the recording behavior in the database so that the screen reader column of the mdl_user table follows the value of the customized "Visual" field.

b. Inserting Images into the Content of Courses::

The standard content of a course consists of HTML pages containing text and HTML elements such as images, tables, videos and sounds. For the visually impaired, the form of presentation of such content should be different. As a solution, the way to insert HTML content was changed as follows: the Moodle system provides a WYSIWYG (What You See Is What You Get) editor, which enables data formatted in HTML to be entered easily, without the content specialist being obliged to know this language. In the entry screens for multimedia content, it is proposed to create a customized and mandatory field, in which the content specialist should enter the alternative text. The dialog box for entering images had its behavior changed as per the data flowchart given in Fig. 2.

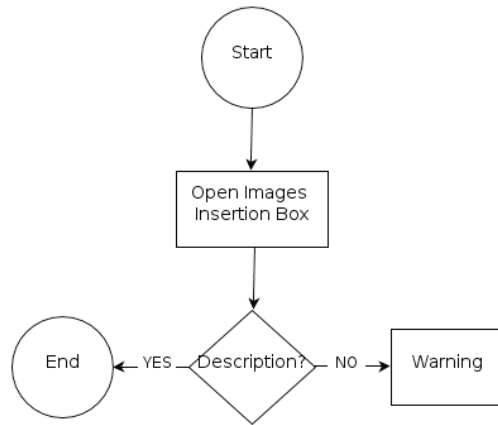


Fig. 2: Flowchart of the insertion of images (Source: Author)

The alternative text is required, and if this field is not completed, the content specialist will not be able to insert the image, and will receive a message asking for the text and showing an example. The changes, which modify the behavior of this dialog box, were implemented in JavaScript code of the TinyMCE editor. The data of the alternative text were stored, in HTML tags, within the alt attribute of the img tag (Fig. 3).

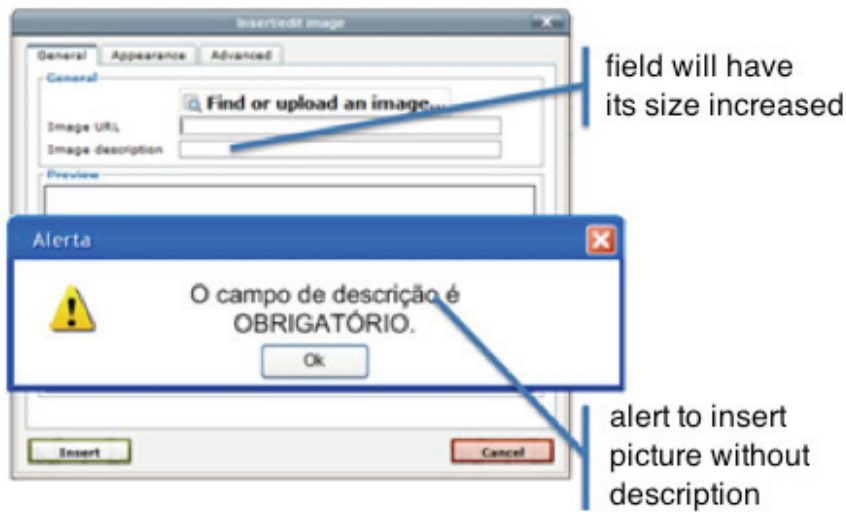


Fig. 3: Insertion of images (Source: Author)

c. Inserting Tables into the Content of Courses:

The dialog box for inserting tables had its behavior changed, and the alternative text is required. If this box is not completed, the content specialist cannot insert the table. The data of the alternative text are stored within the summary attribute of the table tag (Fig. 4).

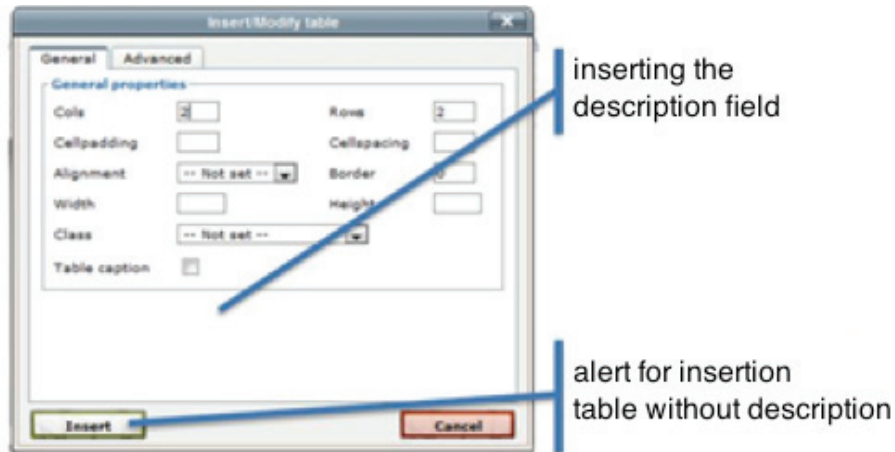


Fig. 4: Inserting tables (Source: Author)

d. Inserting Sounds into the Content of Courses:

The dialog box for inserting sounds also underwent changes in its behavior, in a similar way to the flowchart shown in Fig. 1. Any alternate text, (description or transcription), of this audio will be required. If at least one of them is not completed, the content specialist cannot insert the sound file (Fig. 5). The description data will be stored within the alt attribute of the object tag, while the transcription data will be saved in a customized custom1 attribute.

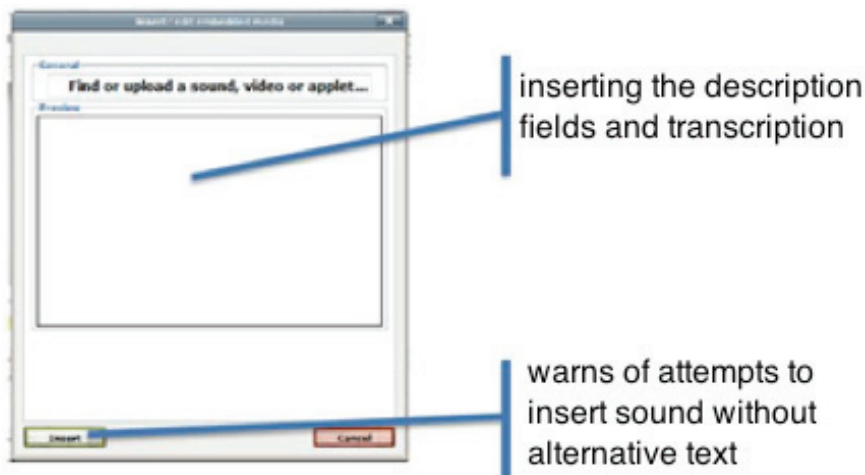


Fig. 5: Insertion of Sounds (Source: Author)

e. Inserting Video:

The dialog box for inserting videos has its behavior expressed in Fig. 6. The content specialist will have to insert some alternative text, or the description, or the transcript of the video. If at least one of them is not completed, the content specialist will not be able to insert the video file.

The description data are stored within the alt attribute of the object tag, and the transcription data are saved in a custom1 customized attribute.

Changes to the behavior of the dialog boxes described were implemented in the JavaScript code of the TinyMCE editor.

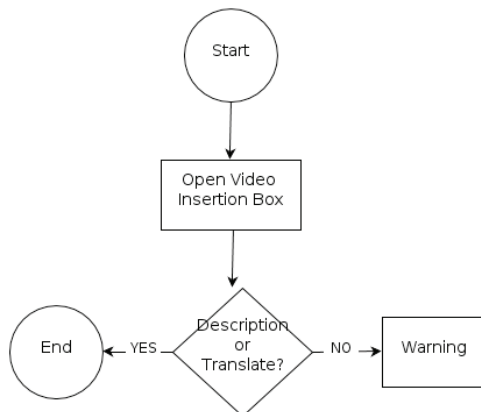


Fig. 6: Flowchart of inserting videos (Source: Autor)

f. Display of the Content in HTML:

The module for constructing HTML pages of the Moodle environment was changed to support the creation of different pages depending on the student's profile. For students without disabilities, the media will be displayed with their original content. For students with visual impairments, the media will be displayed as per the norms of Table 1.

Table 1. Those who are visually and/or hearing impaired (Source: Author)

Element	Visual impairment
Image	Textual description.
Table	Textual description.
Sound	Original.
Video	Transcription.

g. Normal Display:

For students who do not have any disabilities, the display of pages will be normal, without any change, as presented in Fig. 7.



Fig. 7: Normal exhibition (Source: Autor)

h. Display for a Visually Impaired Person:

The display of the pages to a visually impaired person will have its graphic contents altered as shown in Fig. 8.

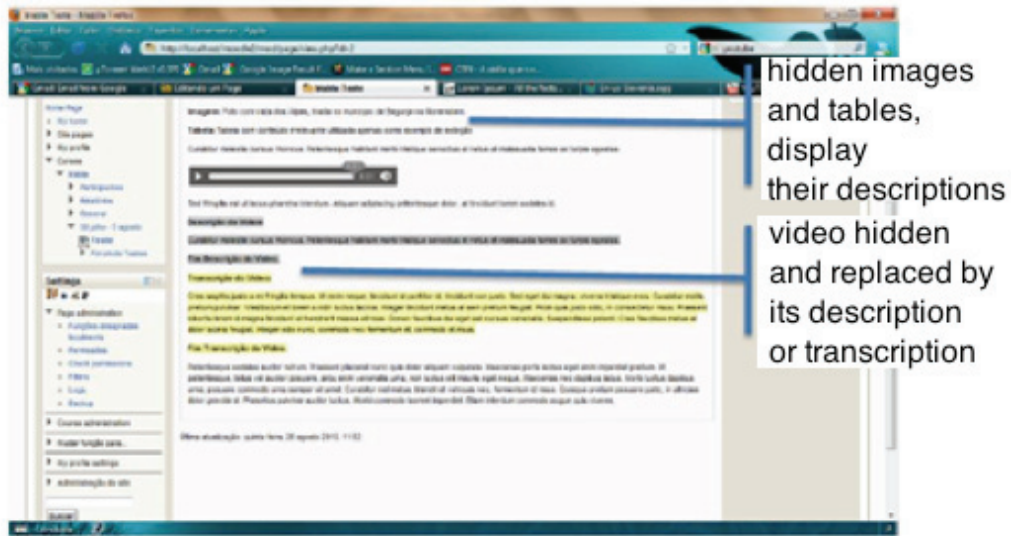


Fig. 8: Display for a visually impaired person (Source: Author)

The changes in the display of content should be made on the client’s computer, using JavaScript. The idea used for this is: at the end of loading the document, run a script to analyze the structure of the page and, depending on the user’s impairments instantly change the DOM structure of the page. The library used for this will be jQuery. The PHP code, of the server, will also be changed in order to send the user’s type of disability to the client’s browser. This process is shown in Fig. 9.

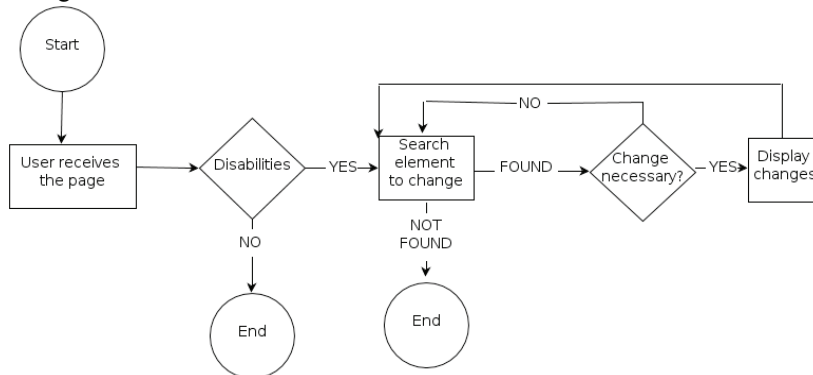


Fig. 9: Flowchart of Behavior in the Client (Source: Author)

In addition to the pages, other Moodle elements also had their content changed in the same way. It is important to point out that most of the elements and resources of the Moodle environment have an introduction or description, and this field is dealt with precisely when content is displayed to the user. The resources of the Moodle environment, considered in this study, were HTML pages and the activities comprised the forum and wiki. Resources and activities that do not have multimedia elements do not need to be addressed.

It should be noted that, for this first study, there was limitation of accessibility with regard to some documents that may be attached to the Moodle (Word, PPT, etc.), since the architecture proposed considers only the content inserted via the Moodle interface, without considering files attached. As this limitation is intrinsic to the format of

such files, the only way to make them accessible through displaying alternative content will be to convert them to HTML format. The best way to make this conversion is in the source program itself, and this should be considered by the author of the course.

4. Conclusion

Rosenberg [12] states that in order to create value in the future e-learning will have to be reinvented. At the same time as it is sought to provide formal education with more options and careful approaches, it will also be necessary for virtual learning environments, and their respective platforms, to enhance the quality of information, to target collaborative solutions so as to develop a community "spirit" in order that virtual teaching-learning may display - in ways that are proven - that they are effective for all participants, and offer universal accessibility. Thus, teaching-learning platforms must reflect the acquisition of knowledge with the potential inherent in today's and tomorrow's technology, without leaving aside the educational aspect of absorbing this knowledge autonomously. Paying attention to this issue can guide platforms and, as such, e-learning, from 'closed environments' to a genuinely open door to knowledge.

Although MOODLE has won three trophies from the eLearning Guild Guide, it is clear from the report on the survey of satisfaction among various sectors that use DL platforms that much still remains to be done. Its accessibility guidelines are rather strict, because it is only by using screen readers that information on the images and other content is made available; hence the need to develop tools that help teachers of content to make content accessible.

As to implementing an accessible environment what stands out is the functionality of importing external HTMLs. This module is there to read the contents of the HTML file, to verify its structure, to send automatically to the server the necessary files such as attached images, and to ask the content specialist to insert alternative content for each of the media

A start has been made by the researchers on testing the changes made, as has a project to design a tool that will give those with a hearing impairment access to the Moodle platform.

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