

A FRAMEWORK TO SUPPORT LEARNING, APPLIED IN THE FIELD OF ELECTROTECHNICS AND THAT MEET THE CRITERIA OF THE ACCESSIBILITY OF THE W3C

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Abstract— This paper describes the EcoLabore Framework, an Open Source software, GPL, free of any restrictions on use, which can be implemented in any Internet server, with the objective of providing a web page manager that is fully accessible, and that may serve as a platform for the development of free educational content. Developed for the most part by a blind programmer, the system works in PHP, has open source and is available in <http://www.ecolabore.net>. Currently the portal is already in use by teachers, researchers and students IFAL, serving as a virtual learning environment in elector-electronics area applied to courses Electrical and Electronic Technicians.

Keywords— E-Learning, Electricians, Analysis Circuits, Technical Education, object learning.

I. INTRODUCTION

The Digital inclusion for blind people still presents a challenge. In Brazil, about 640,000 people are blind, and 50% have access to computer and internet, according to the World Health Organization (WHO). The biggest accessibility problem faced by these users is the difficulty in obtaining information presented visually and navigate through different keyboard devices, distinguish links, browse through spatial concepts and sites loaded with widgets and pop-ups, [4][5]. You can find many web pages no support for the use of screen reader programs that transform into voice texts and published images, without the adoption of recommendations for development sites as the World Wide Web Consortium (W3C), the body which coordinates the development and standardization of accessibility rules, and these recommendations are also used by some smartphone manufacturers and tablets. Despite the existing initiatives, the digital inclusion of visual deficientes is far from ideal and lack effective initiatives for the employability of technology to those users. [7].

These obstacles faced by the author who is also blind, served as incentive for the development of a portal that allows a greater degree of accessibility, and also make available facilities for the production and publication of digital content beyond zens share. The usability of the web is the creation of more accessible portals in order to promote digital inclusion, [1]. In this sense, the idea of Ecolabore portal creation is to provide a unique environment for creating websites with features blogs and database to allow customization of the pages still being fully accessible to blind people to contribute significantly to inclusion digital thereof.

Moreover, as advocates Meyer and Rose [Meyer and Rose 2014] in his book "Universal Design for

Learning", learning today is mediated by the new technologies of communication and information in a dynamic and complex. For the author, technological tools are part of the learning environment, and, therefore, such environments must be designed in such a way to promote interaction and collaboration among stakeholders.

According to Borges, "we all need new cognitive ability to live and function in a world where the relationship between humans and technology is no longer limited to simple storage, processing and transmission of data and information," [Borges 2010]. Thus promoting the digital inclusion is to ensure access to resources and open environments, with different settings for teaching and learning, recognizing the plurality of contexts and the educational possibilities for learning throughout life, [Amiel 2012]. Therefore this work intends to offer a web page manager that is fully accessible, and can serve as a platform for the development of free educational content.

II. THE ECOLABORE PORTAL AND ITS FEATURES

The Ecolabore Portal was developed with the goal of being a manager fully accessible web pages, differentiating tools like Wiki, it allows the user to customize appearance and functionality. The platform, disonível in <http://www.ecolabore.net>, appears as in Figure 1.

The Ecolabore offers a structured system where each user has their own space, free to characterize it and organize it in the way that suits you; and at the same time, that map contents and index channels of the structured content for each user promoting sharing. These features allow us to offer secure and flexible means to: customize the look of the pages; organize sections and subsections freely in any order and no

quantity limits or sublevels; publish pages in several languages; provide alternative means for determining the content and rating categories or search by keywords; provide tools that facilitate interaction with visitors, such as contact form, guestbook or comment on articles; format the content edited by the user, recognizing paragraphs, headings, lists, and inserting links and figures in the locations indicated.



Fig.1. Main screen of Ecolabore Portal available at <http://www.ecolabore.net>.

In addition, each interactor which makes the portal member, becomes a space administrator through a subdomain. A "Administrator's Guide" provides support for working with the system. This guide, in addition to explaining the operation of each tool also allows you to configure system behavior within your "domain".

III. DEVELOPMENT METHODOLOGY

The project is based on the principles of free software, so in addition to being released under the GPL3 license, relies on servers, systems and languages also open as follows: The main module "Engine" is the engine that processes the data and assembles the pages, and was developed in PHP. The data storage is accomplished using MySQL, and the Apache server management system, which also offers other important features to the system. Documents are generated in HTML5, with implementations in JavaScript, style sheets CSS and SVG drawings.

It allows the user to publish figures in JPEG format, and the availability of other files in proprietary formats for download as portable documents (*.PDF), MP3 audio format and others, since its content has no legal restrictions.

The module "System" has its own method for interpreting markings among the document templates.

In this way, administrators have complete freedom to edit their models without jeopardizing the safety of the project. In addition, the system has a set of models used by default if you do not want to customize your models or parts of them. Thus, the system is distributed in different folders according to file types that contains: files of the pages of the users; files from user profiles; shared files to download; document templates offered by the system; system's main mechanism; a library of applications and a data cache to speed up the work. It is possible, but not recommended that any user can produce some document template or anything handy, but intentionally system offers affordable models, customization tools and important guidance to administrators so that, except for the direct manipulation of HTML, all selected options ensure the generation of accessible documents. Accessibility have been by parameter indications of W3C, which in addition to general guidelines on accessibility and internationalization, also has specific guidelines on the specifications of HTML5 and Cascading Style Sheets - CSS, versions 2 and 3. Thus, with a view the system is developed by a blind programmer, constant tests are performed, opting for alternatives that allow greater ease in understanding the content and its usability.

An example of this is the option of not using the common links in pages designed to be accessible, such as zoom in, zoom out or change the page contrast. It turns out that most browsers and operating systems provide built-in features for zooming and contrast that can not only meet these requirements for the Web pages, as well as any other documents and program windows. By not believing that a user having trouble viewing Web pages also find the same difficulty in other computer applications, it is recommended that each user to configure your computer to meet these specific needs, applying them on every page and windows system, rather than limited to browse a few pages that have these links. In addition to these considerations, the presence of these links adds unnecessary content to pages, becoming useless information that hinder the navigation of other people which implies transfer constantly by the network the same functions that already are available in browsers and operating systems. Analyzing the standard deviation can also be seen that dispersion decreases, concentrating more students around to the average.

IV. THE FRAMEWORK ARCHITECTURE

The interaction of users with the Ecolabore Framework can give the navigation in the portal content or creating and editing content on a page. Thus, through a "Browser" browser, interacting generates a request to the system, which is processed by the main module Ecolabore "Engine", in response generating an HTML document.

All sent requests go through the same step cycle, as the architecture of the portal classes, Figure 2. The operating cycle begins with the routing performed by "Class \$ Document", and then the request is dispatched by Dispatch being organized through the Render into an HTML file type that is sent in response to the user. The versatility of the Portal is to use the same step cycle for a set of tools that processes various requests, such as creating domains, user administration, build pages, blogs, message management, among others.

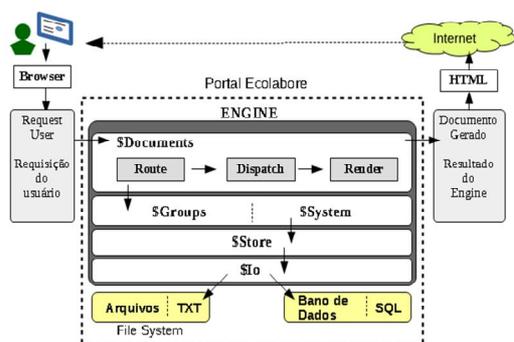


Fig 2. Operating Architecture Framework Ecolabore

Although internally all applications are paired, access to each application is given through a hierarchical tree structure as shown in Figure 2. This structure resembles the address directories of a file system, which makes fully consistent navigation to meet the user requirements. Each application has a main class, capable of generating objects, and each object corresponds to a page. While normally each application generates a corresponding object, in certain circumstances, applications may generate more than one object, corresponding to multiple pages, or not, implying that you can not access this application in that context.

In the application "admin" (eclApp_admin), which can be accessed at <http://www.admin.ecolabore.net>, an object corresponding to the initial page of the admin panel is generated. Since to another application as "domain" (eclApp_domain), which can be accessed through the example <http://www.labteca.ecolabore.net>, another domain object registered in the system - will be generated. All the registered domain will have the same set of applications in a sublevel directly connected to sí, meaning that when we access a valid domain we have a set of possible tools and all generated content will be structured within a domain that is always available a homepage generated by the application "eclApp_domainIndex".

Already the application "eclApp_section" will generate no or sections within a domain. how many sections you want can be created, and is only available if it has right of access to "eclApp_section_create", being able to also add subsections, giving full freedom to users to organize their sites.



Fig. 3: Hierarchy Classes tree of the Ecolabore Framework

V. APPLICATION OF THE ECOLABORE FRAMEWORK IN EDUCATION WITH PRODUCTION OF THE OPEN EDUCATIONAL RESOURCES.

In the year 2013 Ecolabore Platform was used to create a learning environment oriented production of Open Educational Resources (O.E.R) with a focus on high school students integrated into professional courses. As the supply of distance learning courses in accessible virtual environments are still scarce, [6], it was decided to try out the platform by setting it as a Virtual Learning Environment.

The production of free knowledge content increases the formation of a culture REA, therefore, based on the implementation of a physical space called LabTEC@, a mix of library, video library and laboratory, high school students integrated into technical courses in electrical engineering and electronics, were encouraged to produce open educational content, developing projects, products, experiments, games and movement within a virtual

community projects also called LabTEC@. It is a virtual space created within the Ecolabore Portal, where students develop their material (O.E.R.) collaboratively integrating automatically content through a channel where the contents are unified and combined to form a website that is updated every time dynamically with the participation of each group member.

With Ecolabore platform was possible to create and subdomains management quickly and safely, which enabled the creation of specific areas for each student maintaining their autonomy in what and how to publish. So the students created their projects and set up their sites without much programming knowledge in HTML or PHP.

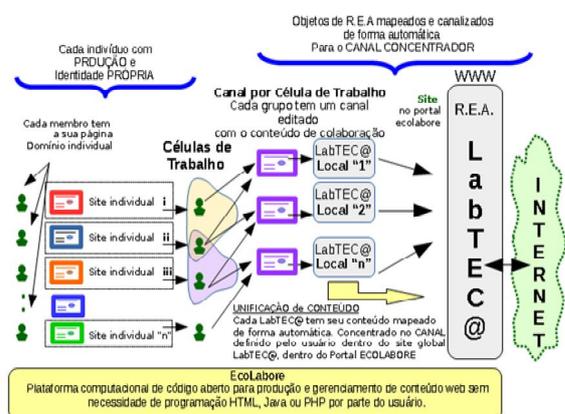


Fig.4. Operation of LabTEC@ environment on the Ecolabore Framework.

The project's main site, accessible in <http://www.labteca.ecolabore.net> is a hub channel functionality is available on the website and which allows each student to select within your site-specific section that will be shared on the hub. So LabTEC@ the main site grows automatically when members add content on their personal pages, as Figure 4

CONCLUSIONS

The ease of creating pages and publishing digital content portal Ecolabore allowed easily implement the hybrid method of education within the Technical Courses of Electronic and Electrical Engineering, through the creation of Labtec sub-domain, which allows students Integrated School technical and technological training to use the Portal in their learning process.

Pedagogical contributions of the use of LabTEC@ and consequently the use of the framework environment were noticeable in the last two semesters 2014-2 and 2015-1, which demonstrated an increased interest and participation of students in discussions in the classroom, and the question for them about what is to be an educational resource open quality that significantly contributes to learning in high school. Effective use by the students about the environment, measured by the number of access and updates,

validates the use of Ecolabore Portal, demonstrating that the system has good usability, with a view to good acceptance by the students involved in the process, and prove that the construction contents implies the assimilation of themes discussed in class, confirming that the strategy of encouraging the production of open educational content contributes to the improvement of the learning process. Although it is constantly evolving, and it always adds new features and improvements of existing tools, this experiment tested the usability of Ecolabore framework in addition to interest the students in being part of the development of the Portal.

So, what is intended in the continuity of this work is to promote the offer of a course in programming in PHP, using Xampp package, increasing the spread of Ecolabore further and demonstrating that its facilities contribute to the usability of the internet freely and collaborative ensuring accessibility and promoting digital inclusion.

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