Websites of learning support in Primary and High School in Portugal: a performance and usability study

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ABSTRACT
Main: This study aims to evaluate the quality of educational websites focused on learning support of two degrees of education, Primary School and the High school. **Methodology:** To develop this analysis was used a Model of Evaluation of the Quality of Educational Websites (EQEWS). This Model divided into Functional Aspects, with five criteria: Authority, Update, Usability, Accessibility and Communication; and in Technical and Aesthetic Aspects, with five criteria: Graphic Design and Multimedia Quality, Content, Navigation, Speed of Access and Interaction. This model of evaluation applied to 57 websites, according to the Likert scale of 0 to 4. The data subjected to statistical analysis with the support of computer calculation tool SPSS, version 23. **Results:** Through this exploratory study concluded that educational websites that had better ranking with higher average values were affected by High School sites. We conclude that the creators of these resources aren't conscience of the importance to assess their resources from heuristics evaluation, even before putting them on the Internet. It was noted the failure of the functional and technical requirements for who conceives, publishes and maintains their content online, often for lack of knowledge in handling these new technologies.

CCS Concepts
Social and professional topics → computing education → Information science education → Computing literacy

Keywords
Educational websites; Evaluation; Primary School; High School; Teaching; Evaluation criteria; Education

1. INTRODUCTION
People use the Internet in all areas of knowledge, not only looking for information but also to communicate with each other. As such, the Internet is considered the largest and most vast repository in the world, where different types and quality of information [6]. At present the Internet allows sharp democratic access to information is adopting new models of access, new query interfaces facilitating users haven't any experienced of needs in information retrieval and handling of websites. This instrument has become an increasingly useful tool for all types of organizations [2].

The consumption of large content and accessibility to information continues to grow on a large scale. With this in perspective, and knowing that young people need to select information and taking into account a significant amount of information it offers on the Internet, it's important to carry out a study that allows creating evaluation instruments. Thus, this study aims to evaluate to help students' choose their quality information and evaluating this kind of information instrumental.

Currently, electronic resources for educational purposes are increasingly present in the teaching-learning process. The development of the Internet and the development of technological communication and information tools have transformed the educational setting, through the emergence of new spaces, where they present themselves new features, with different methodologies and resources. The educational community needs to establish a set of clear and relevant criteria related to the assessment, which allows determining the quality of the learning support online resources and ensuring a better quality of teaching-learning process.

The vast amount of information available on the Internet, its complexity and heterogeneity, together with the different characteristics of users accessing such information, requires you to create a methodological approach to evaluation regarding functionality and technical and aesthetic terms. Educational websites in addition to providing users with accurate information should at the same time guide them correctly in your search satisfying their needs, according to their objectives, their knowledge or expectations.

The permanent presence of the Internet as a tool and its continuous technological development associated with social development in different areas of education. Currently, the WWW (World Wide Web) is a powerful "weapon" motivational among the various educational levels. Internet use has been growing in most developed countries, and the "digital natives" [22] are increasing. They are Eximious on this tool, exploring the close and carefree way with the volume of information without looking for the quality of the website, currently, counterproposal by Boyd [5] which considers that young person is surfing the Internet all alone, giving it the name "Orphan Digital."

Since the school cannot remove from their reality and context, it has to fit the use of existing technological artifacts to their availability to students' learning. The roles of Information and Communication Technologies (ICT) in teaching and learning process have become indispensable, while the technological tools have become increasingly available [9]. So, should permanently be a professional development that includes digital powers of the twenty-first-century teachers [8]. Dunn [12] believes that teachers have been encouraged to create websites classes, but many of these sites are only newsletters.

In this context, the leading figure in questions of site evaluation, usability is a characteristic that allows us to evaluate the ease with which a user uses the web interface [18] [16].

Lencastre [16] says that usability is usually synonymous with the functionality of the system for the user. Krug [15] also says that usability is simply being sure that something functions well and can, therefore used without creating frustration.

Usability is undoubtedly a strategic factor to achieve maximum utilization of an educational resource online. In this respect, usability is applied to ensure the continued viability of education, and ease arises increasingly standard tools for creating learning content [11]. Simões [25] states that usability determines the ease with which various functions can be performed, aiming to satisfy a particular audience. That is, the usability should be the interface of a website with structures that make your system easier to use, to be explored and can be learned through the available contents. The term usability may be related to many concepts such as user satisfaction, time of execution, performance and ease of learning.

Pinto [21] states that the ISO 9241 standard reflects the most common form of usability since its ultimate goal is "to promote the safety and health of users of computers, allowing an efficient, practical and comfortable use." The ISO 9241 [14] explains how to identify the information that is necessary to take into account when specifying or evaluating usability regarding performance measures and user satisfaction.

An educational website for addition to the list of general quality criteria and required specific, educational content implies above all the existence of an evaluation of the site usability. In this context, suggested by Tweddle et al. [26], the information contained in this web tool has to be a current, relevant, complete and accurate; with appropriate language (not offensive) and adapted to the age level of users [3].

Educational websites to support the learning of the youngest must provide tools so that the student can build and share their knowledge with others, involving collaborative editing online (blog or wiki) and the existence of a space where the student himself can publish their work [6].

Although many educational websites have good content, they can be oriented to failure if they are not attention to the specifics of your target audience and whether the site features do not meet your needs and expectations, become an instrument educational inactive. Accordingly, it is important that usability is a key concept in the interaction between user and computer.

Usability is a technical term to describe the quality of use of an interface [4] the interaction of users with the website in a particular context of use, but also when they reach specific goals effectively, efficiently and satisfactorily. The performance is relevant for users, particularly when they can perform the desired task quickly and without making mistakes, taking them to meet and then return to the same website.

The most direct and efficient method to obtain information from users to use the system, the obstacles and the challenges it faces and thus their satisfaction and are important to evaluate the performance of a website for it, there is usability testing, especially for sites directed to students.

2. State-of-the-art

The lack of studies related to the evaluation of educational resources online, including educational websites in support of primary and secondary education was one of the main reasons that led us to map the Internet the existence of these pages. An educational support site can become a very appealing learning tool, leading teachers and students to use these resources effectively without complicated commands, so anyone can efficiently extract the most relevant information**.**

Young people are an important target audience, and the use of the Internet and technology in schools has grown steadily in their everyday life, using a long time of your day, the use of computers and Internet connection [1].

According to Prensky [23], students are born with this technology and called "digital natives," that's, grown side by side with the technology and accompany him in his evolution. Hence, to navigate completely alone [5] there is a responsibility on them to support the appropriate choice of educational pages that best reflect their needs and their satisfaction. The offer is so that websites should build concerning usability.

Increasingly, institutions, government, teachers and educators create pages on the WWW and try to take advantage of technology (tool) popular among students. Many are teachers who created and maintained your online space, through websites or blogs. The offer increases so that if a user does not find the information you want or feel awkward to do some work, quickly abandons this website and will be looking for another.

The need to observe, explore and evaluate educational resources online in Portugal, namely educational sites in support of Primary and High school was one of the main reasons that led us to map the Internet the existence of these pages. An educational support site can become a very appealing learning tool, leading teachers and students to use these resources effectively without complicated commands so that anyone can extract the most relevant information.

Also in Portugal, Internet growth information from the 90s, it was noted by the concern to produce studies related to evaluation websites. A fact reflected in the literature of period literature sources related to the topic. With this observation, we concluded that there are jobs directed to the evaluation of educational websites (smaller number), educational software, and quality indicators of educational sites, accessibility studies, and educational usability websites. Information sources that most were able to recoverable to recover was the assessment of sites in many different social aspects, political, economic, health, among others.

This research focuses on quality assessment questions by selecting criteria and indicators that should be present during the construction and maintenance of an educational website, drawing attention to the usability issues for users.

Many of the authors who build their websites with total ignorance of some very important aspects that are crucial to your success. In the case of education, we found the web a significant and growing body of educational sites created by teachers and educators, who did not have in mind these aspects thus jeopardizing its success.

Systematically, we observe our students abandon some locations because they cannot find what they want or because the interface is very complicated. Usability and accessibility, with their content made available, are determining factors for a user to visit a website regularly. It's vital that the information provided in the millions of Web pages is accessible and usable by all.

Therefore, Nielsen [19] refers usability of a website, or your application is related to check if it's easy to learn, efficient to use, easy to remember, little error prone and enjoyable to use. That's, the degree of user satisfaction is a compelling factor and determines the success of a website.

3. Hypothesis/thesis and/or problem statement

To what extent digital learning resources available online for Primary and High School in Portugal are by the evaluation criteria?

The problem initially placed, and that will guide the research have to own hypotheses that can take a plausible answer, as Fortin [13] tells us that the hypothesis is "a formal statement of substantial relationships between two or more variables." Combines with the problem and the purpose of a clear explanation of the expected results of a study.

We set out for this study, with several cases defined, they are:

Hypothesis 1: The creators of educational websites will be interested in updating their content, developing knowledge by users.

Hypothesis 2: The educational websites to support learning to potentiate the evaluation criteria.

Hypothesis 3: The evaluation criteria in educational sites can be specific and can be measured. The sites in line with nature of support to students, who take into account the value of the criteria able to increase the student the acquisition and retention of knowledge.

4. Research objectives/goals

To prove the hypothesis set forth above, this research aims is to establish an evaluation system for educational websites to assess the educational websites to support learning directed to study cycles of primary and secondary education and demonstrate how are. The presence of new technologies is present at all times of teaching and learning.

To meet the objective of the study defined a series of tasks to enumerate:

1. Survey of all educational websites in Portugal that support the two levels of education;

2. Know the type of educational websites;

3. Define the requirements for selecting educational sites in Portugal;

5. Create an evaluation theoretical and methodology proposed quality educational sites;

4. Using assessment tools in qualitative and quantitative measurement study of defined evaluation criteria to measure educational websites;

6. Construction of online resources quality assessment tools, according to an objective point of view;

7. Construction of assessment of quality of teaching resources online tools, according to a subjective viewpoint:

a) Check that the educational website is easy to learn;

b) Check that the educational website is easy to use;

c) Make sure the site provides satisfaction to users.

8. Establish a Good Practice Guide that helps teachers to know what requirements must have an educational website.

5. Your research approach and methods, including relevant rationale

The research methodology used will mix, taking into account the use of qualitative methods (direct observation) collected by a Model of Evaluation of the Quality of Educational Websites (EQEWS); and use of quantitative methods (the test result of direct observation).

The evaluation of educational websites in Portugal will hold in two trials: Objective (evaluation of school websites) and, subjective (questionnaires to authors and creators of web and students sites (users of online resources). After processing the data in the program SPSS, the results will present in two parts first, a vertical analysis of the observed evaluation criteria. The second have to do with a horizontal analysis to know which educational websites that are best position in the assessment model, which averages in each approach, creating a quality rank.

Census of all educational websites that are directed to support Primary and High education in Portuguese territory.

Educational Websites support to the Primary and High School in Portugal mapped on the Internet, and subsequently, the sample set selected according to the criteria established for this study. Thus in the following analysis tools will be used:

A) Quality assessment instruments in an objective view:

- Data Description Sheet (FDD);
- Computer applications (Validator Examinator, HERA e Web Link Validator);
- Construction of a Model of Evaluation of the Quality of Educational Websites (EQEWS) adapted by Marquès Graells [17], Carvalho [6], Pinto Molina [22], Olsina [20] and Codina [10]. This approach gave rise to the Model used in this work, supported by ten criteria for assessing the quality of an online educational resource: Authority, Update, Usability, Accessibility, Communication, Graphic Design/Multimedia Quality, Content, Navigation, Speed of Access and Interaction.

B) Quality assessment tools, a subjective point of view:

- Questionnaires targets users' to evaluate the usability and performance of online resources;
- Inquiries directed to the creators and authors of online resources.

C) Resort a tool to process the data analyzed in the quality evaluation, according to an objective perspective, will be through SPSS.

6. Results to date and their validity

Analyzing the differences in categorical assessment attributed to Functional Aspects and Technical Aesthetic Aspects by the degree of knowledge of websites, allows us to observe that both aspects present a satisfactory assessment in High school sites. That's Functional Aspects, the educational sites of the Primary School obtained values in a greater number of Sufficient (classification of two (2)).

Concerning Authority, the educational websites of High School got the highest number of sites with *Bad* rating (didn't accomplish the requirement established by us) in connection with the Primary School websites. Unlike the recoverability of Sufficient attributed more to High School sites. To the development of *Good*, both of criteria obtained the same number of locations with this classification.

With Update, the High School educational websites have received the largest number of places with *Bad* (didn't accomplish the requirement established by us) in connection with the sites of the Primary School. Unlike the recoverability of *Sufficient* attributed more to of High School websites. About the valorization of *Good*, this discretion was the High School sites that have obtained the largest number of places with this classification. In this criterion, we observed with excellent (Very Good) rating was High School sites this means that accomplished the requirements of the Update Date of the place and had no old and misleading links.

In Usability criteria, the educational websites of High School obtained the highest number of sites with *Sufficient* to the websites of Primary School. About to the valorization of Good, this discretion was the High School websites that have obtained the largest number of sites with this classification.

In connection with educational websites of the Primary and High School the Accessibility, received a *Bad* rating (didn't accomplish the requirement established by us), both with a large number of sites. Unlike the recoverability of sufficient valorization the number below this rank, while the High School websites stand out. In this criterion were many High Schools sites (number) and the Primary School, in which three indicators of this approach doesn't apply.

We can't enhance the images, image maps, sounds, and videos without alternative text, as well as the absence of sound, and videos without the user could control.

In communication, the High School educational websites have obtained the largest number of sites with Bad (didn't accomplish the requirement established by us) in connection with the sites of the Primary School. Unlike the recoverability of sufficient attributed more to High School sites. To the evaluation of Good in this criterion, were High School websites that have obtained good quality results.

Analyze the criteria Technical Aesthetic Aspects show that the educational sites that have received a better classification of sufficient remain the places related to Secondary Education.

To the Graphic Design and Multimedia Quality, the educational sites of High School obtained the highest number of locations with Bad classification (didn't accomplish the requirement established) concerning the places of the Primary School. Unlike the recoverability of sufficient attributed more to the High School websites. With a qualitative appreciation of Good, were just Secondary sites that have obtained this ranking, unlike websites of the Primary School, didn't gain this qualification.

To Content the educational sites of High School got the highest number of websites with Good and sufficient, about primary internet sites.

In navigation, the High School educational websites have gained the largest number of sites with adequate to the Primary Internet sites. The classification of Good, this discretion was the High School websites that have obtained the most significant number of places with this classification. The Bad purchased in greater numbers by High School. Also, existed only in the teaching degree websites in the proper speed indicator in the animations and reading the data, but it hasn't been possible to assess because it didn't exist in some websites.

The criteria Speed of Access in both qualitative valuations obtained Education degrees between Sufficient, Good, and Very

Good. This criterion didn't have a negative score and the level of education that most stood out was his High School.

In Interaction the educational websites of High School obtained the highest number of websites (although, more or less equated) with Bad (didn't accomplish the requirement established by us) in connection with the sites of the Primary School. Unlike the recoverability of sufficient attributed more to High School websites. The valuation of Good in this criterion was in the High School the only websites that have obtained good quality results.

We note that the criteria got best results were those relating to High School Education. This result may arise due to the intended audience be more demanding that the resources directed to the Primary School. We note that the criteria evaluated within the two aspects, the High School websites are the most demanding that stand out, only in some indicators don't apply to recovery of images, sounds, videos. That's users of High Education as well as the creators or authors of these resources, intended the contents are more conscientious than in this degree, High School (preparing for the University entrance) require more care resources, with greater interaction between users and with varying content and more up to date. Perhaps, the high degree of education demands it. Unlike the resources directed to the Primary School in which the creators' and authors' of funds consider, for example, that media funds are more suitable for this level of education.

7. Dissertation status

The research is the analysis phase of the questionnaires to users, the data entered into SPSS and creating tables and graphs.

Subsequently will be performed the analysis of the results and their comparative studies of all data obtained with the Model EQEWS, inquiries to the authors of sites and users.

8. Current and expected contributions

This study aims to assess the educational websites for the Primary and High School and the construction of a model to evaluate online resources and possible use by other evaluators in other areas of knowledge.

The contribution of this study also aims to authors sites have attention to good practice guide on the availability of educational resources online and that the essential requirements to take into account.

Conclusions

Analyzed the results using SPSS statistical software educational web sites with higher ranking were the Secondary Education.

To conclude, in fifty-seven educational sites in this study twenty-five obtained a qualitative classification *Sufficient*. Six of the twenty-five educational websites belonged to the Primary School, and nineteen encompassed in High School. The remaining sites received qualitative values in *Bad* rating. In summary, the results of this paper allow us to conclude that there is a lot to learn about how to develop, (not only for teachers but also for institutions for the sharing and dissemination of teaching materials) which the criteria and requirements to value when you create online educational resources. There is a long way to go to achieve satisfactory results in evaluating the quality of Websites.

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