

OER-based Lifelong Learning for Older People

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Abstract: The Open Educational Resources (OER) are becoming a promising contribution to the enhancement of learning opportunities for all people worldwide. The OER involve educational digital content that have been released under an open license for free use or adaptation. The use of OER in formal and non-formal educational environments is known as OER-based learning. On the other hand, population ageing is currently recognized as a global issue of increasing importance with many implications for the economic development of countries. The access to learning by these people, in particular, the acquisition of the technical competence for using information and communication technologies, can improve their social involvement. This research aims to check the feasibility of using OER in lifelong learning programs for older people. Considering that these people have disabilities due to ageing, this research conducted a searching and validation process to verify the relevance and accessibility of OER to be used on a specific learning program oriented to digital literacy for older people. Finally, this research presents an accessibility validation based on barriers that older people face for using OER. Further, this work highlights the issues that hinder the OER-based learning programs.

1 INTRODUCTION

Currently, there is an increasing interest in Open Educational Resources (OER) as a complement to enhance education and knowledge access worldwide to all people. This inclusive vision requires considering people with particular learning requirements such as older people.

At the present, the proportion of people aged over 60 years is growing in almost all countries. The older people experience a decreasing of their physical, sensory and cognitive capabilities. Therefore, the issues of impairment and disability will become increasingly significant in all areas of human life, including education.

In such context, this work explores the feasibility of OER usage in a lifelong learning program for digital literacy aimed at older people through a process of searching resources and validating their relevance to the educational purpose and their accessibility characteristics.

The outcomes of this research highlight the issues related to the use of OER to support lifelong learning as well as the improvements required in OER design to enable their use for older people.

The structure of this paper is as follow. Section 2 presents the theoretical framework; Section 3 addresses the process of searching OER and their validation for relevance and accessibility; Section 4 presents the results of the searching and validation of OER; and, in the final part of this paper, the outcomes of this research are discussed.

2 THEORETICAL FRAMEWORK

2.1 OER-based Learning

The term OER coined at UNESCO (2002) refers to any digital content with a teaching-learning purpose that is released under an open license to allow their free use or repurposing. OER can be full courses or course materials in a diversity of formats such as audio, video, text, PDF, or HTML (Atkins et al., 2007).

The OER-based learning is the use of OER to support learning in different educational environments such as higher education, e-learning, lifelong learning programs, and self-learning (De

Langen and Bitter-Rijkema, 2012; OECD, 2007a).

2.2 Web Accessibility and Older People

According to the World Population Ageing report (United Nations, 2013), the world's population is aging at an accelerated rate. People over 60 years old represent 12% percent of the current global population, and by 2050, that number will rise to 21%. Older people experience age-related disabilities such as decreasing of their physical, sensory and cognitive capabilities (WHO, 2011). Consequently, the impairments that hinder them from using the web are related to gradual hearing loss; vision decline, loss of color perception and contrast sensitivity; restriction of hands movement or restricted hand dexterity, and cognitive decline (W3C, 2008a).

The web accessibility enables that people with disabilities can overcome the barriers to an effective use of the web (W3C, 2005). The web accessibility is achieved through the application of accessibility guidelines. Currently, the Web Content Accessibility Guidelines, WCAG 2.0 (W3C, 2008b) is the most widespread standard for web accessibility. This standard is a set of 12 guidelines structured under four principles: Perceivable, Operable, Understandable and Robust. Each guideline has a set of success criteria associated with a level of conformance.

2.3 Lifelong Learning and Digital Literacy

Lifelong learning refers to the learning that takes place at all stages of life, preferably in adult life, in both formal and non-formal environments (Green, 2002). Under the premise of lifelong learning, the access to learning for older people becomes a motivation for carry out intellectual tasks and consequently to enhance their cognitive abilities (Xavier et al., 2014).

Moreover, the European Parliament and the European Council, in their Recommendation on key competences for lifelong learning (2006), emphasizes that digital literacy should be extended to older adults to improve their quality of life.

Digital literacy refers to the acquisition of the technical competence for using information and communication technologies for employment, learning, self-development and participation in society. It also implies the ability to perform tasks effectively in a digital environment (Jones-Kavalier and Flannigan, 2006).

For the scope of this research we have adopted the common skills of digital literacy at basic level

(UNESCO, 2011) which correspond to these topics:

- *Basic Computer Skills*. This topic refers to the fundamentals of computing, explains the components of a computer, and explores operating system basics.
- *Internet and World Wide Web*. This topic explains how to connect to the Internet, use search engines, browse web pages, use e-mail, and register on a website.
- *Productivity Programs*. This topic explores the most common productivity software applications (word processing, spreadsheet, and presentation software) at basic level.

3 PROCESS FOR SEARCHING AND VALIDATING OER

Some studies highlight the potential of the OER-based learning as an efficient way to promote lifelong learning (Kumar Das, 2011; Misra, 2012; OECD, 2007b). However, another study argues that compared with other educational sectors, adult learning is the sector with the lowest level of OER development (Minguillón et al., 2009), while a study of European Commission points out some obstacles related to the applicability of OER in adult education (Falconer et al., 2013).

In this work we propose a process for searching and validation of OER that enables the selection of suitable resources to be used by older people in a digital literacy learning program. The outcomes of this work could contribute to the discussion in this context.

3.1 Searching OER

The searching of resources can be a time consuming activity because of the vast amount of available OER repositories (Hatakka, 2009). Considering that the scope of this research is related to the accessibility of the resources, we have selected two of the large-scale OER websites that have made major strides in this field: “MERLOT” (<https://www.merlot.org/>) and “OER Commons” (<https://www.oercommons.org/>) (Navarrete and Luján-Mora, 2013; Navarrete and Luján-Mora, 2015).

In addition, it is important to define the main parameters for searching: the topics and the format of the resources. The search has been based on various terms related to the topics proposed above in section 2.3 Digital Literacy. Regarding the formats, this research has prioritized HTML due to the

richness of multimedia resources that can be included in web pages and its independence of a specific software for visualization.

3.2 Validating OER

The validation covers the relevance of the resources for the purpose of the digital literacy program as well as the accessibility of resources that enable their use for older people.

3.2.1 Relevance Validation

The relevance of a resource is related to quality aspects that impact on its educational purpose (Camilleri et al., 2014). For this work, we have considered that the relevance of OER relies on these aspects:

- *Educational value* that includes the relevance of the content concerning the learning purpose, the accuracy and the up to date content.
- *License restrictions* about the use and reuse of the resource. The reference adopted is the open licensing framework “Creative Commons” (CC) which is used by MERLOT and OER Commons. These copyright licenses provide a standardized way to give the public permission to share and use the resources, therefore, it is possible to know whether the resources can be used for free or can be reused if required.

3.2.2 Accessibility Validation

The accessibility validation is performed through a heuristic evaluation of the accessibility of the resources to be usable by older people, supported by the “Barrier Walkthrough” method (Brajnik, 2006). This method is based on the identification of the possible barriers that people with disabilities faced in web design depending on their disability, the type of assistive technology being used, the failure mode (that is the activity/task that is hindered and how it is hindered), and the design characteristics that produce the barrier. Furthermore, this method proposes some potential barriers for different disabilities.

In order to define the barriers for older people, this research has also reviewed the set of recommendations on designing web pages to be usable by older people, proposed by the project Web Accessibility Initiative: Ageing Education and Harmonisation (WAI-AGE, 2009) from the European Commission and the W3C.

Based on the above, Table 1 presents the accessibility barriers for older people that have been

considered in this research. The table also includes for each barrier: its cause, the failure mode, and the guideline or success criteria corresponding with WCAG 2.0 concerning to this barrier. Because of the lack of space, only the most common barriers for older people are included.

Further, the accessibility evaluation has been performed by means of using automated tools complemented with expert human judgment, according to what has been done in a previous work of the authors (Navarrete and Luján-Mora, 2015). The accessibility evaluation has verified the presence of these barriers in the resources.

4 RESULTS

The OER websites do not have a unique standard for content categorization, which implies that the searching of resources is particular for each one. Therefore, to get a preliminary approach to the potential OER that meeting the needs of this research, the search has based on “keywords” or “exact phrases” related to topics described previously. Further, to improve the searching results, the “software products”, have been also included in the searching. Only the Microsoft software products have produced results, as presented in Table 2. This table also presents the list of keywords or exact phrases, the number of resources obtained from each OER website (“# resources” column), and the number of resources that have been validated as relevant for this project (“# relevant” column).

These websites have presented some issues in the search interfaces. For example, the lack of pagination to display the results, and the inability of setting the number of results to be displayed per page. These problems could become barriers for older people.

4.1 Results of Relevance Validation

As presented in Table 2, after the evaluation of the relevance of the resources based on their educational value and license restriction, the number of suitable resources has been reduced significantly.

The resources that were qualified as relevant had HTML format combined with PDF documents or video material.

These have been the main problems with respect to the educational value:

- The content of the resources was not intended to teach the use of a software product, instead, it was about the application of the software to another purpose (e.g. the use of Excel in medical statistics)

Table 1: Barriers related to web accessibility for older people.

Barrier	Cause	Failure mode	WCAG 2.0 Success criteria and/or Guideline
Text cannot be resized	Use of absolute units in CSS to specify font size.	The user might not be able to increase the font size of the text.	1.4.4 Resize text 1.4.8 Visual Presentation
Color is necessary	The color is used as the sole mean to distinguish two or more different information items.	The user has inability to perceive colors (as those users with normal vision capabilities).	1.4.1 Use of color
Insufficient visual contrast	The colors used for foreground material against a background have insufficient contrast.	The user experiences problems recognizing the foreground items.	1.4.3 Contrast (Minimum) 1.4.6 Contrast (Enhanced)
Functional images lacking text	The page contains functional images (clickable links, form buttons, image maps) that do not have alternative equivalent text.	The user would not be able to enlarge the images (if not using a screen magnifier). He would not be able to interpret them.	1.1.1 Non-text content 1.4.5 Images of text
Dynamic menus in JavaScript	When the user moves the focus of interaction with an element, a menu drops down in a given area of the page.	The menu could easily be located outside the visual field of the user, who will not be able to use it at all (when using a screen magnifier).	2.1.1 (2.1.3) Keyboard 4.1.2 Name, Role, Value
Too many links	The page contains too many links that are not well organized in clearly labelled groups.	A large number of links requires that users perform a scanning them all before deciding if there is one that is worth following.	2.4.10 Section headings
Skip links not implemented	The page does not allow the user to jump directly to the content (skipping over breadcrumbs, search boxes, global navigation bars).	The user has no way to quickly set the focus of interaction on the page content.	2.4.1 Bypass blocks
Ambiguous links	The links with labels are ambiguous. The same text is used to represent different URLs.	The user could activate the wrong link by mistake.	2.4.1 (2.4.9) Link purpose
Mouse events	The page is based on JavaScript functions invoked through event handlers (mouse-oriented).	It is probably that user prefers using the keyboard rather than the mouse.	2.1.1 (2.1.3) Keyboard
Keyboard traps	The page contains components that lock the user once moves the keyboard focus on them.	The user cannot use the keyboard rather than the mouse for certain activities.	2.1.2 No Keyboard Trap
Forms with no label tags	The page contains a form whose controls are not marked up with LABEL tag and FOR attribute.	Some controls (radio buttons and checkboxes) have a clickable area that is very small. The user will struggle to hit them correctly.	2.4.7 Focus visible 1.3.1 Info and relationships
Video with no captions	A multimedia file with a video or an animation that has no caption (or textual description).	The older people have problems to perceive the auditory information because of their hearing loss.	2.4 Time-based Media
Missing synchronization	The caption or textual description are not synchronized to the video.	The user has difficulties to perceive the information.	1.2.2 Captions (Prerecorded)
Complex text	The text is complex to read (complexity of the sentences, acronyms).	Older people require great effort to understand the text.	3.1.3 Unusual word 3.1.5 Reading level
Complex site	The website has a complex organization (content grouping and content relationships)	Older people require great effort to understand the content and in navigating through it.	2.4.5 Multiple ways

- The content of these resources was aimed at computer professionals, so, these were not appropriate to a basic level.
- The content of these resources did not correspond to current technologies.
- The content of these resources did not correspond to the associated keywords.

With regard to the licenses of the resources, some of them were not qualified as relevant because their

licenses did not allow the free use. For example, some resources, mostly online courses, required payment for student registration. The accepted resources had Creative Commons licenses based on these conditions: BY (Attribution), NC (NonCommercial), SA (Share-Alike), and ND (No Derivative works) and with these licenses (CC BY, CC BY-SA, CC BY-NC-SA), or a declaration to allow their free use.

Table 2: Number of resources in OER websites.

Keyword or exact phrase for searching	Number of resources			
	OER Commons		MERLOT	
	# resources	# relevant	# resources	# relevant
Digital literacy	87	2	74	1
Basic computer skills	50	3	15	1
Using the web	0	0	66	2
Word processor	5	1	26	0
Spreadsheet	246	1	113	4
Presentation software	5	0	13	0
Microsoft word	51	1	102	1
Excel	441	2	278	0
Power Point	356	3	126	0

Additionally, the searching results showed that some resources were available on both websites, OER Commons and MERLOT. Also, some resources included more than one of the topics of interest.

4.2 Results of Accessibility Validation

Due to the lack of space, the results of the heuristic accessibility validation of each resource cannot be exposed. However, the most important general results are presented below.

- We have found two resources accessible for older people. Fortunately, these web courses encompass almost all the content required for this program on digital literacy.
- All resources that include videos have failed for accessibility because they did not have captions or transcripts. The subtitles for all videos hosted in YouTube have been produced by the speech recognition technology of YouTube. Therefore, these were not accurate. Thereby, the older people who experience hearing loss could have understanding issues of the content exposed in videos.
- None of the resources in HTML format enables text resizing as a user preference. This restriction can hinder that older people with vision impairments be able to read the content.
- In some resources, the HTML pages contain mouse-oriented events. The people who use the keyboard, instead of the mouse for interaction, cannot detect these events. This can be the case of older people with hand dexterity issues that prefer the use of the keyboard.

- In some resources, the HTML pages have issues of color contrast. For older people, their loss of color-contrast perception could hinder the recognition of the foreground items.

5 DISCUSSION AND FUTURE WORK

A frequent criticism for the adoption of OER in learning programs is their lack of adjustment to context-specific needs. Indeed, the biggest obstacle to the adoption of OER in the learning program proposed in this research has been finding the resources that meet the requirements, regarding contents and particular needs, for example, accessibility of the resources.

The searching of resources has been exhaustive and has demanded the verification of a large set of “keywords” and “exact phrases” to achieve significant results. After this, it has been necessary to review the relevance of several hundreds of resources for this learning program. A major issue has been the inconsistency between the content of the resources and the keywords or phrases associated with them. Moreover, we have found that some online courses did not correspond to the “open” philosophy because they demanded a registration payment.

Also, the interfaces for browsing the searching results, in OER Commons and MERLOT, have been inefficient for several hundreds of results. For example, in OER Commons, the pagination of search results is not enabled; although, it is possible to establish the number of results to be displayed (maximum 100). The page shows the option “load more” to see more results, so, the visualization with the vertical scroll of the page becomes a problem.

After the selection of relevant resources and their accessibility validation, we have found two resources that cover almost all the topics for the digital literacy program and are suitable to be used by older people. These resources are web-based courses provided by DigitalLearn.org and the Connecticut Distance Learning Consortium.

Based on the outcomes of this research we can argue that despite the broad availability of resources and the inclusive vision of OER initiatives, the accessibility characteristics have not been addressed as quality requirements of these resources.

As a final reflection, the most significant barrier to wider adoption of OER in this type of learning programs is the user perception of the time and effort required to find and evaluate the resources. If a user

is an older adult, the task of search and selection of resources can be discouraging.

In our future work, we will plan to develop a process to search resources for specific needs that include accessibility characteristics. This process will consider the perspective of older people and people with mild disabilities to increase the reuse of OER.

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