Open Educational Resources: Higher Education Students' Knowledge and use

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Abstract: Information and communication technologies represent one of the main innovation factors within the teaching and learning process, especially in Higher Education. In this context, the search for building useful and grounded knowledge using strategies which meet students' needs and interests requires the use of innovative resources, among which we highlight digital educational resources, particularly open educational resources (OER). The open educational resources issue has deserved the attention of teachers, students and institutions. Considering the present situation as well as the importance given to OER and to the role these may play in supporting learning, the aims of this paper are as follows: assess the digital educational resources features most valued by higher education students; verify the extent to which students' IT knowledge influences their assessment of digital educational resources; identify the knowledge that higher education students have of OER; assess the knowledge that higher education students have of open educational resources platforms. In order to achieve the proposed aims, we focus our attention on open educational resources, starting by assessing digital educational resources' features as well as the connection between students' IT knowledge and that same assessment. We also assess the knowledge that higher education students have of OER as well as of their corresponding platforms. The data was obtained through a questionnaire conducted within a sample of 315 students at a Portuguese higher education institution. Among the results obtained, we highlight that the most valued features of digital educational resources are: free access; any time access; allows reuse; and free and open. The results show that there is a positive, low, or very low correlation between students' IT knowledge and the features associated with digital educational resources. In addition to this, the results show an almost inexistent knowledge of the OER concept and of their uses as well as of the existing OER platforms. The data indicates that there is still a long way to go so that OER may be part of the resources used by students to improve their learning.

Keywords: open educational resources, digital educational resources, higher education

1. Introduction

Considering their features and potentialities, information and communication technologies constitute the major innovation factor within the various contexts of society. Among these contexts, we highlight the higher education context, within which the teaching and learning process is particularly important, as it is based on it that we build useful and grounded knowledge, through strategies that should essentially meet students' needs and interests. Digital educational resources, particularly open educational resources (OER) represent an important way to enrich those strategies. Within the present times and bearing in mind the importance given to OER as well as the relevance these resources might have in supporting students to build their own learning, the aims of this paper are as follows:

- Assess the digital educational resources' features most valued by higher education students;
- Verify the extent to which students' IT knowledge influences their appreciation of digital educational resources
- Identify the knowledge that higher education students have of OER;
- Assess the knowledge that higher education students have of open educational resources platforms.

In order to reach the proposed aims, a study was carried out among higher education students. The data was collected through a questionnaire conducted during the school year of 2013/2014, to a sample of 315 students.

The paper development is presented under the following headings: open educational resources; methodology; results; conclusions; references. Within the topic of open educational resources, we develop the concept of OER and present a framework to the topic based on literature supported by the opinion of experts in the areas of digital educational resources, OER and open education.

In the part concerning methodology, we characterize the study and describe the main procedures leading to the results which enable us to respond to the formulated aims. In the results, we present and organize the obtained data, and discuss and analyze it. In the conclusions, we present a summary of the most relevant results obtained through this study. Finally, in the references, we can find the books, journals and other sources cited in the article.

2. Open educational resources

Under the movement associated with open educational resources lies the idea that knowledge must be built, disseminated and shared through the network free of charge, for the benefit of society as a whole. Thus, it is important to promote the OER philosophy within education institutions. These institutions generally possess better scientific and technological conditions that allow them to contribute to the evolution of digital educational resources, particularly to the evolution of OER as well as of all the features associated with them. Therefore, these institutions may become the motors of creation, dissemination, sharing and use of OER. The *OER movement* started in 2002 and was later named *OER community*. Despite the significant progress made in the introduction of OER in higher education, within the OER UNESCO community, and through a series of other similar initiatives, the concept of OER is not yet widely known or understood, especially by the political stakeholders and institutional managers (Wyk, 2012).

According to Ramos, Teodoro, Fernandes, Ferreira, and Chagas (2010), educational resources follow the evolution of society, as printed material models give way to digital models, accompanying the change of technologies as well as their role in society. In addition to this, information society floods us with a huge amount of information, tools, knowledge and resources from all parts of the world and from the most diverse communities and cultures. Also, Littlejohn, Falconer and Mcgill (2008) highlight that over the last two decades, huge changes have been witnessed regarding teaching methods and availability of new types of resource based on digital technologies.

The concept of OER is complex due to the dimensions that it involves, thus allowing several approaches which enable the identification of its main features.

OER are educational resources provided by information and communication technologies which allow a community of users to consult, use and adapt them in a noncommercial way. When defining OER, the following elements must be considered: the aim - offer a noncommercial educational resource; the view to the service - free access to the resource with a possibility of adaptation; the method of availability - provided by information and communication technologies; the target audience – a diversified community of users (Unesco, 2002).

For Atkins, Brown and Hammond (2007), OER are teaching, learning and research materials which reside in the public domain and were made available under an open license which allows access, use, recovery, reuse and redistribution without any restriction. OER are normally placed in a public domain for others' free use or reuse and they can vary from complete courses to individual modules (Downes, 2007). Butcher (2011) presents a different concept of OER, considering them as any educational resource including curricular maps, course materials, books, videos, multimedia applications or podcasts which have been projected to be used in teaching and learning and which are openly available to be used by both educators and students without any necessary supervision, tax payment or copyrights.

Also regarding OER concept and approach, Downes (2013) states: "OER are a network of words that we use in whatever vocabulary we are using to conduct whatever activity it is that we're doing or that we're undertaking. They are the signals that we send to each other in our network" (p. 218). This author adds that "Understanding OER as though they were words in a language used to facilitate communications between participants in a network should revise our understanding of what it means to be open, and what it means to support OER. It is clear, from this perspective at least, that openness is not a question of production, but rather a question of access" (p. 220).

OER potentialities in learning can be huge, however, as Conole (2012) claims, in order to make them useful to students and teachers it is important to know and understand the way students and teachers are using them

and can benefit from them as well as what their global perceptions are regarding the importance of OER in supporting learning.

Knox (2013) states that as far as higher education learning is concerned, two different OER models are being promoted. One of them promotes an availability restricted to the higher education institution, and the other proposes independent study and learning, reserving the institution's role of evaluation and accredited certification. The author calls the institutions' attention towards the need to consider the implications of these two models as well as the potential problems associated with the two approaches.

OER are generally developed by teachers who expect to share them and see them being used and reused by other teachers, thus promoting a culture which supports both teachers and higher education institutions so as to provide students with free or very low cost quality didactic resources resulting from individual effort or joint effort through formal collaborations (Lane, 2012).

Regarding the use of OER in higher education, Pawlyshyn, Braddlee, Casper, and Miller (2013) suggest that: an effort must be made to implement initiatives which enable an easy introduction of OER rather than follow top-down institutional directives; connections must be promoted and ideas must be shared, not only with other institutions but also among teachers who use OER actively; resources of professional development must be provided, including those used by teachers in OER conferences presentations; the institutional integration of OER modules with teams of educational design must be promoted; models for assessing OER use must be established and the results of such assessments must be disclosed, thus promoting continuous institutional support to the use of OER.

Institutional support to the use of OER can be provided in various ways such as through encouraging, within each institution, the creation and updating of OER repositories as well as projects associated with OER. Regarding the latter, Downes (2013) highlights "MIT's OpenCourseWare project (OCW). Something that's also received a lot of attention recently (because it was featured on the TED videos) is the Khan Academy, which is a whole series of YouTube videos on mathematics, physics and similar science and technology subjects. MERLOT is a project that was created by a consortium of North American educational institutions" (p. 213).

It is essential to assess OER regarding their importance to learning and the benefits they can provide to students. As Pawlowski and Bick (2012) refer, one of the current research key-issues is the adaptation of resources and the corresponding efforts, highlighting that OER success greatly depends on how easily they can be adapted and modified for reuse. According to Wiley (2010), OER offer the previously unimaginable opportunity of using technology to maintain the quality of educational resources reducing costs significantly. Therefore, OER represent tools which enable anybody in the world to get the education they want at a very low cost. The same author adds that the new means of communication and technology will play a crucial role in the future of education, namely regarding sharing, donation and generosity towards others.

3. Methodology

The study assumes an approach of quantitative nature. As stated by Creswell (2014), the quantitative approach enables us to test the relation between variables that provide figures which can be treated through statistical procedures. Kumar (2011) points out that a study can be considered quantitative when it intends to quantify the variation of a phenomenon, situation, problem, or issue; the information is obtained through predominantly quantitative variables; and the information is oriented to assess the variation amplitude.

The data collection tool was a questionnaire, built by the authors of the study. The questionnaire is composed of closed-ended questions, which implied the collection of figures corresponding to the frequency of answers regarding each of the options given in the questions presented. The questionnaires were administered within the classroom context in the presence of the class teacher as well as of one of the authors of the study. The questionnaires were filled in at the beginning of the lesson, before starting developing the plan prepared for the lesson in which the questionnaires were administered.

The sample is non-probabilistic, voluntary or convenience. The selection method of a voluntary or of a convenience sample bears in mind the availability and accessibility of the population elements that it

integrates, and the sample of this study is composed of units which are accessible to the researchers and who voluntarily offered to integrate it.

The sample was selected during the 2013/2014 school year within two schools of a higher education institution. One is a school of Education and the other is a school of Technology and Management. In the year mentioned, there were 1617 students enrolled in the School of Education and among these, 210 integrated the sample. In the School of Technology and Management, there were 2285 students enrolled, among which 105 integrated the sample. Considering the population of the sample to be all the students enrolled in both schools, we verify that the population is 3902 students, from which a sample of 105 was extracted, which corresponds to approximately 8% of the population.

Among the sample elements, 93 (29.5%) are male and 222 (70.5%) are female. The mean age is 20.8 years old, the mode and the median are 20 years old and the standard deviation is 2.7. With respect to the school year they attend, 161 (51.1%) are enrolled in year 1, 70 (22.2%) are in year 2, and 84 (26.7%) are in year 3.

4. Results

The results are presented by analyzing the answers to each question. We start by analyzing the following question in the respective options: *Mark with a cross (X) the option which best translates the importance that you give to the features of digital educational resources: a) Free and open; b) Free access; c) Any time access; d) Allows modification; e) Allows reuse.* Importance is measured in the scale: *not important at all; of little importance; important; very important; extremely important*. The distribution of answers within the referred scale is presented in Table 1.

Table 1: Assessment of digital educational resources' features

Digital educational resources' features	Not Important at All		Of Little Importance		Important		Very Important		Extremely Important		Didn't Answer	
	n	%	n	%	n	%	n	%	n	%	n	%
Free and open	4	1.3	8	2.5	112	35.6	121	38.4	66	21.0	4	1.3
Free access	2	0.6	2	0.6	39	12.4	122	38.7	148	47.0	2	0.6
Any time access	3	1.0	3	1.0	30	9.5	113	35.9	162	51.4	4	1.3
Allows modification	18	5.7	63	20.0	121	38.4	68	21.6	39	12.4	6	1.9
Allows reuse	6	1.9	17	5.4	111	35.2	107	34.0	69	21.9	5	1.6

Considering the percentage of students who classify digital resources' features as *important, very important and extremely important,* we can see that the most valued feature is *free access* (98.1%), followed by *any time access* (96.8%), *free and open* (95%), *allows reuse* (91.1%), and finally, the least valued feature, *allows modification* (72.4). It is also visible that the features *any time access* and *free access* are the ones considered as extremely important by the highest number of subjects.

One of the aims of the study was to verify the extent to which students' IT knowledge influences their appreciation of digital educational resources. The sample subjects' IT knowledge was obtained from the answers to the following question: *Classify your general IT knowledge (mark only one option): a) Basic; b) Intermediate; c) Advanced.*

The distribution of answers regarding the classification of the sample subjects' IT knowledge is presented in Table 2.

Table 2: Classification of IT knowledge (n=315)

Classification of IT knowledge	n	%
Basic	90	28.6
Intermediate	199	63.2
Advanced	24	7.6
Didn't Answer	2	0.6

By observing Table 2, we can see that most subjects classified their IT knowledge as *intermediate* (63.2%), followed by *basic* (28.6%) and *advanced knowledge* (7.6%).

In order to relate IT knowledge to open educational resources, we took IT knowledge as a variable and each one of the assessed digital educational resources' features as another variable. Thus, we consider that each of the referred variables can be measured in an ordinal scale, proceeding to the following attributions or conventions.

IT knowledge assumes the values 0, 1, 2, 3, according to their respective translation into: *didn't answer*; *basic*; *intermediate*; or *advanced*. Each of the features assumes the values 0, 1, 2, 3, 4, 5, according to the respective options: *didn't answer*; *not important at all*; *of little importance*; *important*; *very important*; and *extremely important*.

From the implemented conventions, data can be considered as ordinal data. Thus, according to Pereira (2004) and Maroco (2010), the most appropriate similarity measure to assess the degree of association between the variables is the Spearman correlation coefficient. In Table 3 we present the Spearman correlation coefficients between the variables, determined with the statistic program SPSS (Statistical Package for the Social Sciences).

Table 3: Degree of association between the variables IT knowledge and digital educational resources' features (n=315)

Variables		IT knowledge	Free and open	Free access	Any time access	Allows modification	Allows reuse
IT knowledge	Coef.	1.00					
	Sig.						
Free and open	Coef.	0.217**	1.00				
	Sig.	0.00					
Free access	Coef.	0.128*	0.558**	1.00			
	Sig.	0.02	0.00				
Any time access	Coef.	0.119*	0.527**	0.708**	1.00		
	Sig.	0.04	0.00	0.00			
Allows modification	Coef.	0.241**	0.370**	0.222**	0.219**	1.00	
	Sig.	0.00	0.00	0.00	0.00		
Allows reuse	Coef.	0.129*	0.399**	0.337**	0.411**	0.549**	1.00
	Sig.	0.02	0.00	0.00	0.00	0.00	

**Correlation is significant at the 0.01 level (2-tailed).

*Correlation is significant at the 0.05 level (2-tailed)

Considering the classification of the correlation defined by Morais (2000) as represented in Figure 1, it is possible to conclude that the correlation is: very low or low between *IT knowledge* and each one of the other variables; high (0.708) between the variable *free access* and the variable *any time access;* low or moderate in the remaining situations assessed.

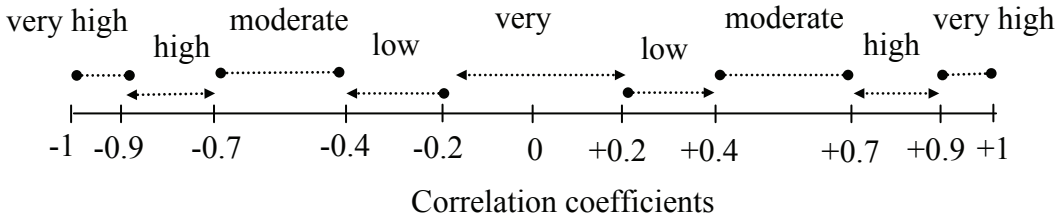

Figure 1: Classification of the correlation (Morais, 2000, p. 184)

In the light of the results presented above, we verify a positive correlation between any pair of variables, being significant in all situations for a level of significance lower than 0.05.

After analyzing the digital educational resources' features, we now assess the knowledge that higher education students have of open educational resources (OER). Although OER are not exclusively digital educational resources, we admit that their evolution is essentially associated with the development of digital educational resources.

The data concerning the knowledge that students have of OER was obtained from the answers to the following question in the respective options: *Mark with a cross (X) the option which best describes your knowledge of the concept of Open Educational Resources (OER): a) I have never heard of Open Educational Resources; b) I have heard but I do not have an opinion about the potentialities of Open Educational Resources; c) I know the potentialities of Open Educational Resources but I have never used such resources; d) I have used Open Educational Resources and I consider them very important in the teaching and learning process; e) I have used Open Educational Resources and I consider them of little importance in the teaching and learning process.* In Table 4, we present the distribution of answers given by the sample subjects.

Table 4: Knowledge concerning the concept of open educational resources (n=315)

Knowledge of Open Educational Resources	n	%
I have never heard of Open Educational Resources	198	62.9
I have heard but I do not have an opinion about the potentialities of Open Educational Resources	70	22.2%
I know the potentialities of Open Educational Resources but I have never used such resources	16	5.1%
I have used Open Educational Resources and I consider them very important in the teaching and learning process	28	8.9%
I have used Open Educational Resources and I consider them of little importance in the teaching and learning process	3	1.0%

The data indicates that OER are completely unknown to more than 60% of the sample subjects and that, among those who have some knowledge, less than 10% give them importance. One of the concerns regarding the adoption of OER in higher education lies in finding strategies which can make OER desirable to institutions, teachers and students. The results obtained give clear evidence of such a need. Also, Conole (2012) highlights that neither students nor teachers have used OER extensively and suggests that the reasons are complex and multifaceted. The author adds that at first, there was a naïve belief that making OER available would by itself grant their use by students and teachers. It later became clear, as it is shown in this study that a generalized adoption of OER did not occur.

It is important to notice that, although the answers to the previous question shown in Table 4 reveal that the majority of students do not know OER, the truth is that according to the answers given to the question regarding the features they appreciate in digital educational resources, even students who do not have an opinion about OER were found to value their features. This happens because, as Downes (2011) refers, OER are materials which can be freely accessed, reused, modified and shared by anyone in order to support education.

Another aim of the study was to identify the level of knowledge that students have of OER platforms. Therefore, the sample subjects answered the following question in the respective options: *Mark with a cross (X) the Open Educational Resources Platforms that you know: a) MIT OpenCourseware; b) OpenCourseware Consortium; c) Carnegie Mellon University - Open Learning Initiative; d) MERLOT; e) Others.*

The distribution of answers regarding the knowledge that students have of OER platforms is presented in Table 5.

Table 5: Knowledge of OER platforms (n=315)

Open Educational Resources Platforms	Does not know (%)	Knows (%)
MIT OpenCourseware	91.1	8.9
OpenCourseware Consortium	94.6	5.4
Carnegie Mellon University - Open Learning Initiative	94.9	5.1
MERLOT	94.6	5.4

Regarding option *e) Others*, here are the answers given as well as the number of times they were mentioned: IPB.Virtual (5), B-On (3), Youtube (2), SCIELO (2), Khan Academy (1), W3Schools (1), Wikipedia (1).

Based on the results directly related to OER and their platforms, we see that the OER issue is still unfamiliar within the teaching and learning context of higher education students, who simultaneously value the features of such resources. Therefore, there is an urgent need to promote the dissemination and use of OER, so that

students can benefit from resources which are mainly developed to be useful, free, charge free, and used by anyone who wants to learn, regardless of their financial or social condition or of the place in the world where they happen to be.

5. Conclusions

The conclusions are drawn from the results obtained through a questionnaire administered during the school year of 2013/1014 to a sample of 315 students at a state higher education Portuguese institution.
Among the results obtained, we highlight the following:

- We analyzed the digital educational resources features: *free and open; free access; any time access; allows modification; allows reuse*. Considering the options *very important* and *extremely important* together, the results show that the most valued features were *any time access* and *free access;*
- We assessed the sample subjects' IT knowledge ranged as *basic knowledge, intermediate knowledge* and *advanced knowledge*. The results show that the majority of students stated to have intermediate IT knowledge.
- We assessed the correlation between *IT knowledge* and each of the variables associated with the digital educational resources' features. We concluded that the correlation is: very low or low between *IT knowledge* and each one of the other variables; high between the variable *free access* and the variable *any time access*; low or moderate in the remaining assessed situations.
- With respect to the knowledge and use of open educational resources (OER), the results show that most of the sample subjects have never heard of OER, and less than 10% of the students have used OER and consider them important.
- Regarding the knowledge of OER platforms, we found that only a very low percentage of the subjects have knowledge of the platforms MIT OpenCourseware, OpenCourseware Consortium, Carnegie Mellon University, and that the MIT OpenCourseware platform is the one known by a higher percentage of subjects.

Thus, we conclude that the features which are considered most important within digital educational resources are *free access* and *any time access.* There is a significantly high percentage of students who do not know OER, their potentialities or OER platforms.

The use of OER within the context of higher education still has a long way to go, and big commitment and effort are required from both institution stakeholders and teachers so that students' interest in using OER in the teaching and learning process may increase in the higher education context. In addition to this, the data obtained may represent a wake-up call for institutions, teachers and students, as those who know OER actually consider them very important and useful, but there is still simultaneously a very high percentage of students, at least within the sample of this study, to whom OER are totally unknown.

This study indicates that higher investment is needed in promoting OER so that they can be more widely used by students. The study may also constitute an important element to provoke reflection on the level of use of open educational resources in higher education, especially if we consider the importance they are given worldwide as well as the view of several researchers, who see OER as essential and innovative elements in the support to knowledge building due to their price-quality ratio and to the fact that they can be used by anyone regardless of their location in the world and their social or financial situation.

As future work, we intend to implement projects associated with teaching and learning strategies which directly involve selecting, using and assessing open educational resources in the building of knowledge within the various areas of study.

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