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Educational innovation and digital competencies: the case of OER in a private Venezuelan university

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Abstract

The challenge for universities in developing countries of Latin America is to provide quality education and to promote the development of the digital competencies necessary for an active citizenship. Nevertheless, the use of technology and open educational resources (OER) promote greater efficiency and social penetration. The objective of this research is to analyze how the attributes of innovation develop when OER are integrated with learning environments that promote digital skills. Case study and data recollection were applied to the interview, the log, the observation, and the document analysis. Results indicated that a combination of innovation attributes generates a change in: a) educational methodology, b) technological tools and ways to present its contents, and c) the way the teacher thinks and students act. The use of innovative elements allowed subjects to overcome space and time barriers, setting the foundation for the development of blended learning in the institution.

Keywords: Educational innovation, Open educational resources (OER), Collaborative work, Web 2.0 tools, Digital competencies

Introduction and situation

In the present knowledge society and globalization there is a need to make university activities more efficient and more oriented towards permeating society. In this sense the United Nations Educational, Scientific, and Cultural Organization determined that during 2014–2017 higher education's three axes would be: a) internationalization of knowledge, b) incorporation of long distance education programs and use of ICT, and c) support the policies oriented to those actions (Didou, 2014). This indicates that in the use of ICT, OER and the impulse towards mixed gender and distance education, Higher Education Institutions (HEI) are relevant in the regional and worldwide agenda pointing towards educational innovation.

As a consequence, the teacher must now proceed as a learning facilitator, and the students have the lead roll in the teaching-learning process. For Salinas (2004), the main challenge in educational innovation is in the adoption of processes on behalf of people, groups, and institutions. This requires changes in attitudes and activities, as well as in the paradigm that emerges in the knowledge society where students and teachers build knowledge together.

In the educational innovation process, it's important to have authorities and teachers participate. This study has been addressed by various authors (Boahin & Hofman, 2012; Ellsworth, 2000; Margalef & Arenas, 2006; Martínez, Toledo, & Román, 2009; Ramírez, 2012) and by organizations such as UNESCO's Regional Office for Education for Latin America and the Caribbean (OREALC/UNESCO, 2013). These studies agree on the fact that the educational innovation process represents a favorable and intentional change in the educational process and involves contents, methods, practices, and means for knowledge transmission.

Teachers have a primary role in educational innovation because they also have to take into consideration the needs of the rest of the educational communities. Anderson (2008) lays this out when he says that the teacher must also focus on the cultural context and the diversity in which the educational process takes place.

Once the decision to innovate has been made, authorities and promoters must know the attributes and elements involved in the process. There are different models that study the educational innovation process, but for this research only two were used: 1) three of the five attributes from Rogers (1995) diffusion model: relative advantage, compatibility and complexity, and 2) the model mentioned by Ramírez (2012) which refers to internal attributes of innovation: the idea of the new, the change phenomenon, the final action, and the process. The knowledge of the attributes allows innovation promoters to manage the factors that affect adopters and to apply measures and adequate strategies before, during, and after its implementation.

On the other hand, the use of ICTs supports innovative changes in education, and more concretely, web 2.0 tools enable education so it can be adaptable to the different scenarios and students' needs. Particularly, wikis are of the most academic tools because of their innumerable advantages and applicability to collaborative work (Area, 2009; Barberà, 2009). Likewise, learning through the use of ICTs can happen independently from space and time, interaction can be both synchronous and asynchronous, and learning can even be understood as a continuum that extends all throughout life (Cobo & Moravec, 2011).

One of the enabling elements of educational innovation is the incorporation of OER. These are digitalized materials offered freely to educators, schooled and self-educated students who can use and reuse them to learn and investigate (Hylén, 2006). There are various types of OERs, which vary both in the use and the teacher's need. The Organization for Economic Cooperation and Development (OCDE, 2008) distinguishes between formative, content, tools, and implementation resources.

The use of OERs in Higher Education Institutions (HEI) offers various benefits: (a) the decrease in costs by unifying objectives, processes and implementation policies, (b) enrichment of the educational process, (c) development of competencies for technological appropriation, (d) educational quality improvement and efficiency, (f) a reduction of time needed to prepare class when OERs are easily accessible (Mortera, Salazar, & Rodríguez, 2013; Nikoi & Armellini, 2012; Ramírez, 2012).

OERs are also tools that can boost learning. Diverse investigations refer to the OERs as resources that have a positive impact on the teaching and learning process by promoting interactive exploration and student collaboration (Bonilla, García, & González, 2010). The use of videos as a didactic expository strategy presently has a greater acceptance on behalf of students in regards to comprehensive reading (Pérez, 2013). This

situation coincides with the results from Mortera et al. (2013) investigation where 76 % of teachers use OER in video format.

Just as James and Bossu (2014) expressed, the use of OER and the perspective of making education more flexible, requires HEIs to: (a) provide a greater knowledge of the OERs with students and teachers, and (b) develop the digital competencies necessary to increase the student's interest in open access content and the teacher's motivation to produce OER.

In order to produce OER it is indispensable to instruct both teachers and students in the subject of copyright protection (Tenorio, 2013) and to apply the Creative Commons licenses: the making of and an effective reutilization of these resources allows for individual creativity and the maintenance of the equilibrium between the author's interests and those of the public. Effective creation and reuse of these resources allows for a decrease in the gap between those who take advantage of their benefits and those who don't (Cobo, 2013). To develop the capacity to use, produce, and appropriate OER allows both teachers and students to take advantage of their benefits.

The report published by the European Commission in 2012 indicates that digital competencies are a need and a public right. They are defined as: a body of knowledge, abilities, and attitudes that are required when ICTs and digital media are used to perform tasks, solve problems, communicate, manage knowledge, collaborate, create and share content, as well as build knowledge in an ethical and reflective manner about work, leisure, participation, learning, socialization, consumption and empowerment (Ferrari, 2012).

Finally, the increased and varied (academic and non academic) information available on the Internet, online businesses and virtual corporative government, among other factors, are evidence of the need to develop digital competencies in students. Anafo and Filson (2014) study reveals that the deficiency developing digital competencies in students can hinder the teaching and learning process.

Investigation method

This study used the unique case method (Stake, 2007) from a qualitative approach. It sought to answer the question: How do innovative attributes operate when digital competencies are being developed, while integrating OER to higher education learning environments? The constructs were innovation and digital competencies.

Sample identification

The population in the study was represented by 21 students of the post-graduate course Planning, Development and Project Management in the university. A sample of seven students was selected based on convenience, opportunity, and availability mentioned by Galeano (2004). The students voluntarily completed the survey and took part in the investigation. Their demographic information is as follows (Table 1).

Theme, categories and indicators

The investigation's main theme was to analyze the development process for innovation attributes, which results from integrating OER in face-to-face education. The analysis of these indicators is presented in Table 2.

Table 1 Postgraduate students and demographic data

Interviewee's employment status	Full-time job	7
Interviewee's profession	Engineer	2
	Economy and Administration	3
	Industrial Relations and Social Work	2
Age range	Between 23 and 29	3
	Between 30 and 36	2
	Between 37 and 45	2
Gender	Female	6
	Male	1

Information sources

According to what Mack, Woodsong, Macqueen, Guest, and Namey (2011) recommended, the data recollection must be adjusted to what will be investigated. Teachers, students, and significant documents were selected.

Data gathering techniques

The data gathering techniques were: a) passive participant and moderate participant observation (Spradley, 1980) for student interactions with the wiki and face-to-face classes, b) face-to-face interview with open questions for students and the teacher in order to get useful results about the aspects that could not be observed directly, like the one mentioned by Creswell (2012), and c) analysis of meaningful documents related to data in the teacher's log, student's delivery of a partial degree project delivery, and formal documents from the postgraduate coordination.

Data collection and analysis

The data was collected in a word-for-word format, codified by theme, downloaded to an Excel worksheet, text segments were analyzed and compared, and patterns were determined according to what Stake (2007) mentions. Validity was attained through a triple entry table that took into account investigations related to the study's categories which allowed individual triangulation. Finally, for the data analysis, Stake (2007)

Table 2 Study indicators and categories

Categories	Indicators
Innovation strategies and educational environments	Educational Innovation
	Innovation attributes: a) the idea of the new; b) final action; c) compatibility; d) relative advantage and e) ease of use
	Evaluation of innovation
Learning environments mediated by ICT	Use of OER
	Collaborative work through the use of Wikis
	Impact on teaching and learning processes
Development of digital competencies	ICT appropriation
	Effective and efficient information analysis
	Evaluate information and its sources in a critical way and incorporate the basic knowledge and value system to it.

follows two strategies in the case study: the direct interpretation of individual examples and a categorical sum of them.

Investigation, results, and analysis

After applying the instruments and executing the categorical sums (Yin, 2012; Stake, 2007), the results are presented and contrasted with the conceptual information according to the categories used in order to give validity and reliability to the findings and their results:

Strategies and educational environment innovation

Educational innovation is a change process in the technological infrastructure. It supposes a change in methodology, in its content and the way of presenting it, and even in the way teachers think. This discovery was made during the student interview. They considered that the technology and personalized attention were innovative in the learning process. Asynchronous interaction between the teacher and students as well as the creation of collaborative groups was mentioned by 71 % of the students, 86 % considered that the video presentations (OER) favored a change in their attitude towards the use of information and its availability. In this regard, the OREALC/UNESCO (2013) mentions that educational innovation must recognize the different contexts, interests, and characteristics while contributing to overcoming space and time limitations, and thus facilitating the development of new learning experiences.

Figure 1, presented below, shows a graph with a summary of the results related to educational innovation.

Learning environments mediated by ICT

In a learning environment mediated by ICT, the use of OER promotes interactive exploration and collaboration among students. However, the teacher needs to be trained to have access and locate those resources, hence all the students expressed the importance of the availability and accessibility of the videos (OER), and 71 % mentioned that they were useful in executing projects. On the other hand, the teacher

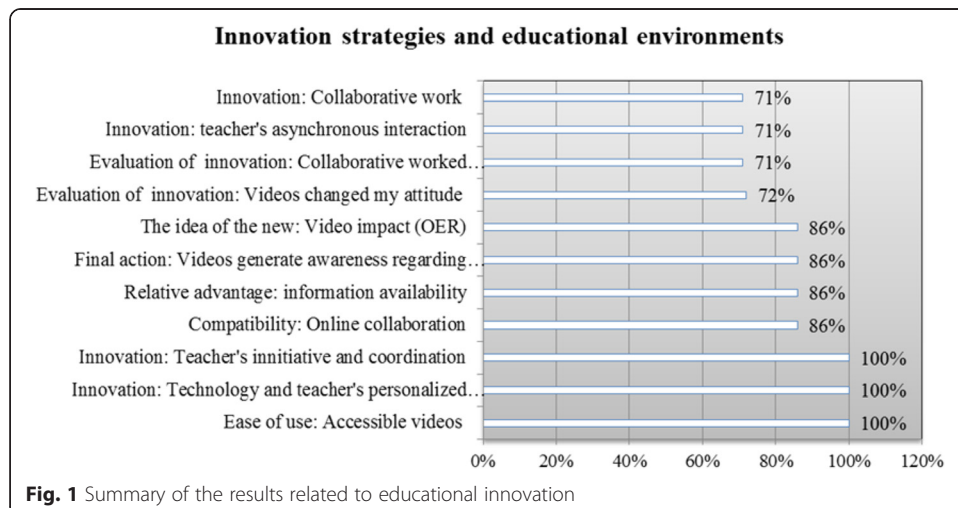


Fig. 1 Summary of the results related to educational innovation

expressed she had a hard time finding adequate OERs for the academic objectives. Cobo (2013) argues that the shortage of teachers and students that are trained to create and reuse OERs precludes the effective use of these resources. As a consequence, in spite of the benefits in ICTs and OERs, users need to be competent in order to explore and have access to quality education.

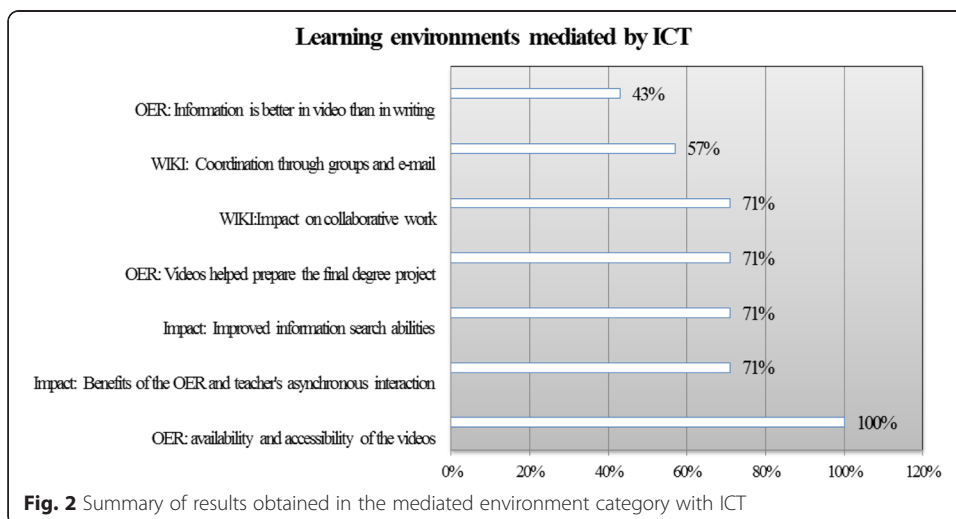
The use of web 2.0 technology, and more specifically the wiki as a platform for the development of collaborative work, propels the generation of shared knowledge and development of digital competencies, but the teacher needs to monitor it. This is noticeable in the students' contributions to the wiki, which were analyzed by the teacher and through the interview answers, where 71 % of the students mentioned that the tool enabled collaborative work and impacted their process in searching for information. This information agrees with Pérez-Mateo, Romero, and Romeu (2014) who considered that the collaborative construction of a wiki project enables the acquisition of digital competencies.

Likewise, the ICT and use of OER can impact the teaching-learning process favorably by enabling asynchronous communication and boosting the teacher's new roll as a facilitator of the educational process. This result could be observed when all the students expressed a perceived advantage in accessibility and availability of the information on video (OER), and 71 % commented that it got better with time thanks to the teacher's asynchronous attention, the added value in video content, and the information available on the wiki. Tenorio (2013) mentions that blended learning is a space that fosters the inclusion of OER, generating educational practices that are open to quality.

The following figure shows the summary of results obtained for this category (Fig. 2).

Development of digital competencies

López (2007) and the European Parliament and Council (2006) mention that this competency is seen in a person's abilities, knowledge and attitudes put in practice to identify and effectively look for what he or she needs. In our study, all the students worked out a plan in order to look for information and 71 % used academic sources. After analyzing the documents, the log, and the interview results, we inferred that the



development of the digital competency was easier due to the fact that the students knew and used relevant information that increased the knowledge construction process.

Finally, the results help us express the capacity to evaluate the information that can be stimulated using Web 2.0 tools, OER, and applying collaborative work strategies that support a student’s autonomy and improve their skill to analyze, synthesize, and express information precisely and responsibly. This affirmation came from various sources: document analysis, wiki exchanges, log notes, and interview answers. It is noticeable that 86 % of the students recognize academic sources as reliable and are prepared to present and discuss their opinions in writing, while all of them could give an accurate definition of plagiarism. In this case, one of the indicators to evaluate this competency is the way in which a person distinguishes between facts, points of view, and opinions, as well as how he or she identifies misleading or deceptive information and selects the appropriate information to solve the problem or question (ACRL, 2000). In Fig. 3 we see a summary of the results related to digital competencies:

Discussion and conclusions

Based on the evidence and findings in this study, the objective of the investigation related to the way in which innovation attributes work when developing digital competencies integrated with OER in the higher education learning environment. The following conclusions are the result of this study;

The first category related to innovation and educational environments has a combination of five analyzed innovation attributes. The way it worked created a change in methodology, in the technological tools, in the presentation of content, and even in the way the teacher thinks and acts with the students.

In regards to the learning environments mediated through ICT and the development of digital competencies, which were the second and third categories, the internal attributes of the study on innovation related to the idea of novelties and the final actions demonstrated that educational innovation through the use of OER, the wiki, and the collaborative work methodology allowed students to overcome space and time barriers

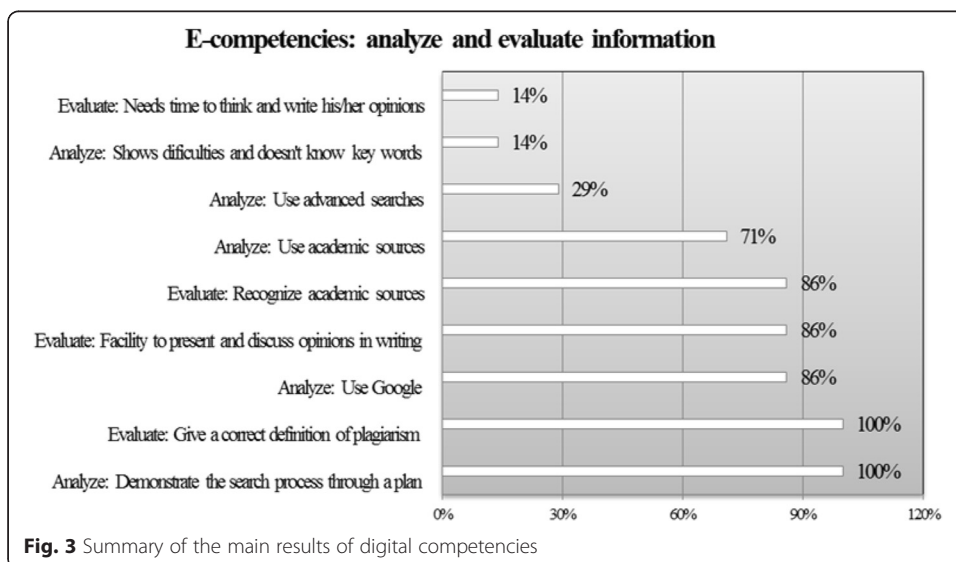


Fig. 3 Summary of the main results of digital competencies

in the face-to-face class. This facilitated the development of digital competencies and put relevant information in the students' hands in order to serve as scaffolding in the knowledge construction process supporting their autonomy and the improvement of their analysis, synthesis, and expression with precision and responsibility.

Finally, the attributes that helped implement and disseminate information were: a) the relative advantage over other resources and tools given the efficacy and efficiency of the process and the learning results that made the quality and success of the innovative process visible, b) a strong compatibility with the participants' experiences and needs and the congruence with learning objectives, and c) the ease of use of the wiki and availability of the videos (OER) that was expressed by the students.

The analysis of the results allows room to make some recommendations and contributions for future investigations:

Based on these results, we suggest the continuous research in educational innovation that includes the use of different web 2.0 collaborative tools and their impact in the teaching-learning process such as the use of Google Docs in order to broaden the options to implement changes impelled by the institutions and teachers in higher education, thus setting a foundation for a sustained developed of combined learning.

In regards to the use of OER, it is important to consider studying the challenge teachers from developing countries encounter when trying to access and locate resources in a systematic way. Because the HEI of these countries don't have the possibility to implement digital repositories with educational resources under Creative Commons licenses.

Finally, the results of this study offer opportunities for teachers interested in innovating with ICT and OER without their institutions' investment of important capital and taking into consideration the limited resources of Latin America's Emerging Economies. With this document, we invite other researchers to continue analyzing the contributions to improve innovative education practices using technologies.

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