

# Apropiación tecnológica para la incorporación efectiva de recursos educativos abiertos

## Technological appropriation for the effective incorporation of open educational resources

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### RESUMEN

#### Palabras clave

Recursos educativos abiertos, educación superior, aprendizaje significativo, integración digital, flexibilidad educativa, mediación tecnológica

El artículo presenta una investigación que identifica la apropiación tecnológica de cinco docentes destacados en tecnologías, según directivos de una institución, para incorporar recursos educativos abiertos (REA) como apoyo a sus prácticas educativas y propiciar aprendizajes significativos en los estudiantes; estos REA son de dominio público y están destinados a enseñar, aprender e investigar con base en alguna licencia intelectual que permita su utilización y adaptación. Como metodología se utilizó el estudio de caso, así como cuestionarios electrónicos, fichas de observación de medios y triangulación de resultados de las aplicaciones. Los resultados indican que los docentes poseen conocimientos y fortalezas tecnológicas disímiles, con algunas coincidencias, para implementar REA como apoyo a procesos educativos; lo anterior puede servir como referente para integrar una propuesta sobre el uso, selección y producción con efectividad de REA que contribuya a mejorar las prácticas educativas, trascender el aula de clases y favorecer el aprendizaje significativo.

### ABSTRACT

#### Keywords

Open educational resources, higher education, meaningful learning, digital inclusion, educational flexibility, technological mediation

*This article is based on a research which sought to identify the technological appropriation of five teachers who excel using technologies, according to their institute's directors, to incorporate open educational resources (OER) to support educative practices and propitiate the student's meaningful learning; these OER are public domain resources used for teaching, learning and researching under some intellectual license that allows their use and re-purposing. The case study was the methodology and also electronic tests, observation sheets and triangulating of results were used. The results indicated that teachers have dissimilar knowledges and technological strengths –with some coincidence– using OER to support educative process, which showed to be useful as referents to integrate a proposal about using, selecting and producing OER with effectiveness which allow better educative practices and propitiate the meaningful learning.*

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## INTRODUCTION

The rise of the Internet and the immersion of institutions in distance education training, supported or mediated by the information and communication technologies (ICTs), poses questions on the ideal way to combine current technological possibilities with education. Thus, the relevance of technological initiatives and opportunities such as those situated in the OERs, understood as any resource of public domain through ICTs intended to teach, learn and do research based on an intellectual license that allows its use and adaptation (Atkins, Brown & Hammond, 2007; Burgos and Ramírez, 2011).

This article is based on the results of a research conducted at the Corporación Unificada Nacional (CUN, Spanish acronym for National Unified Corporation), seated in Santa Marta, Colombia, where students from different social strata seek technical, technological and professional training, by attending pre-university courses in a flexible mode. The majority of these people have multiple obligations and tight schedules that impede them attending a regular classroom, hence the initiative of the institution to ask their teachers to pair their classes with digital resources such as blogs, wikis or social networks to render educational processes more flexible and to attend students' needs.

Along these lines, the interest of the study was to unveil the technological domain teachers could use to implement OERs within their educational practices and the way they could improve the implementation of said resources in their educational practices for the benefit of the students' significant learning. Similarly, specific objectives were set forth to identify the teachers' criteria to evaluate the quality and reliability of an OER content; to acknowledge the teachers' successes and failures in integrating OERs in their educational practices; and generate a reference that allows the teaching staff to optimize the use of OERs in their practice and foster meaningful learning in the students.

In response to the questions and objectives set forth, we established a conceptual framework that included educational aspects from the educational equity, meaningful learning and paradigm transformation with the onset of OERs; OERs , possibilities of integration, advantages and disadvantages, and digital communication, in terms of effectiveness in educational processes and their support in OERs.

Among the results, we observe and infer that the majority of teachers implement OERs in their practice mainly to comply with the institutional requirement and they carry out said implementation intuitively, according to their limited knowledge and personal criteria. We should point out the validity of the efforts to dabble in the field of technologies applied to education, however, this requires the acquisition of new technological and communicative domains and the knowledge of other disciplines that allow

reaching the goal of transcending the time and space of in-class teaching in benefit of the students and educational processes.

In spite of the lack of specific criteria to assess OERs positively from aspects other than the technological ones, the results of the research show that teachers, from their fields of knowledge, experiences as educators and their personal criteria, provide key points that allow the development of guidelines to define efficient ways of implementing and developing these types resources from the structure, function, media and contents in accordance with education and meaningful learning.

## **THEORETICAL FRAMEWORK**

Education is defined as a human activity subject to the historical path and which is set up in different ways over time. It is essential that people establish and structure themselves to keep abreast of times, places and people that undergo adaptations. It is a voluntary, ongoing act of personal development in accordance with different settings and historical moments (Unigarro, 2004).

On the other hand, it must also respond to the interests, necessities and experiences of the learners in accordance to their rationality (Adam, 1970). In regard to adults, according to Brandt (1998), we would allude to andragogical processes or education among and for adults who are the only ones responsible for their learning while remaining “subjects of education” as concluded by Adam (1970, p. 22).

Kaplún (2005) claims that education, mediated or supported by ICTs, poses the same issues as the in-class education in regard to the production of material, motivation, desertion and importance of tutorials, and we should not make the mistake of thinking that the essence of the purpose pursued by education is transformed, but, as Prieto (2015) suggests, other learning and pedagogical mediations acquire relevance as is the case with OERs.

### **Transformation of the educational paradigm with the onset of ICTs and educational equity**

With the rise of technology, the nature and the structures of educational institutions change. According to Mason and Kaye (1990), differences between distance and in-class education disappear; the roles within the educational community transform; and new opportunities arise to create students networks and build a space for collective thought, access to peers socialization and occasional exchanges. Therefore, the current challenge of universities is far from building master classes; they seek to develop new intentional and systemic learning settings that connect students with teachers, learning with experience, and that make use of the advantages,

knowledge and information accessible through technologies (Hanna, 2000).

Castells (2001) points out that the expansion of ICTs has generated marginalization, exclusion and inequity. The Organization for Economic Cooperation and Development (OECD, 2001) describes this phenomenon as a “digital gap” that distances countries, individuals and enterprises that can use ICTs from those that cannot.

According to Silvio (2006), equity in education is linked to the degree in which the distance educational offer provides opportunities of access to a demanding population in economic, educational and technological terms. On the other hand, Mesa (2012) claims that the digital gap, inequity and educational exclusion is brought about by physical conditions, impairment, social and cultural diversity, among others, that can be countered by articulating ICTs with the educational context to promote the access, treatment, development and processing of information and to increase interactivity and educational asynchrony.

### **OERs possibilities in education**

Área and Adell (2009) foresee new possibilities to improve and change teaching and learning processes by implementing web sites that gather a diversity of didactic materials. According to Salinas (1998), said sites allow the access to university studies anywhere thanks to the OER movement responsible of contributing to the expansion of the education coverage (Geser, 2007).

However, adapting education to educational resources and the possibilities of emergent technologies should be avoided. As Kaplún (2001) suggests, institutions could fall in instrumental uses in which, for example, telematic networks would be used to access information without comprehension. In order to avoid the foregoing, Merlo (2003, quoted by Gómez, 2012) talks of guarding against four aspects: parameters, referred to the content analyses and indicators that provide information on each one; indicators that provide information on the aspects to be evaluated; procedures that would implement the application of parameters and indicators; and resources referring to the objects necessary for the evaluation and that involve human, instrumental and documental means to evaluate and determine how to conduct the analysis.

OERs can be used as cells to build major digital entities. Chiappe (2009) talks about learning objects as digital educational materials and instruments of human training, framed in theoretical repertoires about conceptual structures and their role in pedagogical practices; they are materials that gather three internal, editable and minimal components: contents, learning activities and contextualization elements. Moreover,

they require external structures that facilitate their identification, storage and recuperation through metadata.

The greatest advantage of OERs and learning objects is to allow transcending the physical classroom and the class schedules in offering new pedagogical alternatives, significant experiences and better learning opportunities (Jaramillo, Castañeda and Pimienta, 2009). Nevertheless, there are tacit limitations; for example, materials that must meet digital content quality standards such as those of the Sharable Content Object Reference Model; there are no mechanisms that ensure the intellectual protection and material copyright (Burgos and Ramírez, 2011); in service infrastructure, there is tension on “who decides the rules and conventions to share, store and preserve resources” (Atkins, Brown and Hammond, 2007, p. 57), and how to dissolve differences between global standards and practices given by culture and local environment.

### **Communication and Effective Communication**

Báez (2000) reminds us that the Word *communication* comes from the same Greek root as community and common (*communis* or *communicare*), which supposes the communion and sharing among people. Martín-Barbero (2003) claim that communication is often confused with media, while education, with methods and techniques. Furthermore, Paulo Freire’s contribution highlights that the fact that the normalization of literacy techniques may lead to the “emptiness of senses” if the language does not allow processes of insertion, appropriation of the social fabric and, as a consequence, its re-creation.

Freire (2004) concludes that teaching is not the transfer of knowledge but rather the creation of possibilities for its own construction; otherwise, “communication perishes”. According to Coll and Edwards (1996), language is the main mean of communication between teachers and students and, in turn, a mean to represent ourselves and our thoughts. Vygotski (1978, quoted in Coll and Edwards, 1996), on the other hand, distinguishes two dimensions of language: as psychological instrument that individuals use to comprehend the experience and, as a cultural instrument, used by everyone to share the experience and understand it collectively and jointly.

Báez (2000) refers to communicative effectiveness in terms of similar backgrounds in regard to experiences and interests; skills of those that communicate, as good presentation, reading, know how to listen and clear and precise composition; retro-information, currently known as feedback; and typology of social groups that can be formal or informal.

Barberà and Badia (2005) clarify that in a virtual setting, contrary to the in-class setting, students can perceive the educational space as fragmented due to the synchronous technologies that link people in different spaces, and asynchronous ones that generate discontinuity in educational

schedules and rhythms since the connection between individuals occurs at different time schedules. According to García and Rodríguez (2007), these spaces are of interest for e-learning and allow assessing the way interactions are produced, the role of the tutors in the learning process and how communication converge, among other aspects.

For Rizo (2008), the current rise of technologies represents a socio-cultural revolution that creates and consolidates new communication and interaction modalities, in which the latter is one of the essential elements of communication from a constructivist perspective; i.e., the result is the modification of the state of the participants. OERs have impacted the way in which teachers and students interact with knowledge (Valverde, 2010), “motivating the growth of distance education and the development of educational technology” (Tovar, López and Ramírez, 2014, p. 68). Similarly, these authors suggest that their efficiency can be evidenced in terms of reliability and quality achieved with OERs in two core areas: a) visual, aural stimuli and interactivity that influence education positively and b) clear and direct language, as well as support, that improve the students’ attitude towards knowledge.

Lastly, López (2008) provides input on how to achieve the training objectives by means of OERs, from the implementation of “creative teaching” that can be obtained, according to the author, to the extent individuals see the need to improve the teaching strategies and techniques and that they think in several alternatives and contribute with new knowledge, approaches and past experiences to solve issues. This entails the equal transformation of resources being used as support for mediation and interaction with the authors of educational processes.

## **APPROACH**

This article is based on the results of a research conducted at the CUN, [Spanish acronym for National Unified Corporation], seated in Santa Marta, Colombia, where students from different social strata seek technical, technological and professional training, by attending pre-university courses in a flexible mode. These people cannot attend a regular classroom given their multiple daily obligations, hence the initiative of the institution to pair their classes with digital resources such as blogs, wikis, to render the educational processes more flexible and to attend students’ needs.

In this study, we consider the teachers’ “technological appropriation” as the acquisition of knowledge and skills necessary to the development, modification and adaptation of resources (such as the OERs) and their implementation in training processes (Ramírez, Celaya and Lozano, 2010). Therefore, the study sought to respond to the following questions: What is the teachers’ technological domain to use OERs within their educational practices? In which way can the implementation of OERs be improved in educational practices to benefit the students’ significant

learning? Moreover, the following specific objectives were set forth: identify teaching criteria to assess the quality and reliability of the contents of an OER; acknowledge teachers' successes and failures when integrating OERs into their educational practices; and generate a benchmark that allows the teaching team to optimize the use of OERs in their teaching practice and foster significant learning in the students.

The interests mentioned above are justified in the current context in which teachers with creative initiative or OERs implementation are facing the following situations:

Reliability and quality of the resources seem to abide by the prestige of the educational institutions and academic and scientific communities that use banners such as "green path" and "golden" to establish the worth of their productions that are not part of open access repositories and which quality and reliability are considered disputable. (Adame, Lloréns and Schorr, 2012).

- There are no definite criteria to assess the quality, veracity, relevance and effectiveness of their contents (Ramírez and Burgos, 2012).
- Many teachers may fall into "technocentrism", in which, according to Cabero (2006), technology stands above pedagogy and didactics.

On the other hand, the ideal of the information society purports that ever more people access knowledge and participate in their construction by means of ICTs (UNESCO, 2005). In training processes with OERs, it is desirable to transcend the classroom and the class time schedules to offer pedagogical alternatives, significant experiences and better learning opportunities (Jaramillo, Castañeda and Pimienta 2009); i.e., the institutions and education professionals must mobilize and optimize values, aptitudes, joint and social commitment, and the production (however, not the reproduction) of knowledge, as Marrero (Betancourt, 2004) suggests.

## **METHOD**

The population studied consisted in four coordinators of the fields of Business Administration, Public Accounting, Graphic Design and Social Communication of the CUN (subjects from A1 to A4), who, in turn, postulated five professors (B1 to B5) as outstanding subjects to implement OERs and to support the training processes at the CUN, seated in Santa Marta. One of the coordinators has a master's degree, two of them have a specialization, and one has a Bachelor's degree. Their teaching experience is of twenty, fifteen, nine and one year, respectively. In regard to the

professors, one has a master's degree, two are specialists and two have a Bachelor's degree. Their teaching experience is of twenty-four, fifteen, fourteen, seven and six years. It is worth mentioning that one of the teachers has a Master's degree in Educational Technology.

In regard to the ICT training, one coordinator claimed to have acquired said training by means of seminars and workshops. Among the teachers, one mentioned being a specialist and having a technical degree in Systems; another followed informal studies besides having a Master's degree in Educational Technology. From the above, we can infer that two coordinators and three teachers seem not to have any visible training in the use of digital tools or ICTs.

The research methodology was qualitative and oriented to the case study. It consisted in the analysis of digital resources used by five professors with outstanding skills, according to the coordinators of the programs, to implement or incorporate ICTs in their professional educational practice. An *ex post facto* type of research was chosen and Valenzuela and Flores (2011) rated it as non experimental and intended for the analysis of the information previously registered after the fact, and to formulate explanations of study phenomena that do not pertain to a remote past. This work was carried out from the evidence drawn from the screenshots of educational media.

We resorted to the observation or the systemic use of the senses to search necessary data to solve research issues (Méndez, 2001); this exercise was carried out in a simple or non participating manner, since the observer was present to obtain information only; and in an indirect manner, since we took screenshots as evidence of the OERs used by the study subjects, that we analyzed and assessed subsequently by means of an observation sheet (See Table 1).

**Table 1.** Areas of research and their relation with the categories on the observation sheet

Research Areas	Categories on the Observation sheet	Explanation of the categories
Education	<ul style="list-style-type: none"> <li>- Support material</li> <li>- Program contents</li> <li>- Source and authorship Management</li> <li>- OER production</li> <li>- Flexibility and educational equity</li> </ul>	The interest focuses on the means used as OERs so the teachers could present the curricular contents and contribute with the guidelines and procurement of sufficient material in order for the students to support their training process with quality and could transcend the classroom

OER	- Navigation  - Visual setting	The majority of platforms that provide blogs or wikis services also offer multiple options for the construction and configuration of interactive media according to the users' needs  Along these lines, the interest of this research was to see how teachers carried out the construction and organization of their media to adapt them to the training processes they would lead
Communication	- Communication	The focus was directed to the media used or incorporated by the teachers in digital educational settings to benefit the interaction among the participants of educational processes

We also conducted surveys that, according to Méndez (2001), allowed us to know the motivations, attitudes and opinions of the individuals on a given object of study, and are applicable to issues that can be investigated through observation, analysis of documentary sources and “knowledge system”. The surveys were used to gather information on the criteria of the coordinators at the moment of postulating the study subjects as outstanding professionals to use technologies and implement OERs in their practice. Likewise, said surveys were applied to the study subjects to contrast their responses with those of the coordinators and the contribution of theoreticians on the areas of study by means of the triangulation of research findings.

## RESULTS

The initiative of the blog as support for training processes sprung and was projected to all the sites in the country thanks to the CUN directors. In Santa Marta, even though the professors met the requirement, the lack of adaptation of said blog did not enrich the training processes mediated by the technology.

### Educational Area

In regard to the curricular contents and documents, we observe that four professors use their media to share documents and information related to the contents of a subject: objectives, competencies to be developed, time of execution and assessment methods (See Table 2).

**Table 2.** Results of the application of the observation-indicators sheet, category of programmatic contents.

Category	Subjects	Indicators
Programmatic Contents	B1	OER provides documents or information related to the contents of a subject, objectives, competencies to promote, execution time and assessment methods
	B3	
	B4	
	B5	
	B2	OER provides information related to the contents, objectives, competencies to promote, execution time and assessment methods of the study objects as they are being developed

Likewise, four professors provided resources or support information to the topics being worked upon in classroom sessions and activities to perform outside the classroom (See Table 3). However, they did not provide instructions, materials or sufficient information to transcend the classroom for the students would keep up-to-date in their academic tasks or expand their knowledge with the teacher's assistance or mentoring.

**Table 3.** Results of the application of the observation-indicators sheet, category of support materials

Category	Subjects	Indicators
Support materials	B4	OER has a space to share support digital materials with classes, activities to perform or as suggested for the expansion of knowledge
	B5	
	B2	OER does not have a specific space to provide support digital materials to classes, activities to perform or as suggested for the expansion of knowledge. However, activities or academic assignments are going to be published in an integrated manner
	B3	
B1	OER is not used to provide support digital materials to classes, activities to perform or as suggested for the expansion of knowledge	

In regard to the management of support resources, sources and third parties' copyrights, two professors are pooling digital educational resources and mentioning their origin or authorship; one professor pools resources without specifying the sources or the authorship; and the other two do not incorporate any sources. In regard to the production of digital resources, such as tutorials and instructions, it was evidenced that two professors had their own creations.

### OER Area

The majority of the teachers complied with the use of buttons or links to facilitate the navigation of the sites and the general categorization of

contents with resources that provide platforms such as <http://www.blogger.com> to make instant menus of the pages that had been created. Nevertheless, prioritizing sections, information and contents, requires basic knowledge of the language programming such as *html*, which is not of public domain. Many teachers combine contents with texts and images intuitively or based on preferences and experiences. We observed this in two of the five professors who obtained averagely pleasant digital settings with content identifiers and differentiators that facilitate their comprehension and reading.

The suggestion of digital resources as support or expansion of the classroom topics are to be found on the media of two professors who dedicated a page to this effect. Two other professors suggested material as they progressed in the development of the topics and in a sequential manner, from top to bottom, on the same page used for everything referring to the assignment. This shows, without a doubt, the difficulties of the technological and cognitive domain in developing digital educational resources.

### Communication Area

Communication seems restricted to the publication of announcements, academic information and study documents. Four of the five professors did not include means of synchronous or asynchronous interaction in their blogs and only subject B4 (with educational technology training) used temporary discussion forums to deal with class topics or to address students' concerns.

We observed that visual communication poses difficulties in including, in a clear manner, elements to optimize the appearance, navigability and reachability of the blog to the students. It also showed difficulty to differentiate contents, to ensure the intuitive unfolding of elements and to motivate the students.

**Table 4.** Results of the application of the observation-indicators sheet, communication category

Category	Subjects	Indicators
Communication	B1	OER does not have the means of interaction among the people that intervene in the educational processes and the communication is restricted to announcements posted by the teacher on the academic assignments, institutional activities and other information of interest to the educational community
	B3	
	B3	
	B5	
	B4	OER has the synchronous or asynchronous means of occasional use that allow and promote interaction and exchange of knowledge,

		information and contributions among the participants of the educational processes
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## SURVEY DATA ANALYSIS

When choosing and assessing third parties' digital materials, the preference goes to the products developed by prestigious educational institutions since they are of better quality and reliability than those developed by a fellow teacher or an acquaintance. The belief is based on the fact that the products developed by renowned institutions have theoretical basis and are previously revised.

However, a minority support the productions made by other professors if said productions are related to their area of professional competence. Moreover, they believe that the students are motivated if they have the producer of the material as teacher, and it is also a way of encouraging the intellectual development of the country.

**Table 5.** Criteria for the selection of OER, according to its origin, as support for the educational processes

Options	Subjects	Justifications
A media belonging to a repository or digital "library"	A1	- Provide more reference topics
	A3	- Given the quality and validity of the information
	A4	- Respect of copyrights
	B2	- Provided they adjust to the curricular needs
	B3	- Offer a range of bibliographical references
	B4	- Given the diversity of resources they have
		- The quality of the material previously filtrated
A media developed by one of their fellow teachers	A2	- Take advantage of and promote research and national innovations in areas of development of the country
	B1	
	B5	- Show the achievements of a known person to arouse curiosity among the students  - Support the innovation and creativity of a colleague

Among the teachers and coordinators, there are no generalized or common criteria to assess positively OERs produced by teachers (See Table 6).

Some voice their concerns on the need of theoretical basis, materialization and relation of the materials with the study objects to ensure their validity. Moreover, and at a lesser degree, reference was made to the need to include motivational aspects for the students, a language consistent with the target public, creativity of the media and minimal technical requirements for its viewing.

**Table 6.** Criteria to assess the OERs developed by teachers positively.

Subjects	Criteria (must)
A4, B1, B2, B4	- Focus on training objectives
A2, A4, B1	- Be short
A2, B1, B5	- Allow interaction with students
B3, B4	- Have references - Have reliable sources
A1, A2	- Be concrete
A2, B3	- Relate to the topic at hand
A1	- Have a video
A2	- Be attractive visually and auditorily - Be profound
A3	- Have a technical sheet
B1	- Motivate the students - Focus on the students
B2	- Respond to the context and setting
B3	- Have hyperlinks
B4	- Tener pocas exigencias técnicas - Manejar lenguaje acorde con los públicos objetivos
B5	- Ser creativo - Reiterar aspectos complejos de aprender - Ser de fácil entendimiento

The responses to what characteristics should be taken into consideration when choosing OERs for educational purposes were varied and quite different (See Table 7). The following qualities are among those that allow: loading and unloading of files, incorporating videos, including hyperlinks, integrating multiple media to motivate the students, issuing publications, seeing articles, presenting supplementary material, customizing design, facilitating reading and locating elements.

**Table7.** Coordinators and teachers' criteria in choosing digital media and constructing OERs as support for training processes

Areas	Subjects	Characteristics (must be/allow)
Communication	A2	- Make interaction posible
	A3	- Allow use of chats, forums and formats
	B1	- Allow making comments
	B4	

Digital media for mounting OERs  A	A4	- Allow loading and unloading files
	B2	- Allow the incorporation of videos
	B3	- Allow the inclusion of hyperlinks
	B4	- Make it possible to incorporate multiple media
	B5	- Allow issuing publications and see articles  - Make it possible to present additional materials  - Allow customization  - Facilitate Reading  - Allow easy location of elements

Among the criteria for selecting OERs according to their origin, besides those that assess positively the resources developed by teachers and those intended to construct OERs to support training processes, there are several elements that can be used to create a guideline or a benchmark of aspects that should be taken into consideration when selecting or making a decision to produce media and resources that support training processes. In other words, according to their own experience, every participant made a valid contribution to expand the discussion on the OERs requirements that should or could comply with the objective of attending in an effective and valid manner the needs of those participating in the training processes, as well as foster significant learning in the students while taking advantage of the benefits that technologies offer to the world of education.

In line with the foregoing, it would be difficult to say that the OERs developed and used by the teachers of the CUN, seated in Santa Marta, contributed to the achievement of significant learning in the students. Many resources and facilitating elements are still lacking to set up the encounter, exchange and construction of knowledge in the digital world that transform teachers and students as a result of the outcome and interaction of educational processes, as expounded in Freire's liberation theory (1970). Moreover, education through digital means would be effective only if learning is associated with a creative act, thus exercising the critical comprehension of the experiences (McCarthy, 2000).

## DISCUSSION

In order to address the solution of the general objective of identifying the teachers' technological approval in the creation and utilization of OERs in their professional practice, as benchmark to improve their educational

practices with OERs and foster significant learning in their students, as well as those more specific, we carried out a process of triangulation of results that allowed us to contrast the findings of the surveys and the observation format in the light of the assertions of the authors on the topics.

Six people (among coordinators and teachers) showed a preference for OERs from repositories and digital libraries given the amount of reference topics, quality and validity of the information, respect of copyrights, wide range of bibliographical references, diversity of resources and quality of materials. This finding confirms the difficulties and challenges that teachers with creative initiative must face since positive assessment of said resources seems to be associated with the reputation of educational institutions and academic and scientific communities, as Lynch (2003) points out.

However, the society of information seeks to increase the access to knowledge and the participation of people in its construction by means of ICTs (UNESCO, 2007). This is a model that invites professors to create their products according to the two study subjects that selected a media developed by a fellow teacher to take advantage of, show, promote and encourage national research and innovation in the interest of the country's development.

On the other hand, Atkins, Brown and Hammond (2007) suggest that there are no definite criteria to assess OERs according to quality, veracity, relevance and effectiveness of their contents in reference to all those that are on the Web. However, by gathering the opinions of eight study subjects, we can draft a sheet of interesting criteria on the elements that said resources must and should have: approach on training objectives, short duration, means of interaction with students, references, reliable sources, concretion and relation with the topics being dealt with.

The foregoing can also be applied to the learning objectives which, according to Chiappe (2009), are digital educational materials and valid instruments of human training that are categorized in theoretical repertoires around conceptual structures and have a role in pedagogical practices. In the words of the abovementioned author, an OER should be "A digital self-contained and reusable entity, with a clear educational purpose, with at least three internal and editable components: content, learning activities and elements of context. The learning objects must have an external structure of information to facilitate their identification, storage and retrieval: the metadata."

To return to the topic of choosing the media to construct OERs, it is said that their efficiency must be measured according to their reliability and quality; this can be proven according to two core aspects: a) visual and aural stimuli and interactivity that influence education positively; and b)

clear and direct language and accompaniment that improves the students' attitude towards knowledge (Tovar, López and Ramírez, 2014).

In said aspects, we can find the need to a) use simple, clear and intuitive navigation systems that facilitate the location of contents of the assignment – as is the case of three of the professors – and b) a pleasant and aesthetic visual setting with the coherent use of images, texts and colors that facilitate reading, the permanence of the students on the media, the assimilation of contents as elements of context and identification of the topics and sections – which, to a large extent, have been complied with by three professors -. Similarly, high school education or education supported by ICTs poses the same issues as in-class education in regard to the production of material, motivation, desertion and relevance of tutorials (Kaplún, 2005).

Three professors have provided digital material to support classrooms and activities to be carried out or suggested. This was done according to the need to use Web sites to gather a diversity of didactic materials to change and improve the teaching and learning processes and to allow the access to knowledge from any place (Salinas, 1998). The foregoing is part of the challenge to construct new intentional and systemic learning settings that link students and teachers, learning with experience, where both students and teachers can take advantage of the benefits and abundance of knowledge and information accessible through technologies (Salinas, 2005).

Four professors provided documents or information related to the contents of the assignments, objectives, competencies to develop, time of execution and assessment modes. They have also categorized the educational actions in clear strategies that determine the population that wishes to be trained and the reason for which it wants to be trained (Kaplún, 2005). Nevertheless, we should not lapse into making an “instrumental use” of technology, in which the telematic networks would be used to access information without comprehension (Kaplún, 2001).

Four professors did not provide sufficient instructions, information or material for the students to keep up with the different academic assignments and developed them with little assistance or mentoring. According to Jaramillo, Castañeda and Pimienta (2009), this does not allow the integration of ICTs to transcend the physical classroom and the class schedules, or offer new pedagogical alternatives, significant experiences or better learning opportunities, let alone contribute to overcome the digital gap, inequity and educational exclusion experienced by people with physical disabilities or special needs or social and cultural diversities (Mesa, 2012).

Nine study subjects believed that the platforms chosen to develop OERs as support for classes should allow interaction through chats, forums and formats. Other opinions were; to load and unload files, use hyperlinks,

incorporate multiple media, issue publications, view articles, present supplementary materials, customize the platforms and facilitate the reading and location of information. By gathering all these criteria, we could construct a benchmark or guideline to develop or implement resources such as web sites that compile a diversity of didactic materials to improve and change the teaching and learning processes (Area, 2003).

Four teachers did not possess means of interaction among the people who intervened in the educational processes and the communication was restricted to posting announcements. However, *communicate* comes from *community* and *common*: “put in common”, communion and sharing among people (Báez, 2000). Technology does not transform the essence of the objectives being pursued by education and what occurs is that other “pedagogical mediations” usually acquire relevance (Kaplún, 2005, p.18), and teaching consists in creating possibilities for the very construction of knowledge, otherwise, “communication perishes” (Martín-Barber, 2003, p. 20).

Lastly, the findings of the surveys, the observation sheet and the contrast provided by theoreticians on the axes and categories addressed in this research, contribute to giving a response to the general objective of the study and providing a perspective on the implementation of OERs made by teachers to support their classes and, at the same time, making them aware of the missing elements that could optimize their educational activities.

The teachers’ cognitive gaps can be addressed by a training proposal focused on their individual and general needs, as well as on the contributions of experts on the synergic relation among OERs, education and communication. Said proposal could set forth guidelines to achieve significant learning in the students by using resources and mediating elements for the encounter, exchange and construction of knowledge in the digital world that transform the stakeholders of the training processes (Freire, 1970) and allow learning to be associated with a creative act by exercising the critical comprehension of the experiences (McCarthy, 2000).



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