Evaluation of Digital Didactic Skills in Massive Open Online Courses: a Contribution to the Latin American Open Education Movement

Evaluación de competencias digitales didácticas en cursos masivos abiertos: Contribución al movimiento educativo abierto Latinoamericano

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Abstract

The aim of this article is to present an evaluation of digital teaching skills in a project funded by the National Distance Education System (SINED) in Mexico conducted on a Massive Open Online Course (MOOC) which was designed to develop competences in teachers in the distance learning or classroom setting for the integration of open educational resources (OER). The course was conducted by the Regional Open Latin American Community for Social and Educational Research (Clarise), and posed the question: how are distance learning didactic competences using OER developed? The aim was to identify and evaluate how OER were used and the form they took throughout the stages of the open education movement. The study deployed a mixed methodology with instruments such as emailed questionnaires for the MOOC participants, viewing screens in the discussion forums and anecdotal evidence. The results show that MOOC participants were able to develop digital teaching skills, identify how to use OER and how the training process occurs in the open education movement. Constraints to the development of these skills were also seen in the acculturation in the open education movement, as well as limitations on the design of distance learning models that promote these skills and the recognition of informal learning.

Resumen

El objetivo de este artículo es presentar la evaluación de competencias digitales didácticas en el entorno de un proyecto financiado por el Sistema Nacional de Educación a Distancia (SINED) de México, donde se llevó a cabo un curso masivo abierto (Massive Open Online Course: MOOC, por sus siglas en inglés), dirigido a desarrollar competencias en profesores de educación a distancia o presencial para integrar recursos educativos abiertos (REA). El curso se impartió a través de la Comunidad Latinoamericana Abierta Regional de Investigación Social y Educativa (Clarise). Se partió de la interrogante ¿cómo se desarrollan las competencias didácticas en ambientes de aprendizaje a distancia que utilizan REA?, con el fin de identificar y evaluar cómo se usan los REA y cómo se está formando a través de las etapas del movimiento educativo abierto. La metodología empleada fue mixta, con instrumentos de cuestionarios electrónicos para los participantes, rejillas de observación en foros de discusión y registros anecdóticos. Los resultados muestran que los participantes en un MOOC, logran desarrollar competencias digitales didácticas, lográndose identificar claramente cómo se usan los REA y cómo se está dando el proceso de formación en el movimiento educativo abierto; sin embargo, también se denotan limitaciones para el desarrollo de estas competencias, tales como la culturización en el movimiento educativo abierto, el diseño de modelos de aprendizaje a distancia que promuevan las competencias y el reconocimiento del aprendizaje informal.

Keywords / Palabras clave

Digital competences, didactic competences, virtual environments, connectivism, open education movement, OER, MOOC, mixed methodology.
Competencia digital, competencia didáctica, ambientes virtuales, conectivismo, movimiento educativo abierto, REA, MOOC, metodología mixta.

1. Introduction

The social and economic changes now in progress have redirected the concept of education and its pedagogical approaches towards a holistic vision that embraces cognitive, factual and axiological aspects (De Pablos, 2010, Selvi, 2010), and this, combined with access to information and the management of knowledge enabled by ICT (Information and Communication Technologies) (Tobón, 2005) requires people to learn digital competences so that they not only get information (Rychen & Salganik, 2001) but also acquire the capacity to select, analyse, process and transform it into knowledge and use it according to the situation, context and personal or social intention (European Commission, 2010).

The capacity to process, relate, search for and express information, and even think in a more fragmented, visual, interactive and rapid way, questions some of the current pedagogical propositions in place in our schools (Pérez-Rodríguez & Delgado, 2012). For citizens of the XXI century, the development of digital competences has become an indispensable strategic function in education, and this concern is increasingly prominent at international forums on the subject (Aguaded, 2011), in which considerable importance is given to the closing of the digital divide by means of the development of competences in the teaching-learning process that involve pedagogical, investigative and instrumental aspects. It is also necessary to define didactic, investigative and instrumental competences to enable the implementation and functioning of open educational resources (OER) in distance learning settings. This study specifically examines didactic competences in terms of the knowledge and skills needed to teach, or more precisely, to plan and design learning settings that enable the student to pass effec-

tively through the educational process (Páez & Di-Carlo, 2012) as well as incorporating media and ICT by exploiting their information, communication and motivational features (Marqués, 2011), which assumes the development of skills inherent to teaching, and the acquisition of strategies for implementing such skills in the context of digital competences for planning and design, communication and interaction, instruction and learning, management and administration and ICT usage (Barrón, 2009; Fernández, 2003; Zabalza, 2003; UNESCO 2008; Shaikh & Khoja, 2012).

The digital didactic competences referred to in this research are grouped according to the dimensions that appear in table 1.

Table 1. Classification of digital didactic competences	
Digital didactic competence	**Actions**
Planning and design	• Adaptation to new learning modalities both as user and designer of learning scenarios using ICT. • Integration of digital resources as didactic instrument, content and material in curricula. • Selection and objective assessment of digital resources for their use in pedagogical practice contexts: design, implementation and use of technology.
Instruction and learning	• Design and production of digital resources for didactic use. • Development of assessment plans using ICT. • Use of ICT to advise, orientate and monitor students. • Initiate interactive debates and maintain them. • Understanding of collaborative, constructive, reflective, active and authentic learning.
Communication and interaction	• Understanding the impact and function of ICT in including them in the Knowledge Society. • Knowledge of basic concepts and tools of communication and consulting information on Internet. • Collaboration in virtual academic communities with actors in the teaching-learning process. • Develop learning among equals and social links.
Management and administration	• Understanding the legal and ethical aspects associated to ICT through networks: licences, privacy, intellectual property and security. • Self-management for continuous learning and incorporating technologies in the teaching-learning process. • Acquisition of skills for applying the advantages of ICT to teaching-administrative tasks. • Knowledge management.
ICT use	• General knowledge associated to ICT. • Managing basic functions of computing and electronic communication devices and operating systems. • Handling basic production tools: word processors, spread sheets, presentations and multimedia elements.
Adapted from Barrón, 2009; Fernández, 2003; Zabalza, 2003; Carmona, Gallego & Muñoz, 2008; UNESCO 2008; European Commission, 2010; Marqués, 2011; Shaikh & Khoja, 2012).	

The Open Education Movement (OEM) is seen as one of those praiseworthy activities that promotes the democratization of education, which involves open access to educational training via Internet (Ramírez, 2013b) with the aim of enabling ac-

cess to scientific, academic and cultural information without economic, technical or legal impediment (Max Planck Society, 2003), with the use of OER such as teaching, learning and research materials that can be consulted and used without restriction, provided that authorship is respected (UNESCO, 2012; Atkins, Brown & Hammond, 2007).

The OEM framework is in line with the worldwide trend in using ICT as a tool to democratize knowledge. In the Latin American context, this movement has advanced through the efforts of the Regional Open Latin American Community for Social and Educational Research (CLARISE in Spanish), with studies, courses, seminars and the first Massive Open Online Course (MOOC) implemented with the support of the National Distance Education System (SINED in Spanish) on the subject of «Training distance-learning teachers for the development of competences in the use of open education resources» (Ramírez, 2013a).

MOOC are learning settings in which participants and course materials are distributed on the Web in open format (Rodríguez, 2012), but they are more than just a meeting point, a place to connect students to teachers through a common theme (Siemens, 2004; Siemens, 2006; Popkewitz & Rizvi, 2009); they represent a teaching-learning process based on the Connectivist model (Siemens, 2006; Downes, 2012), a constructivist approach for learning that is centered on the student, who is responsible for connecting and constructing knowledge in the context of groups and networks (Carmona, Gallego & Muñoz, 2008, Tschofed & Mackness, 2012), and which Delors foresaw in 1994 as the adaptation that ICT should make in order to store and circulate information efficiently and on a massive scale.

It is important to note that social and cognitive presence forms part of the student's learning experience in a connected, collaborative setting through networks. In this context, MOOC act as an environment in which new forms of distribution, storage and recovery of information enable the development of shared knowledge and distributed forms of cognition (Kop, Fournier & Sui-Fai, 2011).

The biggest leap forward for MOOC occurred in 2012 (Daniel, 2012) when several universities, institutions and foundations launched projects for massive open online courses, mostly free although some were profit-motivated. EDX, Coursera, Udacity, Khan Academy and Udemy were the organizations most notably involved (Chronicle, 2013).

However, and despite the success the MOOC have gradually gained, there are still questions about the future of education, the value of a qualification and how technology influences the way an educational institution functions. The OEM has questioned university hierarchies' adherence to a fixed course curriculum and foresees that they will be replaced by open courses such as MOOC (Leber, 2012).

A MOOC forms the basis of the study presented in this article, and its aim is to develop digital competences and skills in course design in order integrate OER in distance learning (SINED-Clarise, 2012) settings. The course is supported on Blackboard's CourseSites open platform and was a free five-week online course (March to April 2013) at the end of which students were awarded a certificate on completing all the modules that consisted of activities in which participants learnt: competences for producing open education resources (OER), searching for and using OER, disseminating OER and mobilization (appropriating OER).

MOOC such as these are the subject of various studies, this one included, in which researchers assess the digital and didactic competences developed by participants through specially designed learning activities.

2. Methodology

This study was carried out using the mixed method (Johnson & Onwuegbuzie, 2004) concurrent triangulation design (Creswell & Plano-Clark, 2011) that enabled the use of qualitative and quantitative approaches in order to confirm and check the validity of the data and corroborate the findings gleaned from the MOOC. The choice of this type of research was due to the need to identify categories, analyse data and the effects arising from the acquisition of didactic competences among the MOOC participants, and to understand the situational and structural contexts. This course was considered a scenario for real, contemporary and holistic research, taking as its sources of information the students, teachers, the work platform and course documentation; the research also made use of techniques for collecting data with qualitative and quantitative instruments: observation, interviews, questionnaires and analysis of important documentation, which were applied simultaneously and over a short time period in order to integrate the results in the data interpretation phase.

The use of the qualitative approach in this study enabled us to understand the nature of the event without manipulating the research scenario, so as to establish the following conditions: 1) to describe the little-known phenomenon of the format of MOOC for the development of digital competences; 2) to understand the meaning of data such as thoughts, ideas and behaviour before they are converted into numbers; 3) to describe a process, not a product, that is the acquisition of digital didactic competences, information that could be used to describe the context, participants and activities of interest by means of techniques selected for gathering data, which were: the analysis of course documents and interactivity on the course platform (forums, programs, assessments), interviews with participants and facilitators, field notes, e-mails and questionnaires, combining all these with common propositions in order to check the reliability of the study.

The quantitative approach allowed us to deploy standardized tools such as questionnaires, structured observation and content analysis with pre-established categories in order to obtain a numerical interpretation of the study that enabled us to explain statistically the behaviour, skills and attitudes of the MOOC participants in their acquisition of digital didactic competences. The quantitative aspects reveal how frequently the same perspective or measurement scale was determined by the study participants with regard to the categories proposed (Silva, 2008), which led to the establishment of a general view of the quantities and flows of behaviour without having to intervene in their content.

The study population consisting of 1,126 students from 11 Latin American countries, Spain and Portugal and 58 MOOC teachers officially enrolled on the course. This population constituted the sample of participants for the quantitative data, and a further sample of 15 students and five teachers were selected for the qualitative data. There were three study categories: the participant context, didactic competences and distance learning settings.

Over a period of eight weeks, a series of data gathering techniques were used such as the observation screen, a ledger of anecdotes, a partially structured interview in the form of a questionnaire (Google Drive) conducted online due to the geographic spread and nature of the study population, which contained open and closed question types and multiple choice options. Through observation we were able to investigate the search for digital education resources, the production of didactic resources supported by technology, the supervision provided by the facilitators, patterns of cooperation among students, the acknowledgement, support and encouragement given by facilitators, participants' perception of their level of digital competences, the use of OER and involvement in the open education movement. The interview allowed us to analyse indicators like the level of digital didactic competences (table 1) and involvement in the open education movement, an understanding of the use, production and benefits of OER and the implications of the use of the Connectivist MOOC model, along with its benefits and drawbacks.

We used a spreadsheet to process the information from the online questionnaire, and with the observation tools data were collected in electronic format and subsequently codified and analysed.

In the data analysis, the information gathered was organized in order to establish relations, interpret and extract meanings and conclusions and to demonstrate the importance of the findings (Valenzuela & Flores, 2012), with the aim of validating and testing the reliability of the investigative process using triangulation methodology (Stake, 2007): contrasting observations, interviews, questionnaires, documents and the literature; supporting the results and explaining the development of the digital didactic competences through the use of assessment scales.

3. Results

The data compiled from various sources of qualitative and quantitative information enabled us to analyse the context, digital didactic competences and distance learning settings.

3.1. Context

The corpus of the research consisted of 1,126 participants enrolled on the MOOC from 11 Latin American countries, Spain and Portugal, with ages ranging from 22 to 51; 75% were women and 25% men, all of whom had completed their high school education, and most of them had a Masters and experience teaching students in the classroom or in other hybrid forms of education.

Eighty percent of the participants stated that they had qualifications like diplomas, degrees and masters, and specialized in teaching, educational research, pedagogy and science teaching. Only 20% declared they had no formal academic qualification in teaching.

3.2. Digital didactic competences

a) Planning and design. It was observed through the activities analysed and tested during the MOOC that the use of OER improves curricular planning and design. A noteworthy fact is that the participants declared themselves competent to develop activities such as: defining an objective, strategy, and the intended out-

come of using the OER; identifying OER features; drawing up a teaching strategy for incorporating OER in courses or materials; dissemination and implementation of OER.

b) Teaching and learning. When analyzing how the participants produced didactic resources using technology, the results show that the majority believe the objective is important whereas the number of potential users is not very relevant or totally irrelevant. Other criteria were also used to measure this indicator, such as user type, the type of material used, production, tests and reviews, time, equipment and costs. In terms of the aspects apparent in design learning scenarios with technology, all the students consider that it is important to incorporate ICT.

c) Communication and interaction. The competences that the participants believed they developed best on the MOOC were: learning with their peers, cooperative interaction and, in some cases, social links between students (figure 1).
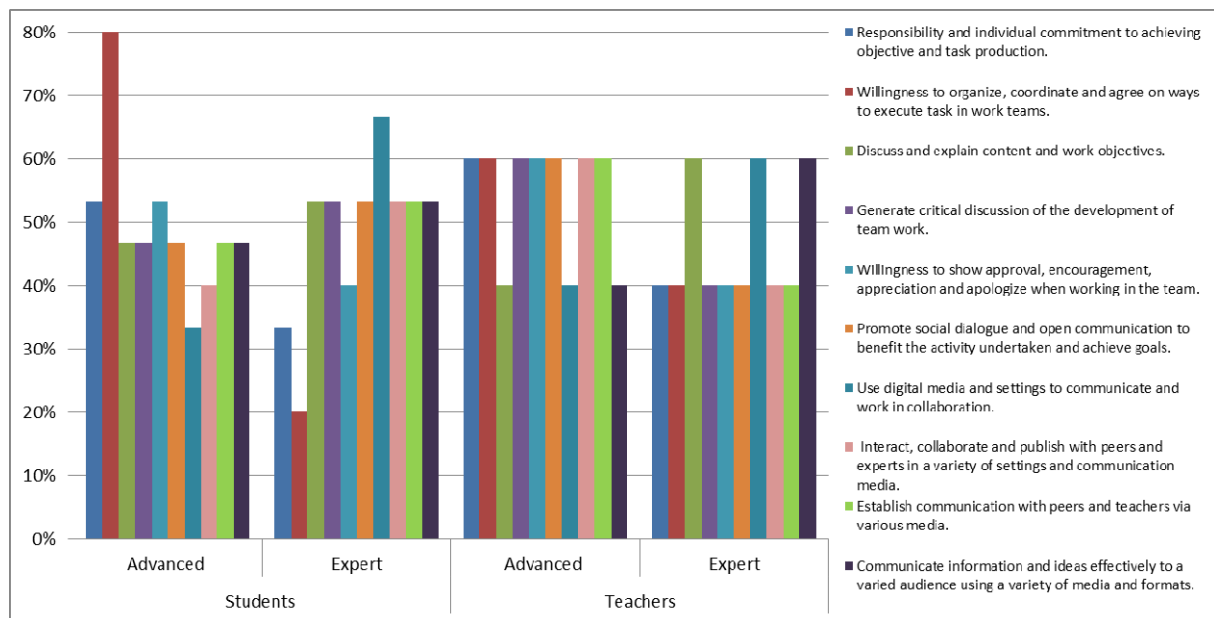

Figure 1. Skills level for communication and interaction in virtual settings.

d) Management and administration: it was observed how collaboration in the development of academic activities was a constant in all participants. When working online all students stated that they used e-mail, followed by social networks, as the main channel for communication in carrying out academic tasks.

In terms of developing the skill of independent learning on the MOOC, most students stated that they did so with help from tutorials and peers. Most teachers emphasised that self-learning is a challenge given the gap that exists between digital literacy and the willingness to learn. In terms of the competence required to solve problems through the use of digital media, the results show that most students developed this process by «searching for, analysing and producing information in databases or folders».

e) Use of ICT. The participants declared that their skills level in ICT use ranged from intermediate to expert (figure 2).
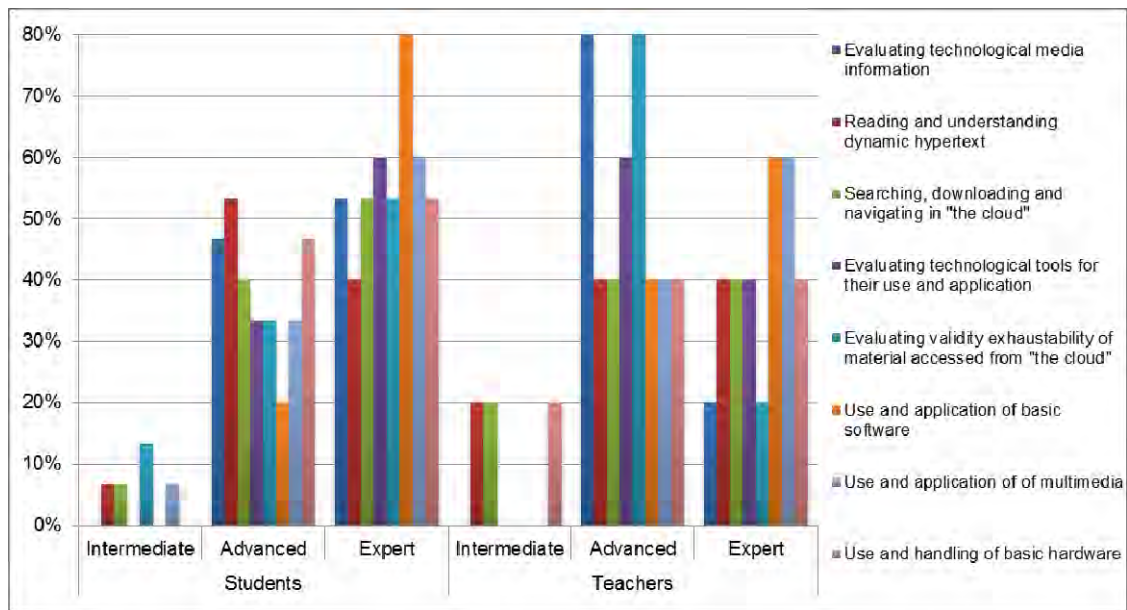
Figure 2. Level of expertise in ICT use (adapted from Gros & Contreras, 2006).

3.3. Distance learning settings

a) The experience of the open education movement. All the participants felt motivated by participating in the open education movement, and had had some previous experience in virtual learning settings although only 5% had done a MOOC before.

b) Use of Open Education Resources. Concerning the advantages of using OER, the information compiled shows that they develop research and critical thinking as well as greatly motivating student participation. It is also worth mentioning that a small percentage of students believe that OER can impede the teaching process. On the skills level acquired in the use of OER, most (66%) see the lack of institutional policies at regional and national level as a barrier to OER production and use (figure 3).

c) Participation on the MOOC. The teachers declared themselves partially or totally in favour of Connectivist pedagogical principles. In similar numbers the students indicated that the advantages of MOOC are that they are student-centered, participation and interaction can take place on various platforms and in different forms, they are accessible and cost-free; they allow autonomy in learning, the establishment of knowledge networks and, to a lesser extent (at 12%), access to various types of content.

For the students, the most relevant contribution of the MOOC was the knowledge they could acquire and personal training (90%) while the least significant factors were organization/participation in events and the socialization of material (53% in each case). The teachers cited the number of participants to attend to and the time factor as hindrances, while the work dynamic and clarity of instructions were the most recurring difficulties for the students.
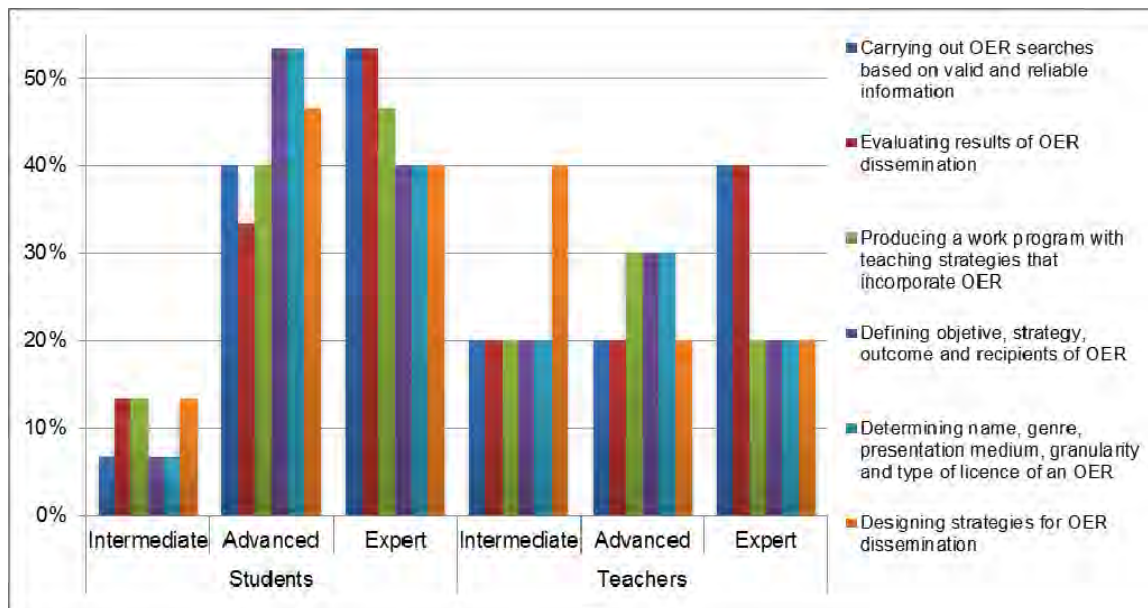
Figure 3. Competence level for OER use (based on the MOOC rubrics).

4. Discussion and conclusions

The data extracted for this study show that MOOC virtual learning scenarios are highly suitable for the design and use of OER to develop digital didactic competences. We base this statement on the following findings:

- OER are digital tools used to innovate educational practice and motivate learning. The MOOC provides participants with the digital tools they need to produce their own designs for teaching through OER. Shaikh & Khoja (2012) state that the use of digital resources as didactic instruments, content and material in the curriculum is an essential competence for teachers when planning and designing in virtual settings where, according to Busto-González (2005), the teaching-learning process focuses on the development of competences that generate new knowledge that can be continuously applied to the work and social environment.

- The OER design and production enables the development of new teaching-learning practices within the Knowledge Society. This was evident from the results for the criteria corresponding to the production and assessment of digital didactic resources considered necessary for the design of learning scenarios. According to Gros & Contreras (2006) and UNESCO (2008), digital competences allow the user to develop knowledge, skills and attitudes in order to evaluate the technological tools and material available on Internet that can be used as a support to traditional content formats; Shaikh & Khoja (2012) relate this to cognitive and instructive aspects of teaching.

- Open learning scenarios require superior teaching skills to reach educational objectives. The participants agreed that monitoring and follow-up are essential activities to ensure that students do not drop out of online courses. Shaikh & Khoja (2012) state that the new roles in teaching involve organizing bodies of thought that are comprehensible to everybody in order to

motivate students to take control of their own learning processes so that they can achieve their goals.

- MOOC are suitable settings for encouraging collaborative learning and co-operative interaction. It was observed that the design of the course contributed to the achievement of a level of competence for interacting and promoting synergies between participants. Zabalza (2003) notes that these skills enable the capacity to transmit information in a significant way by means of healthy, cooperative interactions, the promotion of learning among equals and social links, as well as support for collaborative learning activities in order to establish a learning environment.

- The learning scenarios that include OER allow for the development of competences to promote collaboration in learning, independent learning and problem solving. This was verified by the answers related to the involvement of participants in collaborative and online activities undertaken on a daily basis. Barrón (2009) and Fernández (2003) state that the didactic skills used in management and administration involve activities ranging from the dissemination and adaptation of administrative actions to the process of knowledge management (the creation and transmission of knowledge) in which, as Carmona, Gallego & Muñoz (2008) indicate, data are transformed into knowledge.

- Skills in ICT use and its implications for the Knowledge Society improve in MOOC settings that use OER. The results show that participants performed the activities proposed on the MOOC by effectively mobilizing the skills needed to use ICT and, as a result, they were able to generate their own OER and disseminate them via mass media on Internet. As Thomas (2011) indicates, in the educational context ICT use means the deployment of basic tools, downloads, searches, navigation, classification, integration, evaluation, communication, cooperation and creation with the aim of improving the quality of and access to education, which includes stimulating production, exchange and access to OER (UNESCO, 2012; Amador 2013).

- In the Latin American context, massive learning settings are an underused alternative, which hinders the integration of countries into the open education movement. For the majority of participants, attending the MOOC was their first experience of this type of virtual learning scenario, which was clearly appreciated in their opinions concerning how difficult it was to adapt to the course dynamic. In this respect Kop, Fournier & Sui-Fai (2011) state that MOOC act as an environment in which new forms of distribution, storage and recovery of information can potentially develop shared knowledge and distributive forms of cognition.

- MOOC demand that participants acquire knowledge and skills in order to understand the Connectivist paradigm that supports it, which is seen in students' opinions on the MOOC's pedagogical dynamic and the complications that arose during the development of the course. Connectivism assumes that access to Web technologies is universal, and at its core is the construction and maintenance of network connections in such a way that, as Siemens (2006) says, the learning process (applicable knowledge) is based on the connection of nodes containing specialist information that re-

sides not only in individuals but also in technological devices that can be accessed at any moment.

Analysing from various qualitative and quantitative aspects how MOOC students are capable of developing digital didactic competences enables us to identify how OER are used and how the process of training develops in the open education movement. In this context, it was deemed important to fix dimensions and indicators to enable us to draw up a didactic proposal for the development of digital didactic competences, which is displayed in the diagram below (figure 4) detailing aspects which this study considered to be important.
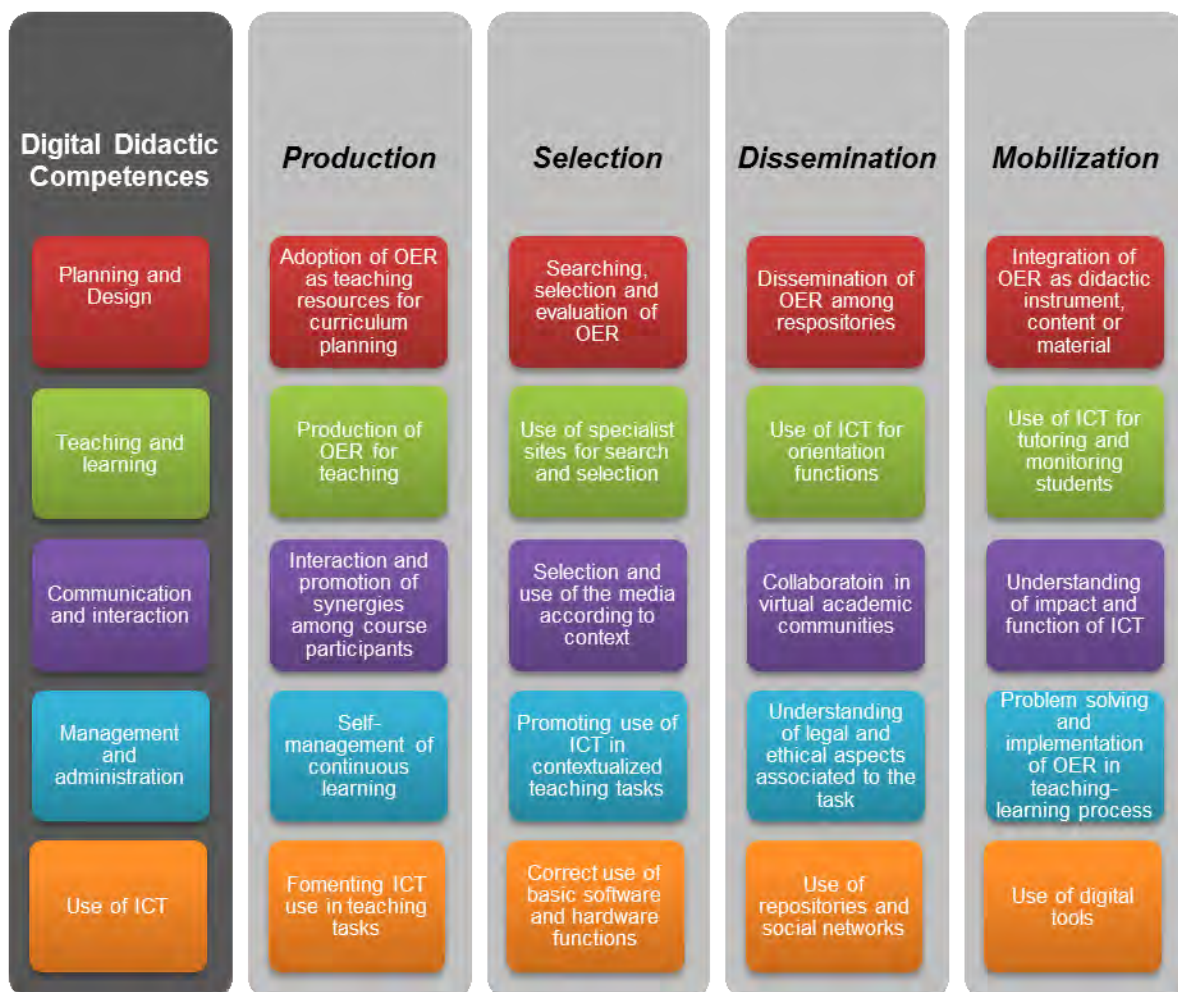

Figure 4. The process of developing digital didactic competences in the open education movement (adapted from Ramírez, 2013a).

This study argues that in the context of massive open online learning settings a course design based on OER can contribute to the development of digital didactic competences that correspond to the four open education movement stages described by Ramírez (2013a), in which training practices can make it possible to produce, select, disseminate and mobilize open online educational activities.

It was also determined that: 1) the more developed the digital competences of the participants in the open education movement, the more successful and enriching the experience in the effective usage of OER, and those with advanced or expert control in ICT use were more capable of managing and designing digital didactic resources; 2) MOOC represent an alternative distance learning setting that enables users to acquire didactic competences since such courses require them to develop skills in planning and design, instruction and learning, communication and interaction, and management and administration, all of which are implicit teaching indicators; 3) The OER are teaching-learning tools that mobilize didactic competences that allow users to acquire fully integral digital competences since these require the student to take on instrumental and investigative skills.

We can conclude that the development of digital didactic competences in virtual settings still represents a challenge for those involved in the open education movement: the closing of the digital divide, the development of digital competences, acculturation in the open education movement (opening up the curriculum), the design of more advanced distance learning models, the acknowledgement of informal learning, the replacement of physical for virtual spaces and the widest possible use and dissemination of OER, all of which ought to lead educational institutions to rethink the concept of knowledge for the development of competences that allow students to exercise their intelligence. This vision clearly shows that research in education needs to be a priority on political agendas throughout Latin America in order to explore the benefits that the open education movement can bring.

Finally, these results point to the need for designs in education in Latin America and the intensive dissemination of OER and their induction in curricular planning, not just in the virtual modality but also in the classroom, as a way to draw students into the paradigm of digital competences; this is more a requirement than a necessity for the successful development of 21st century citizens. This article is an invitation to continue analysing the contributions of MOOC, the open education movement and the development of digital competences for education.

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