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

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 competencies 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.

KEYWORDS | PALABRAS CLAVE
Digital competences, didactic competences, virtual environments, connectivism, open access, OER, MOOC, mixed methodology.

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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 effectively 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.

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 access 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

<table>
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<th>Digital didactic competence</th>
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| 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. |

Table 1. Classification of digital didactic competences

Adapted from Barrón, 2009; Fernández, 2003; Zabalza, 2003; Camona, Gallego & Muñoz, 2008; UNESCO 2008; European Commission, 2010; Marquina, 2011; Shaikh & Khoja, 2012.
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» (Ramirez, 2013a).

MOOCs are learning settings in which participants and course materials are distributed on the Web in open format (Rodriguez, 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 & Munoz, 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, MOOCs 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 & Su-Fai, 2011).

The biggest leap forward for MOOCs 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 MOOCs 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 curri-
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 participants produced didactic resources using OER in courses or materials; dissemination and implementation of OER; identifying OER features; supporting the results and explaining the development of the digital didactic competences through the use of assessment scales.

3. Results

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.

3.2. 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 outcome 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).

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).

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 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 showed 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 MOOCs 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.

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.

- MOOCs are suitable settings for encouraging collaborative learning and cooperative 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 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.

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Figure 2. Level of expertise in ICT use (adapted from Gros & Contreras, 2006).
lop shared knowledge and distributive forms of cognition.

- MOOCs 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 resides 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.

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) MOOCs 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 MOOCs, the open education movement and the development of digital competences for education.

Support and acknowledgments

![Figure 3. Competence level for OER use (based on the MOOC rubrics).](https://www.scipedia.com)
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