DIGITAL SKILLS DEVELOPMENT: MOOC AS A TOOL FOR TEACHER TRAINING

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Abstract

Digital skills are an important element in the educational environment, their development and integration should be a priority in order to address modern society demands. Therefore, the objective of this research was to identify how a Massive Open Online Course (MOOC) for teachers influences the development of their digital skills. This paper is part of the project "Estudio comparativo del desarrollo de competencias digitales en el marco del programa Mi Compu.Mx", an initiative by the Ministry of Public Education (SEP), which gave 240,000 computers to children in fifth and sixth grade in Colima, Sonora and Tabasco (Mexico) during the 2013-2014 school year. 5th and 6th grade teachers participating in the program took a MOOC to develop didactic-digital skills to integrate the resources and tools available in the program to their teaching practices. Data was collected through a pre-test (self-administered questionnaire) and a post-test to know the self-concept that teachers had about their digital skills before and after the course. We also interviewed some participants to know about their experience during training. We employed a mixed methods approach with an explanatory sequential design (QUAN→qual), in which quantitative data was used to measure training's impact on teachers' digital skills development, and qualitative data allowed us to explain the problems that arose during training and the perceived benefits. Results show that MOOCs have the potential to develop digital skills to use OER and to solve information problems (especially the ones related to communication and project planning); and visualizing a practical application of course content increases participants' overall satisfaction.

Keywords: MOOC, OER, learning environments, digital skills, elementary education.

1 INTRODUCTION

The potential of technology to innovate and improve learning experiences has always attracted the attention of educational researchers and practitioners [1]. Using the Internet to deliver courses is an example of using technology in this way, and it's called distance learning. Distance learning environments need to facilitate processes that support participants to achieve high-level objectives and help them acquire and transfer new knowledge and skills to different situations and contexts. Currently, distance and open learning has received a lot of attention because it plays a vital role in the future of training processes, and these environments are characterized by key aspects such as flexibility, innovation, inclusion, and a continuous development [2]. This has given place to many initiatives like Massive Open Online Courses (MOOCs), which have been growing in popularity among the academic community, instructors and learners [1]. MOOCs are a novel way of delivering a course and they promote active learning as well as the creation of information networks, incorporating a great amount of participants [3]. Many authors have agreed that MOOCs provide better experiences in virtual education and more opportunities for socialization and collaboration between learners [4]. Pappano [5] and Meisenhelder [6] conclude that MOOCs represent a possible solution to many educational problems but they also generate new challenges that need to be addressed.

Connectivism theory, from which MOOCs emerge, affirms that learning occurs when participants connect information in a learning community [7]. Kop and Hill [7] add that the most important abilities for these environments are information search and the ability to filter secondary information. Open Educational Resources (OER) are considered supporting materials that enrich these educational processes and facilitate the development of digital skills [8]. Virtual learning scenarios constitute spaces in which the design and use of OER allows developing didactic and digital competences. Hernández, Romero and Ramírez [9] found that participants had to mobilize skills in the use of TIC in order to generate and disseminate their own resources in a MOOC. However, the incorporation of massive learning scenarios is a very little explored alternative in the Latin American context.

Considering MOOCs potential for developing digital skills and the lack of studies taking place in Latin America, this research was conducted in a massive course environment that aimed to promote the use, production, dissemination and mobilization of Open Educational Resources (OER) in the participant's teaching practice. This study is part of the project "Estudio comparativo del desarrollo de competencias digitales en el marco del programa Mi Compu.Mx", an initiative by the Ministry of Public Education (SEP), which gave 240,000 computers to children in fifth and sixth grade in Colima, Sonora and Tabasco (Mexico) during the 2013-2014 school year. Some of the teachers of the schools selected for the program were invited to participate in the MOOC mentioned above. The presented paper aims to measure training's impact on teachers' digital skills development, and explain the perceived benefits and problems that arise in this type of teacher training.

2 THEORETICAL FRAMEWORK

2.1 Teacher training

Teachers are frequently targeted when schools don't meet national or international expectations [10], and their supposed limited digital skills and practices are often debated. The notion of teacher digital competence is relative to time and context, and is similar to the term "digital literacy". Buckingham [11] proposes that digital literacy encompasses more than instrumental skills; he argues that the ability to evaluate and use information, but also to understand the social, political and economic role of technology are key aspects of the digital competence. In this sense, Van Dijk [12] divides digital skills into six categories: The first two categories refer to operational skills required for operating digital tools and handling formal structures, such as browsing the Internet; and the next four categories are content related, content creation, information and communication skills (like searching and evaluating information). In addition, Erstad [13] argues that digital literacy comprises the skills, knowledge and attitudes in using digital media necessary to master the challenges in the knowledge society. This definition includes skill-oriented aspects of technology and includes knowledge and attitudes towards the use of technology in the society.

Teachers must meet expectations exposed above and facilitate students' digital competence development. This requires digitally competent teachers [14]. In other words, teachers are expected to have digital confidence and be prepared for making adequate choices about when and how integrating technology into educational practice. Mishra and Koehler [15] describe teacher skills required for integrating learning digital tools in a productive way in relation to technological, pedagogical and content knowledge. The main focus of this model is showing how to use technology as a tool for learning other subject areas.

Salomon and Perkins [16] discuss the effects of performance with, of and through technology; and Johannesen, Øgrim & Giæver [14] propose teacher's digital competence is threefold: teaching of, with and about ICT. *Teaching of ICT* means to plan and facilitate students' digital competence development through systematic training (using technology); *teaching with ICT* means using technology as a tool to learn about other discipline (using technology to learn); and *teaching about ICT* refers to the relationship between technology and society (critical reflection about the role of technology). This enriched understanding of teacher's digital competence should be considered in teacher training programs. In the Latin American context, Hernández, Romero y Ramírez [9] study specifically examines didactic competences in terms of the knowledge and skills needed to teach, as well as incorporating media and ICT in their learning settings. These digital didactic competences are grouped according to the dimensions in table 1.

Table 1.

Classification of didactic digital competences [9]

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 for 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: Licenses, 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, spreadsheets, presentations and multimedia elements.

Then, traditional training alone is not sufficient to develop teachers' competences and to strengthen their capacity to deal with the challenges of the information society [17]. For this reason, there is a greater necessity of training teachers through on-line learning environments. Virtual learning environments are expected to develop digital skills, address learners needs and meet the demands of the knowledge society more effectively than face-to-face learning environments.

2.2 Distance learning environments and MOOC

Information and communication technology has improved access to information. Glance, Forsey and Riley [18] argue that online courses enhance learning through short videos, self-assessments, discussion forums and networks. Massive Open Online Courses (MOOCs) are a new way of online education that includes virtual interaction, feedback, discussions, evaluations and certificates. These courses are free, there are no entrance requirements, schedules or a formal accreditation; and each student can regulate his/her own learning depending on their goals, knowledge and interests [19]. In addition, MOOCs are massive so they facilitate access to education through information and network technology [20]. In other words, MOOCs allow a lot more individuals to participate in learning activities and they have the potential of improving the quality of the learning experience at the same time.

Due to their characteristics MOOCs can be a good tool for developing digital competences. Hernández, Romero y Ramírez [9] discovered that the competences that participants believed they developed better in a MOOC environment, were: learning with their peers, cooperative interaction and social links between students. In addition, MOOC settings that use OER improve skills for ICT use and its implications for the Knowledge Society. Then, MOOCs represent an alternative distance learning setting that enables users to acquire didactic competences. On the other hand, OER are teaching-learning tools that mobilize didactic competences that allow users to acquire fully integral digital competences.

There have also been several problems and challenges among MOOCs. McAuley, Stewart, Siemens & Cormier [21] found that one of the biggest problems was the high dropout rate because there are no filters to choose the participants of the course. They also discovered that many people do not feel comfortable in this environment, either by their geographic, economic and/or personal conditions; they also tend to feel disoriented due to the large amount of information. Rodríguez [22] identifies that one

of the major problems in these courses are participants who just follow the course in a consumerist way with no intention of socializing the acquired knowledge or creating networks. We can conclude that the development of digital didactic competences in virtual settings still represents a challenge for those involved in teacher training. Research in education needs to be a priority on political agendas throughout Latin America in order to explore MOOCs benefits and how they can be effectively used as a tool for developing teacher's digital competences.

3 METHODOLOGY

Some of the 5th and 6th grade teachers of schools participating in the program Mi Compu.Mx, were invited to a MOOC, which aimed for participants to develop didactic-digital skills, integrating OER and technological tools to their practice (Figure 1). The course started with 863 participants, and finished with 211. From this population we selected a random sample of 50 trainees that: (1) Were part of the program Mi Compu.Mx; and (2) completed the four modules of the course. Data was collected through a pre-test (self-administered questionnaire) to know the self-concept that teachers and directors participating in the MOOC had about their digital skills. Then, a post-test was applied to measure the same digital-skills perceptions after the completion of the course. We also interviewed some teachers to know about their experience during training, and if their expectations were met.

Figure 1. MOOC web portal (http://mvirtual.institutomora.edu.mx/login/index.php)

We used a mixed methods approach with an explanatory sequential design (QUAN→qual), in which quantitative data was used to measure training's impact on teachers' digital skills development, and qualitative data allowed us to explain the problems that arose during training, and the perceived benefits [23]. From this perspective, statistical results are reported first, followed by qualitative issues and categories, supporting or refuting these quantitative results [24; 25]. The quantitative part of the study was conducted through a survey research, providing a numerical description of trainee's digital skills perceptions before and after the course, and comparing them to measure training's impact. The qualitative data was analyzed through the Constant Comparison Method (CCM) to find relationships between the identified categories, and behavior patterns [26]. We triangulated the data to validate the results, comparing the qualitative and quantitative information.

4 RESULTS

Results show that training had a positive impact on teachers' digital skills perceptions. Training had a bigger impact on skills related to OER use than skills related to solving information problems. Perceptions of digital skills to solve information problems improved 9% after training, and perceptions of OER use skills improved 24%. The skills to solve information problems that showed the biggest increase were: (1) Communicate learned content through technology (15%); and (2) plan projects mediated by educational technology (15%). On the other hand, the skills to use OER that showed a greater increase were: (1) Identify OER characteristics (26%), (2) Identify OER potential in your practice (24%); and (3) Design open resources in different formats (24%). Table 2 shows the minimum and maximum values of teacher's digital skills perceptions and their means, before and after training.

Table 2.

Digital competencies before and after MOOC

Digital skills	Pre-test				Post-test			
Digital skills to solve information problems	**Min.**	**Max.**	**Mean**	**%**	**Min.**	**Max.**	**Mean**	**%**
Select significant information on the web	2	5	3.22	64%	2	5	3.52	70%
Search information on the web	2	5	3.16	63%	2	5	3.44	69%
Organize information	1	5	3.04	60%	2	5	3.52	70%
Process information	1	4	3.04	60%	2	5	3.5	70%
Communicate learned content through technology	1	4	2.66	53%	1	5	3.4	68%
Plan projects mediated by educational technology	1	4	2.44	48%	1	5	3.14	63%
Total (30 possible points)	8	24	17.66	59%	10	30	20.52	68%
Open Educational Resources (OER) use	**Min.**	**Max.**	**Mean**	**%**	**Min.**	**Max.**	**Mean**	**%**
Identify OER potential in your practice	1	5	2.28	46%	1	5	3.5	70%
Recognize different types of OER	1	4	2.18	44%	1	5	3.2	64%
Identify OER characteristics	1	3	2.04	41%	1	5	3.36	67%
Design open resources in different formats	1	4	1.94	39%	1	5	3.16	63%
Develop open resources in different formats	1	4	1.88	38%	1	5	3.04	60%
Total (25 possible points)	5	19	10.32	41%	5	25	16.26	65%

The interview inquired about the teacher's experience in the course and whether their expectations were met. 76% of the 50 participants considered in the sample, said that their expectations were met. These responses were classified into 4 categories: (1) learning (new knowledge); (2) skills; (3) transfer and (4) course design. Most participants (37%) mentioned that their expectations were met because they had glimpsed a practical application of the new knowledge and skills (transfer). For example, they were pleased to apply OER in their classes in order to improve and innovate the process of teaching and learning. They also showed interest in sharing resources with their colleagues and other professionals, to contribute to students' learning at all educational levels. One participant commented that she had already begun to apply the "Smart" technique in her classes, taking into account what she wants and why, who is involved and what tools are used. 26% focused on their learning, in other words, their acquired knowledge. The most frequently mentioned topics were the use, production and dissemination of OER, their characteristics and where to find them, as well as the correct use of information and open licenses.

20% focused on MOOC dynamics and design. They talked about the design aspects they valued the most, like the opportunity to collaborate with colleagues, and the interaction. They also said they had enough information, that the explanations were clear and accessible, and the activities were related to the objectives of the course. On the other hand, they recognized the importance of having subject matter

experts and facilitators who supported learning in the course. 17% spoke of the acquired skills; commenting that thanks to the course they were able to search information on the web and organize it, as well as design, disseminate and mobilize OER. Finally, 23% of trainees said that they partially fulfilled their expectations, or they didn't fulfill them. Some said they did not get all the knowledge and skills they were expecting, such as management of educational programs. They also mentioned that they need more practice, they perceived the course gave them the theory, but they were not sure if they could implement it in their practice. A few others mentioned that they had not achieved their objectives because of personal problems, such as lack of time due to their workload.

5 ANALYSIS AND CONCLUSIONS

Massive and open environments have the potential to develop digital skills to solve information problems, especially skills related to the communication and project planning. Results show that teachers participating in the MOOC increased 15% their ability to communicate content through technology (pre-test: 53%, post-test: 68%) and to plan projects mediated by educational technology (pre-test: 48%, post-test: 63%). Hernández, Romero and Ramírez [9] argue that communication and planning are digital and didactic competencies related to: (1) Knowledge of communication tools on Internet; (2) collaboration in virtual academic communities; (3) development of social links; (4) integration of digital resources as didactic instruments and content; and (5) selection and evaluation of digital resources for pedagogical contexts. Knowledge society demands communication and planning abilities, so we should take advantage of open environments' potential to foster their development.

MOOCs have the potential to greatly develop skills related to OER use. Training had a bigger impact on skills related to OER use (Pre-test: 41%, Post-test: 65%) than skills related to solving information problems (Pre-test: 59%, Post-test: 68%). Hernández, Romero and Ramírez [9] state that MOOC settings that use OER improve skills for ICT use and its implications for the Knowledge Society. To improve the teaching and learning experience, we should promote open and massive settings in which participants design and develop their own resources, and share them with their pairs. MOOCs are appropriate spaces to promote this culture of creating and sharing.

Visualizing a practical application of knowledge and abilities learned in a course increases the overall satisfaction. Most participants (37%) mentioned that their expectations were met because they could link new knowledge and skills to their academic practice. Rodríguez [22] identifies that one of the major problems in MOOCs are participants who just follow the course in a consumerist way with no intention of socializing the acquired knowledge or creating networks. To reduce the problem of consumerist participation in MOOCs, clear objectives and their practical value must be specified at the beginning of the course. Thus, individuals will be able to visualize whether the content is useful for them, increasing the chances that the course meets their needs.

This study considers the development of teacher's digital skills, however, for future studies it's recommended to consider the adequacy of MOOCs in the development of different competencies. This paper explores the experience of using a massive and open settings for teacher training, with an invitation to continue making investigation about MOOC potential to develop different skills.

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