

Mena, J., E., Ramírez-Montoya, M.S. & Rodríguez Arroyo, J.A. (2016). Users' digital competences as perceived in a MOOC course and its relation to the use of OER: A possible path to teaching energy sustainability. *Proceedings of the 9th annual International Conference of Education, Research and Innovation* (pp....) Seville, Spain: ICERI.

USER'S DIGITAL COMPETENCES AS PERCEIVED IN A MOOC COURSE AND ITS RELATION TO THE USE OF OER. A POSSIBLE PATH TO TEACH ENERGY SUSTAINABILITY

Juanjo Mena¹, María-Soledad Ramirez-Montoya², José-Antonio Rodríguez-Arroyo²

¹*University of Salamanca (SPAIN)*

²*Tecnológico de Monterrey (MEXICO)*

Abstract

This study is part of a research project entitled: "Comparative study on the development of digital competence under MiCompu.mx program" that was financed by the Mexican fund SEP-SEB CONACYT 2013. The main purpose is to confirm whether in-service teachers' self-perception on Digital Competence (DC) may influence the use of Open Educational Resources (OER) in their classrooms. A group of n=863 in-service teachers from elementary, high education and tertiary education from various disciplines participated in a massive open online course (MOOC) training course on Digital Competences. A 26-item validated questionnaire on DC and use of OER was delivered to the participants of the MOOC course. Additionally, participant interviews and course facilitator's weekly reports were also collected. Mixed methods research was used in this study, presenting in his article a correlational analysis of DC and OER and the results of the interviews conducted to teachers and principals. Scores in DC and OER were ordered into three levels of performance: High, intermediate and low. Main results indicate that in-service teachers that perceive themselves as digital experts can reach an intermediate level in the use of OER. The main implication out of it is that teacher training programs in DC are required to prepare teachers for the use of OER in class on a daily basis. This model will be double tested in a national wide Project funded by the Secretary of Energy in Mexico: "Binational Laboratory for the smart management of energy sustainability and technological training" (2016-2019).

Keywords: MOOC, Teacher Education and ICT, MOOCs, Digital skills, OER

1.INTRODUCTION

During the years 2013 and 2014 a national program called MiCompu.Mx was developed by the Secretary of Basic Education of Mexico (SEB) and the National Digital Evaluation Commission (CEDN) to increase the digital inclusion, equity and quality of public school students. The program was implemented in the Mexican states of Colima, Sonora and Tabasco with the delivery of 240,000 PCs to students in fifth and sixth grade of different school organizations. Among the program objectives were: the use of the personal computer to improve the study conditions of children, the improvement of teaching strategies, the strengthening of teachers academic groups, changes in school management and reduction of the digital and social gaps between families and communities [1]

As mentioned, this program was not to impact only the student population, but also the development of digital competence in teachers. Digital Competence (DC) nowadays is essential for teachers' construction of efficient knowledge for practice. DC is defined as the set of contents, skills, and attitudes that are necessary to use Information and Communication Technologies (ICT) and digital media in a critical, creative, and ethical ways. There is an increasing demand to learn digital skills in Teacher Education because they are drivers of innovation. As a result of this innovation Open Educational Resources (OER), as freely openly licensed media, play a central role in new educational reforms.

This study is part of a research project entitled: "Comparative study on the development of digital competence under MiCompu.mx program" that was financed by the Mexican fund SEP-SEB CONACYT [2]. This research presents the results of part of that research project, specifically the study of whether in-service teachers' self-perception on Digital Competence (DC) may influence the use of Open Educational Resources (OER) in their classrooms. This model will be double tested in a national wide Project funded by the Secretary of Energy in Mexico: "Binational Laboratory for the smart management of energy sustainability and technological training" (2016-2019).

2.THEORETICAL FRAMEWORK

Digital Competence (DC) nowadays is essential for teachers' construction of efficient knowledge for practice. DC is defined as the set of contents, skills, and attitudes that are necessary to use Information and Communication Technologies (ICT) and digital media in a critical, creative, and ethical ways. There is an increasing demand to learn digital skills in Teacher Education because they are drivers of innovation. As a result of this innovation Open Educational Resources (OER), as freely openly licensed media, play a central role in new educational reforms. The conceptual basis of the work presented here is based on three components of teacher training: digital competence, OER and open massive courses.

Digital competence involves the critical use of information and communication technologies (ICT) and its development in teaching is becoming increasingly important. To address this term it is necessary to differentiate its meanings between students and teachers. Gallardo-Echenique, Marquis-Molíias, Bullen & Strijbos [3] reviewed 127 articles published between 1991 and 2014, finding that, despite the high digital confidence and skills of students, their digital competence can be much lower than their "digital teachers". This has become interesting in European contexts, especially to the new educational reform named "Promotion of Knowledge" in schools, where digital competence is now the fifth core competence in all subjects at all levels, as well as the new curriculum of teacher training in Norway [4]. In this sense, it can be stated that digital competences can support teachers from adopting resources and technologies to its appropriation and innovation.

One of the materials that can support the work of digital competence, are the open educational resources (OER). Open educational resources are digital materials which are characterized by an open licensing, with the possibility (depending on the type of licensing), to use, reuse, adopt or modify these materials, for use by teachers, researchers or students [5]. These materials give possibilities for open access to knowledge and training. [6] and [7] have identified cases in Latin America where OERs have been the engine for the generation of open practices, networks and contributions for teacher training. Thus, the OER can contribute to the development of digital competence and teacher training.

In this order, MOOCs have become a possibility for teacher training. [8] mention that there are many massive open online courses worldwide and millions of subscriptions to them, however, not all people have the possibility or the ability to know very well this tool, making it difficult to learn, which is the main objective. In that sense, [9] say that not always the technology can be effective for academic and educational performance, so it is important to know what is being done in order to avoid errors in learning systems, and to make sure that students, teachers and researchers can be benefited through these resources. [10] increase the chances of OER and online platforms with mobile services tools and technological and electronic resources. Thus, in MOOCs, the increment of technological resources is noted providing opportunities for teacher training and development of digital competence.

3.METHODOLOGY

A group of n=863 in-service teachers from elementary, high education and tertiary education from various disciplines participated in a MOOC training course on Digital Competences. This MOOC was available to all teachers and principals that participated in the macro study in the three states where the program MiCompu.Mx was implemented. A 26-item validated Likert type questionnaire on DC and use of OER with two open questions was delivered to the participants of the MOOC course (Cronbach Alpha=0.93). The questionnaire was divided in three parts: demographical information, digital skills self-assessment and use of Open Educational Resources self-assessment. Additionally, participant interviews and course facilitator's weekly reports were also collected. Mixed

methods research was used in this research. For the part of the study presented in this article, descriptive statistical analysis for the 26 questions using SPSS v21. These results were triangled with participant interviews after the transcripts were submitted to topical analysis of the qualitative data based on the Grounded Theory Analysis [11]

4.RESULTS

Scores in DC and OER were ordered into three levels of performance: High, intermediate and low. Table 1 shows the percentages of teachers who self-assessed them in each level of performance of DC and OER.

Table 1. Levels of performance

Level of performance	Description	DC	OER
Low	Little DC knowledge limited to accessing and retrieving information/ No use of OER, or sporadic use in classroom	34.8%	67.5%
Intermediate	DC Knowledge focused on having access to information but also communicating to others / OER regular use as supplementary tools to ordinary teaching	62.1%	31.6%
High	Extensive DC knowledge so as to serve as teaching problem solving / Extensive use of OER in classroom as the main resource for teaching	3.1%	0.9%

On the other hand, when teachers were asked in the questionnaire about what they have learn in the DC MOOC training course, a total of 332 topics were extracted and grouped in a three level category where the main groups were: (1) improvement of classroom students' learning (147; 44.27%): many teachers indicated that being digitally literate would help them to boost their classroom students' performance; (2) improvement of teaching strategies (139; 41.86%): some other teachers believed that learning DC would improve their general pedagogical skills; and (3) improvement of teachers' communication (46; 13.85%):

As far as the interviews, teachers reported that they were pleased to apply OER in their classes understanding that it is a path to improve and innovate the process of teaching and learning. For example, one participant commented that she begun to use the "Smart" technique in her classes, reflecting on what she wants, why, who is involved and what tools are used. For others, focus was put on knowledge acquisition about OER: the use, production, dissemination, characteristics, where to find them and the correct use of information and open licenses. However, based on teacher's responses to the interview show some external factors that are affecting the possibility of performing at a high level on DC knowledge and the use of OER.

These factors are grouped in three categories: training, infrastructure and management, as shown by the following quotes:

- We have struggled for performance with the (technological) equipment because we were not provided with prior training [...] (Teacher)
- Training has not been entirely effective [...] just last week we had a second training throughout the school year [...] (Teacher)
- The facilities are not very good. There are problems with (internet) connections, because the devices themselves are good and they have good programs (Teacher)
- Every week teachers handle their lesson plans to me and I check that equipment is included but I do not go to the classroom to observe how they use it. (Principal)

5.ANALYSIS AND CONCLUSIONS

Our results indicate that in-service teachers that acknowledge themselves as digital experts by using technologies as tools to solve regular teaching problems are able to show intermediate levels on the use of OER, limiting their use to occasional use as supplementary materials to regular teaching. This is essentially important to be overpassed since it has been found by [3] that digital students have a lower development of the digital competence than their teachers; thus teachers become role models on this topic and such modelling need to be of a high performance.

As shown in Table 1, a small percentage of teachers identify themselves with a High performance level in DC Knowledge (3.1%) and a smaller percentage in the same level in the use of OER (0.9%). This could be related to external factors of training, infrastructure and management. It was found that digital competence, including use of OER is not significantly developed due to lack of adequate training, infrastructure and equipment in good condition and the management involvement in the follow up of the implementation. About this last factor, management, teachers from some schools reported that even when there are areas of opportunity in monitoring the use of the equipment and the regulation of its use, the school principal of these schools have played an important role to ensure the necessary conditions for full functioning of the project, such as access to internet, furniture and security.

On the other hand, results show that training through the MOOC had a positive impact on the perception that teachers have on their DC broken down to digital skills; especially to the skills related to OER use (identify OER characteristics, identify OER potential in practice and design open resources in different formats) and those skills related to solving information problems (communicate learned content through technology and plan projects mediated by educational technology). When comparing the results of the pre and post questionnaire, the perceptions of digital skills to solve information problems improved 9% after the MOOC, while perceptions of OER use skills improved 24%. These results show how important training is and the empowerment that knowledge provides to teachers. This is linked with what [6] and [7] have stated about the MOOC settings that use OER, like the one provided to the participants of this study. These MOOC improve skills for the use of information and communication technologies (ICT) with a direct implication for the Knowledge Society. These teaching and learning experience, should promote settings where 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 which may also lead to new scenarios of teacher collaboration [12].

Teacher Education is key in the development of DC since teachers are perceived as an important element in the implementation of changes by introducing ICT in classroom and the use of OER, taking in consideration that not all the digital natives that enrol in schools are digital competent. Training should take place constantly and should be provided by school authorities but also self-imposed by teachers as a compromise to their profession, taking advantages of the numerous offer available for MOOC [8]. In order to successfully implement the use of OER, teachers need to be digitally competent and for that teacher education programs need to include the DC component in order to systematically train teachers to make regular use of OER in their environments. Teachers need to be prepared to use digital media such as videos, textbooks, audiobook or different software programs as a teaching support materials and for that they need to be trained to be highly competent in the use of technological devices or tools (computers, internet, and social media) as well technical knowledge on digital tools for teaching, including mobile services tools as recommended by [10]. As repeatedly mentioned in international reports such as the European Commission Report, 2013, this study reaffirms the need of empathize ICT teaching training in order to support active teaching practices in schools.

As of July 2016, a new research is being implemented under the “Binational Laboratory for the Management of Intelligent Energy Sustainability and Technology Education” funded project. As part of the project, 10 MOOC are being developed and implemented with OER in order to provide knowledge to consumers and employees about energy sustainability. The results of this previous project presented in this paper has served as a background to maximize the use of OER and MOOC and to double test this model in the nationwide energy project funded by the Secretary of Energy in Mexico from 2016 to 2019.

ACKNOWLEDGEMENT

This paper is presented in the framework of the project: "Comparative study on the development of digital competence under MiCompu.mx program" (supported by SEB-SEP-CONACYT-2013-1 Fund) and Project 266632 "Binational Laboratory for the Management of Intelligent Energy Sustainability and Technology Education "(with funding from the Energy Sustainability Fund CONACYT-SENER, Call: S0019-2014-01). The support of CONACYT and Tecnológico de Monterrey is appreciated.

REFERENCES

- [1] SEP (2015). Programas estratégicos. Recuperado de:
http://www.sep.gob.mx/esp/sep1/Programas_Estrategicos
- [2] Ramírez, M. S. (Coord.) (2016). *Competencias Digitales en el Marco del Proyecto Mi-Compu.Mx: Investigaciones y Comunicaciones* [eBook]. México: Lulú editorial digital. Disponible para versión impresa en: <http://tiny.cc/eBook-MiCompuMx> y en formato libre en el repositorio abierto: <http://hdl.handle.net/11285/609571>
- [3] Gallardo-Echenique, E. E., Marqués-Molías, L., Bullen, M., & Strijbos, J. (2015). Let's talk about digital learners in the digital era. *International Review of Research in Open and Distance Learning*, 16(3), 156-187.
- [4] Krumsvik, R. J. (2014). Teacher educators' digital competence. *Scandinavian Journal of Educational Research*, 58(3), 269-280. doi:10.1080/00313831.2012.726273
- [5] Smith, M.S., and Casserly, C.M. (2006). The Promise of Open Educational Resources; Change: *The Magazine of Higher Learning*, 38(5); p. 8 (EJ772126). <http://dx.doi.org/10.3200/CHNG.38.5.8-17>
- [6] Ramírez, M. S. (2015). Acceso abierto y su repercusión en la Sociedad del Conocimiento: Reflexiones de casos prácticos en Latinoamérica. *Education In The Knowledge Society (EKS)*, 16(1), 103-118. doi:10.14201/eks2015161103118. Disponible en: <http://catedra.ruv.itesm.mx/handle/987654321/873>
- [7] Hernández, E. E., Romero, S. I., & Ramírez, M. S. (2015). Evaluation of digital didactic skills in Massive Open Online Courses: A contribution to the Latin American Movement. *Comunicar*, 22(44), 81-90. Retrieved from <http://catedra.ruv.itesm.mx/handle/987654321/848>
- [8] Alyssa, W., Yi, J. Vytasek, J. (2017). Mining for gold: Identifying content-related MOOC discussion threads across domains through linguistic modeling. *The Internet and Higher Education*, 32, 11-28.
- [9] Tabassum, H. & Muhammad A. (2016). Technology use, self-directed learning, student engagement and academic performance: Examining the interrelations. *Computers in Human Behavior*, 63, 604-612.
- [10] Tuğba K., Aykut, T &, Okursoy, A. (2016). Acceptance and usage of a mobile information system in higher education: An empirical study with structural equation modeling. *The International Journal of Management Education*, 14, 286-300.
- [11] Strauss, A. & Corbin, J. (1994). Grounded Theory Methodology. In N.K Denzin & Y.S Lincoln (Eds.) *Handbook of Qualitative Research* (pp. 217-285). Thousand Oaks, Sage Publications.
- [12] García-Valcárcel, A. & Mena, J. (2016). Collaborative learning and ICT use: What in-service teachers think and do in their classrooms. *Journal of Information Technology Research (JITR)*, 9 (1), 1-17