Journal of Universal Computer Science, vol. 23, no. 12 (2017), 1215-1237
submitted: 10/5/17, accepted: 24/8/17, appeared: 28/12/17 © J.UCS

Open, Mobile and Collaborative Educational Experience. Case study: The European ECO Project

Sara Osuna Acedo
(National Distance Education University (UNED), Spain
sosuna@edu.uned.es)

Javier Gil Quintana
(Catholic University of Ávila, Spain
javier.gil@ucavila.es)

Carmen Cantillo Valero
(National Distance Education University (UNED), Spain
carmen.cantillo@invi.uned.es)

Abstract: The European ECO Project has contributed to the dissemination of MOOCs by developing an educational model which promotes participation and interaction through social networks and an own virtual platform. Likewise, it fosters students' empowerment by allowing them to create their own courses. Such training model is studied in this research work, firstly, through the analysis of teachers' and students' speeches posted on forum boards and groups. Then results obtained in several surveys conducted among participants, which consider interactions taking place both in and off the platform, are triangulated. Educational and motivational factors in the students' profile show the advantages and disadvantages found in their perception of the collaborative learning model, as well as the empowerment derived from the participation in the creation of their own MOOCs. This study reveals multiple factors affecting the proper development of these courses, while considering communication as an incentive for the creation of knowledge through the MOOC itself. All this will contribute to improve the quality of education and to trigger a change of paradigm, necessary to understand today's education and society.

Keywords: sMOOC, Europe, collaborative learning, mobile learning
Categories: L.1, L.2, L.3

1 Introduction

In 2014, several institutions, including the National Distance Education University (UNED) in Spain, came together with the purpose of collaborating on this global innovation initiative through the European ECO Project (*E-learning, Communication, Open-Data: Massive Mobile, Ubiquitous and Open Learning*). A series of courses were created to train citizens and promote a shift in education by providing training to teaching teams. ECO Project, by proposing a schedule of courses, has provided an opportunity for a large number of teachers in training from various nationalities to participate, with an emphasis on the potential of MOOCs to break down the barriers that had excluded certain social and cultural groups from knowledge. Among the courses covered, we would like to highlight the *sMOOC Step by Step*, the subject matter of our analysis, which endows students with the skills necessary to be able to create their own MOOC, providing space for everybody's participation in the creation of new subjects and learning environments. This is an ECO course delivered in six languages simultaneously (Spanish, English, French, Italian, Portuguese and German). It is shared by a teaching team and students from each one of the six languages, making the training massive and open to other cultures and nationalities. It contributes to "breaking down the inflexibility of classic virtual environments, where learning activities take place, in order to open up education to thousands of people with different learning interests, which has led to the socialisation and democratisation of learning at a worldwide scale" [Cantillo-Valero 14]. We start off with the idea that students are very participative and co-responsible for their own learning, needing only virtual users and passwords to interact with the massive, open and online courses.

ECO considers MOOCs as the concept of open source and open access education, in accordance with the movement for open educational resources with no restrictions whatsoever in accessing, reusing or adapting the MOOC contents. Although there are other commercial versions of MOOCs, at ECO we endorse a successful and sustainable model of open and mobile education practices [Gil-Quintana, Camarero-Cano, Cantillo-Valero & Osuna-Acedo 17]. This proposal is being presented as an invitation to reflect upon the role that massive, online and open education plays today, in the 21st Century. *sMOOC Step by Step* allows students to specialise in the steps to be followed, once the minimum access requirements have been met, to create a sMOOC, request space on the project's virtual platform and become *e-teachers*. Such process demands, therefore, a highly engaged and collaborative role from students in the course, making them the focus of attention as web actors [Pisani and Piotet 09]. As stated by Osuna-Acedo, "the real challenge is to get the players in the virtual settings to adopt the right interactive attitude that will engage individuals as active cultural agents in the creation of the cyberculture of the 21st Century"[Osuna-Acedo 11].

2 MOOC and OER. The educommunication environment *sMOOC Step by Step*

MOOCs may be considered a major expression of OER (Open Educational Resources) posing great challenges and with a huge potential to promote greater access to education in any Higher Education Institution, especially in developing countries. Muganda, Samzugi and Mallinson advocate "the immense potential benefit of the use of OER materials for promoting wider access to education as well as improving the quality of programmes offered by The Open University of Tanzania (OUT)" [Muganda, Samzugi and Mallinson 16]. Among the various types of MOOC available, we find considerable differences in the communication and pedagogical model followed; however, all of them have in common the use of open educational resources. Depending on the level of interaction of each MOOC, development of these materials can range from closed contents prepared by the course teacher to others created collaboratively between teachers and students during the course [Pang et al. 17]. The differences are established, firstly, by the pedagogical approach to contents, methodology and assessment and, secondly, by the communication level for more or less unidirectional and hierarchical environments [Gil-Quintana 15]. In the sMOOC model, learning spreads across all social software spaces that truly help establish collective intelligence [Lévy 04] by global society, presenting a unique education process that has a social impact from the community created around the course. This implies that "courses must stimulate connectivism, socio-constructivist learning and situated learning. They must be aimed at the development of independent learning and focus on participants. The design must be oriented towards creating opportunities for collaborative learning and seeking strategies or resources to facilitate adaptive learning" (*sMOOC Step by Step*, 2014-17. ECO Project). New ubiquitous forms of communication are sought establishing the "feed-feed" model, which breaks away from traditional communication norms and the verticality and hierarchisation of people in the communication processes [Aparici & Silva 12].

The purpose of the sMOOC approach in ECO Project is social involvement and knowledge-building by the participants, based on ubiquity, equity, social inclusion, quality, diversity, accessibility, independence and openness [Gil-Quintana 16]. As stated in ECO, the educational resources provided in their sMOOCs to build knowledge are presented within the context of an open and integrating activity and not as objects in a repository. The idea is for all sMOOC materials and resources to be licenced as OER and available for free on the Internet, from anywhere, anytime. Likewise, video, audio and text resources provided in sMOOCs should not only be available but also downloadable in formats compatible with most platforms and devices.

sMOOCs may be an essential instrument to bridge the gap between the various social classes to access education. There are no impositions or previous requirements to take the courses. Students choose the pathway they wish to follow according to their own possibilities, criteria and availability, sharing their conclusions, making true the maxim: "We all learn from everyone". Osuna-Acedo analysed this concept based on terms coined by several authors: “Smart Mobs [Rheingold 04], the Wisdom of Crowds [Surowiecki 04], Collective Intelligence [Lévy 03] and Intercreativity [Berners-Lee 96] […] «We all learn from everyone» […] All individuals need to become [somehow] teachers and students, at the same time, exchanging roles continuously in the process towards building knowledge carried out in virtual environments” [Osuna-Acedo 13].

Interaction with a social projection through the Internet is the goal to be achieved by these proposals, not only among students, but also in the teaching team, as well as inside and outside the sMOOC environment [Osuna-Acedo & Gil-Quintana 17]. Martínez, Contreras and Ríos pointed out that “social networks work as a sounding board, transmitting and amplifying the ideas and expressions of society, especially those of people who normally do not have the means to express themselves. At the same time, they allow the rest of the world to follow events in real time; […] for citizens play the role of journalists by feeding the world images and audios of events” [Martínez et al. 13]. This quality is enhanced by the gamification mechanics inherited from “serious games” and video games, which make these platforms more motivational and interesting. Gamification and the promotion of participation in social networks, entails going from connectivity to engagement of the members of the community with the social structure, "providing an experience marked by interaction and social participation, and seamless because ideally it should be accessible through various platforms and mobile devices. […] Integrated with real life experiences of participants by contextualising contents and gamification" (sMOOC *Step by Step*, 2014-17. ECO Project).

It should be noted that the purpose sought by sMOOCs cannot be achieved if students are not empowered by turning the massive, open, online courses and OER into spaces for participation and knowledge-building from a collaborative standpoint and building collective intelligence through a "complex space with multiple interrelated and moving entrances, pathways and exits" [Silva 05]. These courses thus take on a more educommunicative note. They become the smart mob that is created through an "architecture of participation" [O'Reilly 05].

3 Research Questions and Hypotheses

The objective of this paper was to show that the education and communication practices used in sMOOCs break away from traditional paradigms, which focused on individual and competitive learning. In this sense, we asked the following questions to guide our research:

> Q1: Do the collaborative work practices used in the education method of the sMOOC *Step by Step* favour the pedagogical change that is so necessary in education?
>
> Q2: Do the type of documents and audiovisual materials used in the course and the interrelationships between the members of the learning community have an impact on the level of satisfaction expressed by the students?
>
> Q3: Does the communication model used in the sMOOC learning communities promote student empowerment in their own training?

Likewise, the experiences analysed in this study aimed to confirm the initial hypotheses establishing that the new communication and education model implemented in the sMOOC *Step by Step* fosters positive interrelationships between the members of the learning community. The hypotheses were:

> H1: Students show a high level of satisfaction with the collaborative work and communication interrelationship method used in the sMOOC *Step by Step*.
>
> H2: This satisfaction includes the documents and audiovisual materials used in the course.
>
> H3: The communication and collaboration practices have an impact on student involvement by changing the traditional rules of pedagogical verticality.

4 Methodology

The case study, which can be used as a tool for exploration, verification and constructions of theories, is the main asset in our research work. The reason to choose it is our intention to study a specific phenomenon such as the European ECO Project's training model. Therefore, the study has a descriptive nature.

To answer the questions in the previous section, representations have been made that describe, analyse and explain the reality observed using mixed methods. This "generates a feeling of solidness" when the convergence of results generated by various methods or research techniques is confirmed [Callejo and Viedma 10]. The questionnaire shows the results by categories that can be related to certain variables according to population characteristics, and the anonymity of the answers facilitates sincere feedback. While the analysis of the comments in the discussion forums aims to openly address more personal arguments or views of subjects who know they may be observed and are expressing themselves in the first person. With the results of the quantitative and the qualitative analyses of the interventions in the discursive dynamics proposed by the various communities online, we aim to validate all information compiled both in the group discussion forums and in the questionnaire. That is, we are not only considering the perception of their motivation held by the students, but we are also triangulating it to confirm the validity of the discourses by verifying that there was indeed greater participation in the collaborative work proposals.

Since the late 1990s, various studies have been carried out on communication in discussion forums [Mason 90]. In this specific case, we have conducted this analysis choosing a type of qualitative study whose intentional samples are the discourses of the teaching team and the students, posted on forum boards and groups of the *sMOOC Step by Step*. The critical analysis of the sample discourses on forums and groups of the platform is understood as a social practice or a representation of the same. This analysis has allowed understanding reality basing on texts which we have had to unravel, interpret and break down. Already in 1999, Rourke and others established three elements to research post on discussion forums: social presence, cognitive presence and teaching presence. Three subcategories related to social presence and necessary to motivate students in their learning process we identified as well: affective responses, interactive responses and cohesion responses. In this study, we have established analysis categories based on communication, and considering information, regulatory and affective functions as well. Likewise, we have categorised the students' written discourses according to their meaning, bearing in mind that "the range of categories are not closed in advance, but rather are closed once all the expressions found in the documents have been registered" [Bernete 13].

To achieve the goals of this study, we used two clearly distinct instruments, described in the section on Results:

A. A self-administered questionnaire sent -using LimeSurvey software – to all students enrolled in ECO Project courses. This questionnaire was anonymous and voluntary, enabling classification of answers and association of certain variables by population characteristics in order to, subsequently, compare groups and study correlations between variables with the software SPSS (Statistical Package for the Social Sciences).

B. An analysis of discourse (in discussion forums and work groups), aimed at openly addressing more personal arguments or perceptions from individuals who know they may be observed and are expressing themselves in the first person. Based on a process of inductive reasoning, we arranged discourse into categories and codes, based on quotes, which were examined and compared with the qualitative analysis software Atlas.ti.

Therefore, this sample comprises different discussion forums, directly related to the work of students, generating units of messages analysed -in the *sMOOC Step by Step* in six languages- and provided by 1,612 students and 18 teachers. In the teachers' discourse, all 101 "complete messages" posted on forums were accounted for, as well as 15 fragments shared on each one of the work groups created to conduct collaboration proposals while performing training actions. Also, we analysed the 941 messages shared by students and the 191 created in the groups. The sample has generated an open dialogue, there have been conversations and exchange of opinions related, very often, to personal persuasion skills concerning fellow members. Therefore, we have considered aspects related to the dynamics of participation and interaction and the dimensions of students' discourse.

It should be noted that not all teachers, neither all students wrote in the forums and groups, but rather completed their tasks without participating in the collective knowledge building discussions. Differences were noted between the topics addressed in the forums, which reached the 1,612 students, and those addressed at the groups, where there was a maximum of 80 people per group.

Additionally, the impact of innovative tools and practices on the community has been taken into account. Among them is the use of “chatbots” on Telegram’s voice mailbox. RetosMOOCsBs chatbot, for instance, included a collaborative, peer-to-peer reviewed activity, consisting of a transmedia, interactive work on *sMOOC Step by Step* content through Challenge-based Learning approach. This way, the boundaries of the course’s virtual platform were crossed in order to reach the interactions taking place in digital social networks, through which collective knowledge is constructed.

5 Results and Analysis

Data analysis comprises three methods commonly used by the scientific community to stablish the relationship between variables: Pearson’s, Spearman’s and Kendall’s correlation coefficients; although their estimation depends on the variables’ nature – whether it is qualitative (ordinal) or quantitative (reason). In this study, the reference is set by Kendall’s and Spearman’s correlation coefficients. It is worth noting that correlation measures the intensity of a lineal relation between to variables which, albeit not having a causal relationship among each other, they could be related nevertheless. Kendall’s and Spearman’s correlation coefficients make sense when the subject variables are qualitative, with ordinal measurement ranges.

The qualitative discourse analysis and its interpretation has been sequenced in two phases: textual and conceptual. The analytic classification provided by Atlas.ti software has allowed complex data relations to be systematised, codified, analysed and visualised. Basing on the grounded theory, we have been able to reflect on the meaning of social processes through the inductive method.

5.1 Sample

The sample used in the final satisfaction questionnaire was made up of 292 people who participated in the sMOOC *Step by Step*, with ages ranging from 19 to 73, who were all students and who voluntarily decided to complete the final questionnaire, of which 52.1% were women and the remaining 47.9% were men. The breakdown by country of residence is shown in the table below.

X3_Residence

	Frequency	Percentage	Cumulative percentage
Argentina	8	2.7	2.7
Belgium	1	.3	3.1
Bolivia	1	.3	3.4
Brazil	6	2.1	5.5
Chile	2	.7	6.2
Colombia	6	2.1	8.2
Ecuador	2	.7	8.9
France	7	2.4	11.3
Germany	2	.7	12.0
Greece	2	.7	12.7
Honduras	3	1.0	13.7
Italy	5	1.7	15.4
Mexico	11	3.8	19.2
Peru	6	2.1	21.2
Portugal	14	4.8	26.0
Spain	205	70.2	96.2
Sweden	1	.3	96.6
United Kingdom	3	1.0	97.6
United States	1	.3	97.9
Uruguay	1	.3	98.3
Vanuatu	1	.3	98.6
Venezuela	4	1.4	100.0
Total	292	100.0	

Table 1: Breakdown of sample by country of residence (absolute figures with their corresponding percentage).

5.2 Satisfaction with documents and audiovisual materials used in the sMOOC *Step by Step* and quantitative tables

It was interesting to examine the social and demographic profile of those participating in the sMOOC *Step by Step* to determine whether there were characteristics that could be related to a greater or lesser degree of involvement. Table 2 shows the *p* values of the Chi-square independence tests of these social and demographic characteristics (X1, X2, X3, X4 and X6) and satisfaction with the documents and audiovisual materials used (X21 y X22).

	X21: Set_documents_provided	X22: Set_documents_provided
X1: Age (n=268)	0.002	**0.000***
X2: Gender (n=292)	**0.000***	**0.000***
X3: Residence (n=292)	0.262	0.454
X4: Academics qualifications (n=292)	**0.000***	**0.000***
X6: Area of employment (n=292)	0.417	**0.000***

* The relationship is significant at 0.01

Table 2: p-values of the Chi-square tests of independence of nominal variables

Satisfaction with the documents and audiovisual materials provided in the course are clearly dependent on the variables age, gender and academic qualifications However, no dependence was found on the variable country of residence. Moreover, the employment area has a clear dependence on audiovisual materials, but not so on the documents provided in the course.

Calculating Kendall’s and Spearman’s correlation coefficients between the ordinal variables where dependence was found in the previous Table, we saw a negative correlation between variables X1, X21 and X22 (Table 3): age did not influence participant satisfaction with the documents and audiovisual materials provided in the course.

5.3 Analysis of participant discourse in forums / groups of the sMOOC Step by Step and graphic representation

This study follows the line of work that has been carried out since February 2014 through the European ECO Project (*E-learning, Communication and Open-data: Massive Mobile, Ubiquitous and Open Learning*), developed in the Competitiveness and Innovation Framework Programme (CIP). This study analyses the discourse between teachers and students of the *sMOOC Step by Step*. We have focused on the intentionality of the discourse, for which we have considered the "full message" [Garrison, Anderson and Archer 01] as the analysis unit of our work. We have chosen this analysis to identify the beliefs and values of the members of the learning community.

The research conducted based on this type of analysis presents a great diversity of discourses [Ibánez 86], considering their assessment and taking into account that the written language of the teachers and students of the sMOOC has influenced the behaviour of other members in the community. The sample of the courses selected to analyse the discussion forums included all of those where student-teachers interaction took place.

Correlations

			X1_Age	X21_Set_documents_provided	X22_Set_audiovisual_materials
Kendall's tau_b	X1_Age	Correlation coefficient	1,000	-,124**	-,081
		Sig. (bilateral)	.	,007	,078
		N	268	268	268
	X21_Set_documents_provided	Correlation coefficient	-,124**	1,000	,743**
		Sig. (bilateral)	,007	.	,000
		N	268	292	292
	X22_Set_audiovisual_materials	Correlation coefficient	-,081	,743**	1,000
		Sig. (bilateral)	,078	,000	.
		N	268	292	292
Spearman's rho	X1_Age	Correlation coefficient	1,000	-,160**	-,103
		Sig. (bilateral)	.	,009	,093
		N	268	268	268
	X21_Set_documents_provided	Correlation coefficient	-,160**	1,000	,803**
		Sig. (bilateral)	,009	.	,000
		N	268	292	292
	X22_Set_audiovisual_materials	Correlation coefficient	-,103	,803**	1,000
		Sig. (bilateral)	,093	,000	.
		N	268	292	292

**. Correlation is significant at level 0.01 (bilateral).

Table 3: Kendall's and Spearman's correlation coefficient between X1 (Age) and X21 (Set_documents_provided) and X22 (Set_audiovisual_materials).

Our research includes a descriptive study examining the presence and form of relationship between the variable *participation in discussion forums* and the variable *intentionality of the comments posted* therein, as well as the impact of collaborative activities carried out off-platform. Therefore, we analysed two variables: the examination of interactions and their intentionality, through a type of descriptive research that aims to explain if the relationship takes place and the frequency with which it is established, using the categories created to relate these variables.

The study resulted in six categories of maximum variability to produce descriptions that could explain the relationship between the discourses and their intentions. To this end we created the following categories: ED-FACREF (Facilitate reflection); ED-RECPAR (Acknowledge participation); ED-RESPPAR (Answer students); ED-EXPCONT (Explain doubts regarding contents); ED-CITPART (Cite student comments) and ED-MOTPAR (Motivate participation). Each one of these six categories has been associated to an aspect of the social dimension of the discourses analysed, identifying intentional elements related to expressions of feelings. When associating these categories to social dimensions, we assessed situations where participants have had supra-cognitive interaction, thus configuring the virtual space as a social community that lends cohesion to the collaborative work group.

To provide a disaggregated view of the discourses according to the main roles established in the space of the sMOOC platform, we have presented, first, data related to the teaching team narrative and, second, that of the students interacting in the course. Based on this first analysis, we were able to establish similarities and differences between frequency of appearance and intentionality by teachers and students.

Thus, Table 5 shows the association of codes and categories to analyse the discourses, as well as the social relationships established according to the messages studied, taking into account the frequency of appearance in the interaction of community members. These codes were assigned simultaneously to the selection of the discourse fragment used for analysis.

Code	Category	Intentionality	Frequency
ED-FACREF	Facilitate reflection	Comments aimed at provoking reflection on course contents	33.7%
ED-RECPAR	Acknowledge participation	Comments aimed at thanking for participation	9.9%
ED-RESPPAR	Answer students	Reply to student questions and comments	31.65%
ED-EXPCONT	Explain contents	Clarify any queries about contents or activities	15.84%
ED-CITPART	Cite student comments	Highlight the best comments from students	4.95%
ED-MOTPAR	Motivate participation	Make comments to foster participation	3.96%

Table 4: Categories of teaching team discourse in the forums.

In order to provide a disaggregated view of the discourses according to the main roles established in the sMOOC platform, we present, first, data related to the narrative of the teaching team and, second, that of the students interacting in the course. Based on this first analysis, we can establish similarities and dissimilarities between the frequencies of appearance of categories and intentionality of teachers and students.

Regarding the discourse of the teaching team in the groups, we found the following categories:

Code	Category	Intentionality	Frequency
ED-FACREF	Facilitate reflection	Comments aimed at provoking reflection on course contents	40%
ED-RECPAR	Acknowledge participation	Comments aimed at thanking for participation	20%
ED-RESPPAR	Answer students	Reply to student questions and comments	6.6%
ED-EXPCONT	Explain contents	Clarify any queries about contents or activities	0%
ED-CITPART	Cite student comments	Highlight the best comments from students	0%
ED-MOTPAR	Motivate participation	Make comments to foster participation	33.4%

Table 5: Categories of teaching team discourse in the groups.

The basic difference between forums and groups is that in the latter the teaching team does not clarify questions about contents or activities, but rather leaves that for the forums. Also, good comments are not highlighted in the groups; that is done in the forums. These two strategies ensure the information reaches all students. Most messages from the teaching team in forums focus first, on provoking reflection on the open contents of the sMOOC, and second, on answering student questions. However, most teaching team messages in the groups are aimed at provoking reflection on the contents provided in the various OER and motivating the participation of the virtual learning community. In relation to the student discourse in the forums, we found the following categories:

Code	Category	Intentionality	Frequency
PA-COMPIN	Sharing information on contents	Make information found available to the other participants	14.24%
PA-REFCON	Reflect on contents	Share with the other participants their thoughts on the contents and activities	24.8%
PA-REFEVAL	Reflect on the evaluation	Share suggestions on the evaluation of a MOOC, specifically on P2P activities	1.7%
PA-PREDUD	Ask questions	Ask questions on contents, running of the course, etc.	6.7%
PA-AGRAPA	Express gratitude to participants	Thank for help, clarifications, etc. received from other participants	2.97%
PA-AGRAED	Express gratitude to teaching team	Thank for help, clarifications, etc. received from the teaching team	7.75%
PA-FALLPLA	Expose faults of the virtual platform	Bring attention to specific malfunction of the virtual platform	2.65%
PA-OPINPOS	Express a positive opinion of the course	Express the positive elements found in the course	2.8%
PA-PROMEJO	Suggest areas for improvement	Provide constructive feedback to improve the course	1.8%
PA-CONTED	Reply directly to comments from the management team	Respond to comments from the management team	2.44%
PA-	Reply directly to	Respond to comments from the other	5.73%

CONTPA	comments from the other participants	participants	
PA-CONVPA	Discuss topics outside the course	Hold conversations outside the specific contents of the course	1.8%
PA-AYULOC	Request for help to find contents	Ask for help when contents cannot be found	0.53%
PA-AYUACPA	Request for help from the other participants for the activities	Ask for help when having difficulties with the activities	2.33%
PA-ANIMAPA	Encourage other students to continue with the course	Motivating comments to motivate the other students	1.06%
PA_MEPRES	Introducing oneself to the group	Post information about oneself for the rest of the participants	16.57%
PA-PRCERTI	Asking questions about the course certificate	Post questions, opinions, etc. about the course certification	3.82%
PA_PUBLPRO	Increase your visibility among the rest of the course mates	Post personal information in order to provide information on oneself to the other participants	0.31%

Table 6: Categories of student discourse in forums.

These categories are displayed graphically showing that student reflection on open contents (Reflect on contents 24.80%) stands out among the rest of the discourse categories analysed. In contrast to this analysis category, we found there was barely any discourse addressing the topic of evaluation PA-REFEVAL (1.7%), which alerts to the lack of self-evaluation and co-evaluation among students.

When focusing on student discourse in groups, we found the following categories:

Code	**Category**	**Intentionality**	**Frequency**
PA-COMPIN	Sharing information on contents	Make information found available to the other participants	12.04%
PA-REFCON	Reflect on contents	Share with the other participants their thoughts on the contents and activities	5.3%
PA-REFEVAL	Reflect on the evaluation	Share suggestions on the evaluation of a sMOOC, specifically on P2P activities	1.04%
PA-PREDUD	Ask questions	Ask questions on contents, running of the course, etc.	8.9%
PA-AGRAPA	Express gratitude to participants	Thank for help, clarifications, etc. received from other participants	3.14%
PA-AGRAED	Express gratitude to teaching team	Thank for help, clarifications, etc. received from the teaching team	1.57%
PA-FALLPLA	Expose faults of the virtual platform	Bring attention to specific malfunction of the virtual platform	8.37%
PA-OPINPOS	Express a positive opinion of the course	Express the positive elements found in the course	7.32%
PA-PROMEJO	Suggest areas for improvement	Provide constructive feedback to improve the course	0.52%

PA-CONTED	Reply directly to comments from the management team	Reply to comments from the management team	0.52%
PA-CONTPA	Reply directly to comments from other participants	Reply to comments from the other participants	25.65%
PA-CONVPA	Discuss topics outside the course	Hold conversations outside the specific contents of the course	0%
PA-AYULOC	Ask for help to find contents	Ask for help when contents cannot be found	0.52%
PA-AYUACPA	Request help from the other participants for the activities	Ask for help when having difficulties with the activities	5.75%
PA-ANIMAPA	Encourage other students to continue with the course	Motivating comments to motivate the other students	4.71%
PA_MEPRES	Introducing oneself to the group	Post information about oneself for the rest of the participants	9.94%
PA-PRCERTI	Asking questions about the course certificate	Post questions, opinions, etc. about the course certification	4.71%
PA_PUBLPRO	Increase your visibility among the rest of the course mates	Post personal information in order to provide information on oneself to the other participants	0%

Table 7: Categories of student discourse in the groups.

The charts of Frequency of appearance of the discourse categories for teachers and students analysed are shown below:

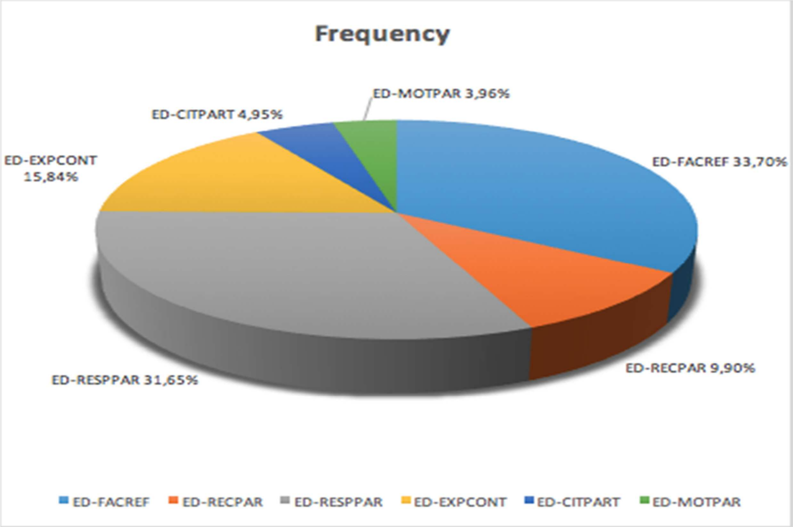

Figure 1: Frequency of Categories of the teaching team discourse in the forums.

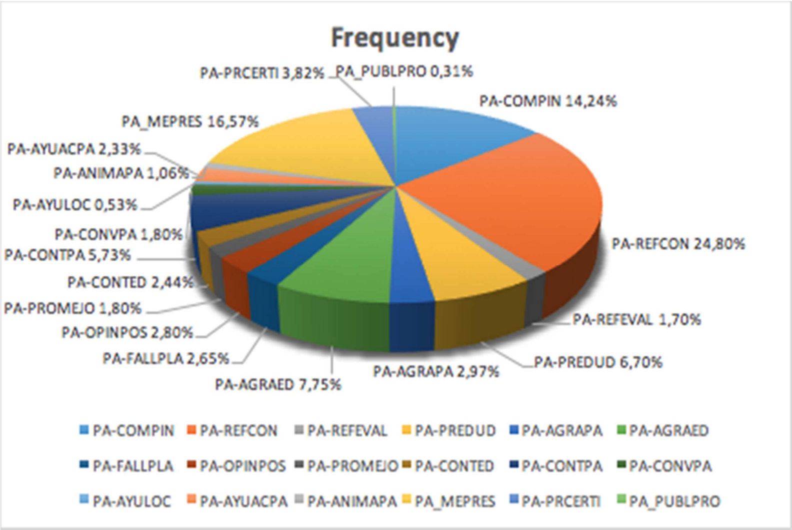

Figure 2: Frequency of Categories of the teaching team discourse in the groups.

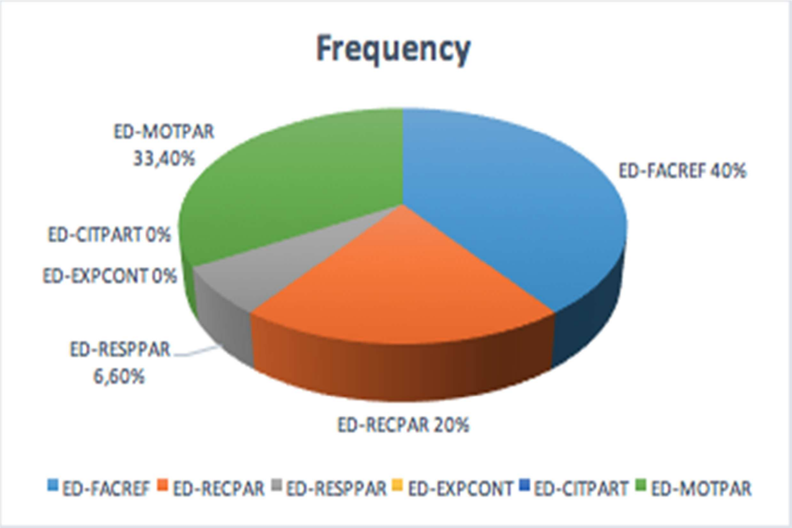

Figure 3: Frequency of Categories of student discourse in forums.

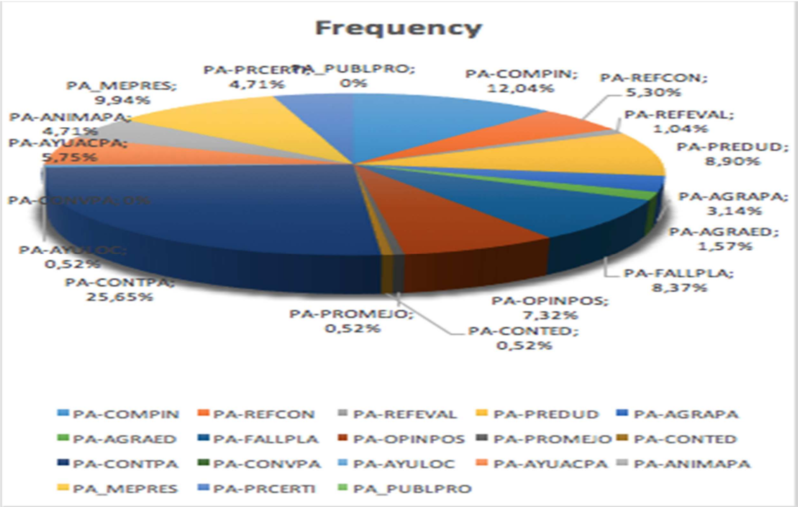

Figure 4: Frequency of Categories of student discourse in the groups

After analysing the messages, in general, and those aimed at enhancing the social dimension of students by the teachers in the group forums, in particular, we found a higher frequency of discourse aimed at encouraging participation (ED-MOTPAR) by students in the groups (33.40%) versus those found (3.96%) in the general forums. Along these same lines were the messages thanking for participation (ED-RECPAR), where 20% were found in the work groups and of these, less than half, 9.90% were aimed at expressing thanks for this in the general forums of the platform.

In comparison, we show the messages related to the cognitive dimension, as this is an aspect highlighting messages related to questions about contents and/or activities in the general forums (ED-RESPPAR and ED-EXPCONT). We noted an appearance of 31.65% in the general forum versus 6.60% in the groups for the first case and, 15.84% in the general forum versus their absence in those posted in the second case.

As shown in Figure 5, there is a higher value of the social dimension in discourse generated by the teaching team in the work groups, therefore providing interaction that goes beyond cognition and involving other factors such as feelings and emotions comprising the social space of the sMOOC learning community.

Similar to the discourse in general forums, were the limited messages shared on the topic of evaluation PA-REFEVAL (1.04%). This manifests a weak evaluation mentality and the use of grading guides for peer evaluations among participants. This is usually considered a task pertaining to teachers and, therefore, it is an additional challenge to propose this innovation as educational practice.

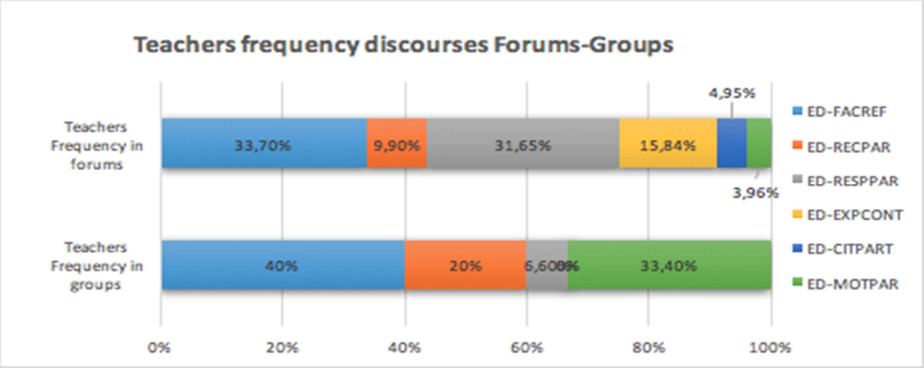

Figure 5: Frequency of teaching discourses in general forums and in groups according to intentionality.

In order to correlate the categories studied in the teacher and student groups, we associated the various codes according to the intentionality assigned to each role, analysing similar frequencies among the teaching team's discourses and the answers found among students related to critical reflection on the OER (ED-FACREF = 40%) proposed by the former and the participation and collaboration (PA-CONTPA + PA-REFCON + PA-PREDUD = 39.85%) shown by the latter.

Also, there is an emerging reflection between messages fostering participation by the teaching team (ED-MOTPAR = 33.40%) and the constructive feedback from students aimed at enhancing the use, distribution and reuse of OER which, no doubt, develops collective knowledge-building (PA-COMPIN + PA-ANIMAPA = 16.75%). The analysis of these elements evidences the impact of more horizontal and participatory dynamics based on bidirectional communications that facilitate student empowerment in their own teaching-learning process, as well as transferring the teacher focus, thus helping set up social and collaborative learning groups related to the creation of OER and collaborative work practices carried out on Telegram social community.

On the other hand, and by paying special attention to student messages, we found the greatest difference in their use when students post discourses, since the forums are used for reflections on contents, while the groups are used to reply directly to comments from other students. Regarding how students use forums and groups in the sMOOC, these are some highlights:

- Students share relevant information they find after searching the Internet. This type of action, which is very common in social networks, was carried out quite naturally in the course.
- The field of evaluation leads to discrepancies, where approximately half show support for the peer-to-peer evaluation (P2P) and the significant role played by students when assessing the work of their peers, both in and off the platform. In contrast, the other half regrets the absence of the teaching team in the evaluations and state that the instructions to assess their peers are not clear. We found that this type of evaluation specific to massive, open online courses is not accepted equally by all students.

- All assessments of the sMOOC were positive, except for a negative comment related to an improper teaching action. At the start of the sMOOC there were comments from students saying they did not know how to find their way around the course and could not understand the teaching logic, but it is always assumed to be due to their lack of experience with the course and the solution is dedicating more time to it.

All the data compiled and analysed which have been included in this study match those obtained in the student satisfaction surveys conducted at the end of the course, showing a high level of interest by the students (Figure 6) and their role as co-participants in the undertaking of this type of massive open online learning (Figure 7).

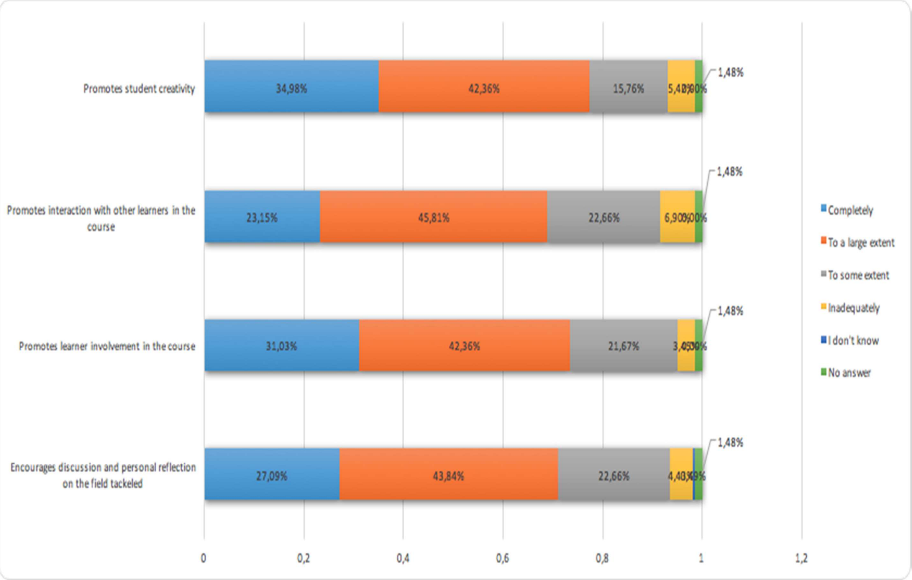

Figure 6: Student Satisfaction with sMOOC Step by Step.

As for the collaborative use of OER materials, we found, as shown in Figure 8, a very positive assessment of the collaborative open tasks (17.65% + 25.98% = 43.63%) by the students, the educational videos shared there (23.53% + 24.51% = 48.04%), the set of documents presented in the contents (22.06% + 33.33% = 55.39%) and the audiovisual materials provided (21.08% + 29.90% = 50.98%). These results show that, both the final materials used by students and those shared and generated in the teaching-learning process, were appreciated by students, since they materialise open and gradual knowledge-building. Therefore, the elements created initially by the teachers, as well as the strategies and practices used to generate the final materials, are initiatives that will continue evolving as they are being shared in open web designs through sMOOC.

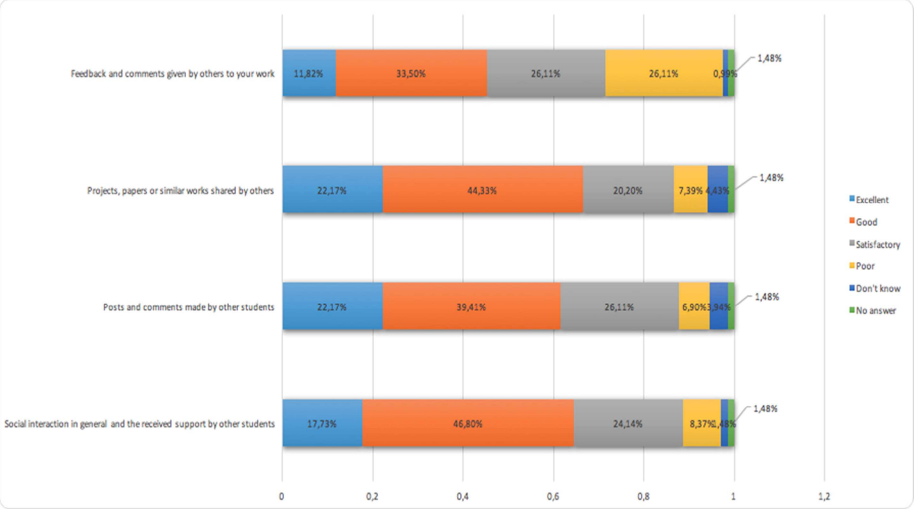

Figure 7: Co-responsibility of students promoted by sMOOC Step by Step.

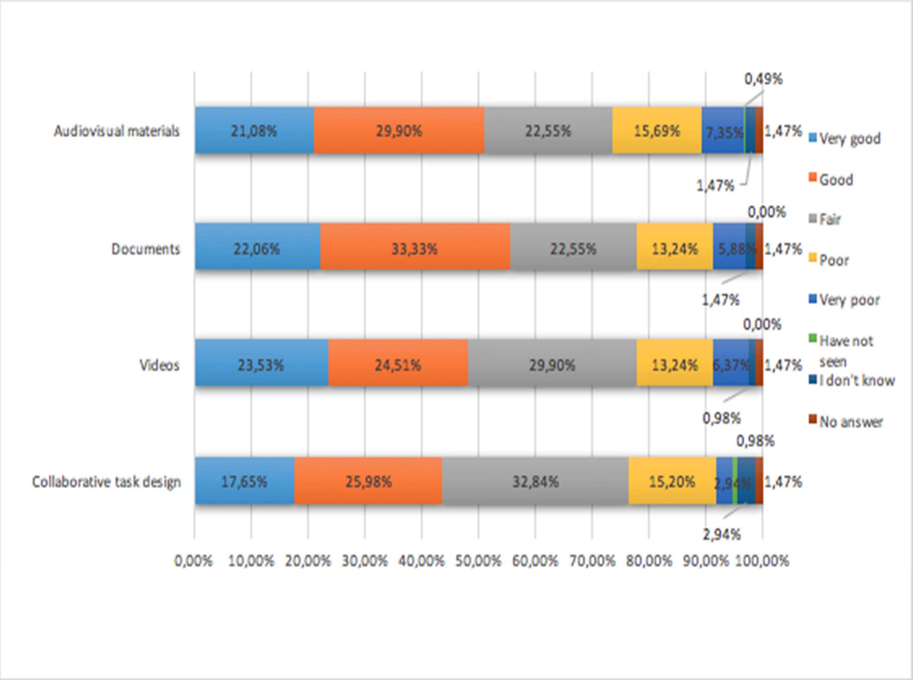

Figure 8: Assessment of resources and OER tasks by students.

6 Discussion

> Do the collaborative work practices used in the education method of the sMOOC Step by Step favour the pedagogical change that is so necessary in education?

The study findings show that collaborative work practices help educational changes [Watson et al. 16]. The student discourse indicates very significant figures in this regard and, to a certain extent, they also show that both teachers and students agree on the need to socialise knowledge and make it democratic. One of the incentives for MOOC to emerge in 2008 was the breaking down of physical barriers in universities and higher education institutions, which allowed knowledge to flow openly worldwide. It is evident that not only teachers, but also students, share this belief and accordingly have created a social community within the course which has led to collaborative work.

> Do the type of documents and audiovisual materials used in the course and the interrelationships between the members of the learning community have an impact on the level of satisfaction expressed by the students?

Moreover, we found that satisfaction with the documents and audiovisual materials used in the course, together with satisfaction with the level of interaction among teaching community members, had a positive correlation with the country of residence of the students of the sMOOC *Step by Step*. They valued interactivity as a real commitment with their own profession. To that end, they agreed that they needed to participate and be jointly responsible for their learning. We found nowhere in the student contents any doubts about their empowerment and level of commitment with their own learning, but not all students of the sMOOC *Step by Step* agree with this.

> Does the communication model used in the sMOOC learning communities promote student empowerment in their own training?

Open and collaborative education practices are one of the solutions in the fight against the digital and cognitive gap. The students of the sMOOC *Step by Step* should commit to including this new education concept in their daily teaching career, becoming active cultural agents. This led the authors of this study to consider a follow-up study, an important aspect in the sustainability and development of the sMOOC model.

The data collected in the teachers' discourses show that collaborative practices are aimed at facilitating reflection and critical thinking in general forums, while the groups work more on answering conceptual questions. There is a clear rise in work showing student feelings and emotions, compared to the drop in more cognitive work.

The data collected from students' discourses show a clear increase in comments among students as well as evidence of the collaborative work conducted by them. Student feedback implies the subsequent inclusion of horizontal and participatory education actions.

There are many comments in the student discourses that mainly give thanks for the opportunity for active participation that this education method provides. However, when it comes to assessing Peer Evaluations, opinions vary wildly. There are two extremes: one values very highly the possibility of peer evaluations, while the other does not like having another student -on equal standing- replace teachers in the job of evaluation. In fact, one of the elements they do not view positively is the quality of the grading criteria that must be used for peer evaluation.

7 Conclusions

The experience conducted in the sMOOC *Step by Step* has been very interesting and enriching for all members of the learning community involved with the course. Digital, mobile learning and communication methods and educational environments, using their own courses, are implemented massively on a technological platform to encourage citizen activism and empowerment. As part of the ECO collaborative methodology, students create OER to evidence their reflection and learning, making them freely available to other participants wishing to use them. We have seen how sMOOCs facilitate reflection, while promoting and motivating participation of the members of the virtual learning community.

The educommunication model used in the sMOOCs of ECO project, in general, and of the sMOOC *Step by Step*, in particular, means that the education platform becomes the right setting to trigger student participation. It becomes a learning ecosystem thanks to the interaction generated among its members and sets the basis for intercreativity, collective intelligence and an architecture for participation. As confirmed when analysing the contents posted in these communities, traditional rules of education verticality are changed, empowering students as active and critical subjects, capable of creating their own learning outcomes and opportunities. This horizontal communication thus becomes the foundation on which a collaborative relationship based on consensus and mutual trust is established.

However, we found the dimension related to evaluation still needs more development. Peer evaluation, a characteristic of this model, has only been valued positively by a part of the sample, and they miss better organisation and planning of criteria for grading, a process which had, for years, been reserved for teachers. This assessment by students is key because the premise is different from the concept of education based on transmissive and conductive models, where students played no active role. As a result, participants in the sMOOC model feel lost, with no experience at all in this type of learning and very limited time to adjust.

In this sense, the teaching team plays an essential role in this education model, to be a guide and facilitator for learning, to respond to questions on contents, to interact in student comments and contributions to create feedback between teachers and students.

In the same way that Wikipedia represented a qualitative change in the building of collective knowledge, “this is a profound change in the dynamics of content creation!” [O´Reilly 05]. The development of a bidirectional communication model and an interactive pedagogical style, helps students feel like co-participants in a unique experience and engages them in the various activities. By making them their own, designing, redoing and sharing their contents, they contribute improvements and significantly enrich the course itself. In this way, collective knowledge-building becomes a reality in the sMOOC settings, projecting horizontal communication that shifts the responsibility for learning to the students, and consequently lends great importance to a teaching practice that must foster the use of techniques motivating participation, as shown by the discourse categories analysed. This reinforces the conclusions in the study by Marta, Gabelas and Herguetta who noted “the creation and maintenance of synaptic relationships (analysis and reflection), nodal relationships (collaboration and organization) and media relationships (information searches in the Net and distribution) played an important role in their acquisition of media competences and, consequently, in their active empowerment and transformation into critical and creative subjects.” [Marta-Lazo et al. 16].

According to the research questions and the results obtained in this study, it can be concluded that the sMOOC model of massive, online and open training breaks with the paradigm of traditional education, which contributes to increase scientific literature regarding a more democratic model of education. Instead of focusing on individuality and competitiveness, it prioritizes learning through collaborative practices which help carrying out those educational changes required by the digital society. The empowerment of students in virtual educational scenarios makes the social construction of knowledge possible, on the one hand, and significantly increases their level of satisfaction with the teaching and learning process, on the other.

The experience within the ECO Project is valued very highly and there is an awareness that a path has been started towards a type of education better aligned with the demands of digital society, where students attain the digital skills needed. However, we are also aware of the fact that there is still a lot of work to be done, because not all students have been able to use the open contents of the sMOOC to build their own knowledge, using, reusing and adapting them to their needs. Nonetheless, it should be noted that one of the most important aspects of this study is that it shed light on everything we still need to improve and the commitment with future research, analysing the reality of these training proposals in the area of education and communication.

This study has brought to the surface everything we still need to improve, as well as the commitment needed for further research to analyse the reality of these massive, online and open training proposals in the field of education and communication. Further projection is open for sMOOCs as training spaces based on interaction and participation, aimed towards the development of students’ empowerment and the peer assessment model in digital scenarios. As future lines of work and research, we propose a further technical development of the platforms in order to enhance its educational and educative tools. There is also open field to analyse the potential of these courses and the methodological changes taking place in digital learning.

Acknowledgements

This work was supported by the European Commission (ECO - E-learning, Communication, Open-data: Open-data: Massive Mobile, Ubiquitous and Open Learning - Project no.: 621127 - Convocatoria CIP (Competitiveness. and Innovation Framework Programme) - Theme 2: Digital content, open data and creativity – Obj 2.3.a: Piloting and showcasing excellence in ICT for learning for all).

References

[Aparici & Silva 12] Aparici, R. & Silva, M.: Pedagogía de la interactividad. Revista Comunicar de Educomunicación, 38 (9) (2012), 51-58. Retrieved March 2017 from: http://www.revistacomunicar.com/index.php?contenido=detalles&numero=38&articulo=38-2012-07

[Bernete 13] Bernete, F.: Análisis de contenido. En Lucas, A., y Noboa, A.: Conocer lo social: estrategias y técnicas de construcción y análisis de datos, 221-261. Madrid: Editorial Fragua.

[Berners-Lee 08] Berners-Lee, T.: Tejiendo la Red. El inventor del World Wide Web nos descubre su origen. Madrid: Siglo Veintiuno de España Editores.

[Callejo & Viedma 10] Callejo, J. & Viedma, A.: Proyectos y estrategias de investigación social: la perspectiva de la intervención. Madrid: McGraw Hill.

[Cantillo-Valero 14] Cantillo-Valero, C.: Nuevas dinámicas de aprendizaje en entornos virtuales, 57-86. In Osuna-Acedo, S.: Escenarios virtuales educomunicativos. Barcelona: Editorial Icaria.

ECO, Proyecto (14-17). E-learning, Communication, Open-Data: Massive Mobile, Ubiquitous and Open Learning. Competitiveness and Innovation Framework Programme (CIP). CIP-ICT-PSP.2013 Theme 2: Digital content, open data and creativity. Obj 2.3.a: Piloting and showcasing excellence in ICT for learning for all. Retrieved from: http://ecolearning.eu

[Garrison et al. 2001] Garrison, D.R. Anderson, T. & Archer, W.: Critical Thinking, Cognitive Presence, and Computer Conferencing in Distance Education. American Journal of Distance Education, 15 (1), 7-23. doi:10.1080/08923640109527071

[Gil-Quintana 15] Gil-Quintana, J.: MOOC Innovación Educativa y desarrollo profesional. Posibilidades y límites de las TIC. Una experiencia desde la educomunicación en el Proyecto Europeo ECO. Qualitative Research in Education, 4(3), 299-328. doi:10.17583/qre.2015.1518

[Gil-Quintana 16] Gil-Quintana, J.: La nueva realidad sMOOC, una ventana abierta a la educomunicación. Revista Mediterránea de Comunicación, 7(2), 59-68. doi.org/10.1498/MEDCOM2016.7.2.5

[Gil-Quintana et al. 17] Gil-Quintana J., Camarero-Cano L., Cantillo-Valero C. & Osuna-Acedo S. (2017) sMOOC and Gamification – A Proposed Ubiquitous Learning. In: Wu TT., Gennari R., Huang YM., Xie H., Cao Y. (eds) Emerging Technologies for Education. Lecture Notes in Computer Science, 10108. Springer, Cham.

[Ibáñez 86] Ibáñez, J.: Más allá de la sociología. El grupo de discusión: Técnica y crítica. Madrid: Siglo XXI.

[Lévy 04] Lévy, P.: Inteligencia colectiva. Por una antropología del ciberespacio. Organización Panamericana de la Salud. Retrieved from: http://inteligenciacolectiva.bvsalud.org/public/documents/pdf/es/inteligenciaColectiva.pdf

[Marta-Lazo et al. 16] Marta-Lazo, C., Hergueta-Cobacho, E., Gabelas-Barroso, J.A.: Applying Inter-methodological Concepts for Enhancing Media Literacy Competence. Journal of Universal Computer of Science doi: 10.3217/jucs-022-01-0037 Retrieved from: http://www.jucs.org/jucs_22_1/applying_inter_methodological_concepts/jucs_22_01_0037_0054_lazo.pdf

[Martínez et al. 13] Martínez, G. Contreras, J.M. & Ríos, D.: Las Redes Sociales, una nueva nación libre y sin fronteras. In Orozco: Tvmorfosis. Colección Tendencias. México: Universidad de Guadalajara.

[Mason 90] Mason, R.: Computer Conferencing in Distance Education. En BATES, A. (Ed.): Media and Technology in European Distance Education. London: Routledge Falmer Studies in Distance Education Series.

[Muganda et al. 16] Muganda, C. K, Samzugi, A. S, Mallinson, B. J.: Analytical Insights on the Position, Challenges, and Potential for Promoting OER in ODeL Institutions in Africa. The International Review of Research in Open and Distributed Learning, 17 (4). doi:10.19173/irrodl.v17i4.2465. Retrieved from: http://www.irrodl.org/index.php/irrodl/article/view/2465

[O´Reilly 05] O´Reilly, T.: What is Web 2.0? Desing Patterns and Business Models for the Next Generation of Software. O`Reilly Network. Retrieved from: http://www.oreillynet.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-20.html

[Osuna-Acedo 11] Osuna-Acedo, S.: Interactuantes e interactuados en la Web 2.0, 135-149. In Aparici, R.: Conectados en el ciberespacio. Madrid: UNED.

[Osuna-Acedo 13] Osuna-Acedo, S.: La Web 2.0 y la educación a lo largo de la vida. In Aranda, D.; Creus, A.; Sánchez-Navarro, Jordi: Educación, medios digitales y cultura de la participación. Barcelona: Editorial UOC.

[Osuna-Acedo & Gil-Quintana 17] Osuna-Acedo, S. & Gil-Quintana, J.: El proyecto Europeo ECO. Rompiendo barreras en el acceso al conocimiento. *Educación XX1, 20*(2), 189-213. doi: 10.5944/educXX1.15852. Retrieved from: http://revistas.uned.es/index.php/educacionXX1/article/view/19037

[Pang et al. 17] Pang, YX., Jin, YY., Zhang, Y. & Zhu, T. Collaborative Filtering Recommendation for MOOC Application, (25), 1, 120-128. doi: 0.1002/cae.21785.

[Pisani & Piotet 09] Pisani, F. & Piotet, D.: La alquimia de las multitudes. Cómo la Web está cambiando el mundo. Barcelona: Ediciones Paidós Ibérica, S.A.

[Rheingold 04] Rheingold, H.: Multitudes inteligentes. La próxima revolución social. Barcelona: Gedisa.

[Sánchez 14] Sánchez, A.: Dispositivos y herramientas de las plataformas virtuales, 149-183. In Osuna-Acedo, S.: Escenarios virtuales educomunicativos. Barcelona: Editorial Icaria.

[Silva 05] Silva, M.: Educación interactiva. Enseñanza y aprendizaje presencial y on-line. Barcelona: Gedisa.

[Schotsberger 01] Schotsberger, P.: Classifying Forms of Synchronous Dialogue Resulting from Web-Based Teacher Professional Development. Orlando: SITE Conference.

[Van Dijk 00] Van Dijk, T.A.: El contents como interacción social, en El contents como interacción social. Estudios sobre el contents II: Una introducción multidisciplinaria; 213-262. Barcelona: Gedisa.

[Watson et al. 16] Watson, S.L., Loizzo, J., Watson, W.R.. Instructional design, facilitation, and perceived learning outcomes: an exploratory case study of a human trafficking MOOC for attitudinal change, 64, 1273. doi: 10.1007/s11423-016-9457-2. Retrieved from: https://link.springer.com/article/10.1007%2Fs11423-016-9457-2