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Typology of motivation and learning intentions of users in MOOCs: the MOOCKNOWLEDGE study

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Abstract. Participants in massive open online courses show a wide variety of motivations. This has been studied with the elaboration of classifications of the users according to their behavior throughout the course. In this study, we aimed to classify the participants in the MOOCs according to the initial motivations and intentions, before long interaction with the online device. Using a survey of 1,768 participants in 6 MOOCs, we classify the participants according to: internal motives, external motives and intention of persistence. Three profiles of involvement in the course were identified: poorly motivated (16.7%), self referential (28.8%) and highly committed (54.5%). All three profiles showed significant differences in self-reported learning experiences at the end of the course. The intensity of the initial motivation was positively related to the satisfaction and perceived quality of the training experience. According to our analysis, identifying motivational profiles before starting the course allows to diagnose in advance the educational use and the diversity of individual training itineraries.

Key Words: Open education, massive open online courses, types of participants, initial motivations, self-regulation skills, learning intention, cluster analysis.

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Introduction

Massive Online Open Courses (MOOCs) are online educational resources addressed to a large number of participants, generally for free and with no access restrictions (Cesareni, Micale, Cosmelli, Fiore & Nicolò, 2014; Israel, 2015; Jansen, Schuwer, Teixeira & Aydin, 2015). The content has didactic objectives and a specific curricular design. It is specifically elaborated to be used for a variable period of time and to facilitate flexible learning patterns, at any time and place.

MOOCs are offered by a variety of providers,[2] some implementing them as part of initiatives to promote open education and lifelong learning, and others simply incorporating them into university curricula, as credits. The courses usually develop content through video lessons, discussion forums and small assessment tasks. In some cases, they are designed and implemented to create communities of practice that generate knowledge and gain added value from the interaction between participants (Watson et al., 2016; Zhang, 2016; Zhang et al., 2016).[3] They can also be effectively integrated with face-to-face sessions (Israel, 2015).

The term MOOC was coined by Dave Cormier and Bryan Alexander in 2008, in a pioneering experience developed at the University of Manitoba, Canada (Moe, 2015). This experience was influenced by the movement to promote open educational resources (OER) in the 1990s and the publication of teaching materials as open content, initiated with the launch of the *OpenCourseWare* (OCW) project of the Massachusetts Institute of Technology (MIT) in 1999 (Alario-Hoyos, Estévez-Ayres, Pérez-Sanagustín, Delgado & Fernández-Panadero, 2017; Greene, Oswald & Pomerantz, 2015; Jansen, Schuwer, Teixeira & Aydin, 2015).

The most significant development occurred in 2011, when Stanford University began experimenting with free online teaching, originally in the form of master classes in virtual format directed at a large number of students (Greene, Oswald & Pomerantz, 2015). Specialized platforms such as Coursera, Udacity and edX were then developed, supporting the expansion of MOOCs around the world. In Europe, several platforms such as *FutureLearn*, *Iversity* or *MIriadaX* were developed, along other initiatives that promote cooperation among MOOC providers such as *OpenUpEdu* (Jansen, Schuwer, Teixeira and Aydin, 2015). At the political level, the communication of the European Commission "Opening Up Education: Innovative Teaching and Learning for All through New Technologies and Open Educational Resources" (DG EAC, 2013) supports the implementation of open education in the European continent.

MOOCs were originally proposed as a way to bring good tertiary education closer to a population with limited resources, overcoming economic, geographic or time availability barriers, among others. However, in practice, only a minority of MOOC users have limited access in terms of educational opportunities. The bulk of the participants are people with higher education,

[2] Some of the most well-known platforms emerge at the university level, such as Coursera <http://www.coursera.org/> and Udacity <https://www.udacity.com/> at Stanford University, and edX <http://www.edx.org> at MIT and Harvard University. Subsequently, they have extended their services to other universities.

[3] Literature has distinguished between xMOOC, which gives priority to student-content interaction, and cMOOC, which promotes student-student interaction. The xMOOCs focus on content transmission and often resort to video lessons followed by brief exams. The cMOOCs are based on the active role of the students in the learning process and emphasize the autonomy, creativity, and participation of learners, who deploy their capacity to generate new content.

qualified jobs and from developed countries. They typically enroll in this type of courses to acquire or recycle knowledge and to develop their professional skills, either to improve their work performance or to change their professional career (Castaño-Muñoz, Kreijns, Kalz & Punie, 2017; Greene, Oswald and Pomerantz, 2015; Liu, Kang & McKelroy, 2015; Loizzo, 2015; Schmida, Manturukb, Simpkinsc, Goldwasserc & Whitfiel, 2015).

The contribution of MOOCs for education innovation has also been questioned, given they often reproduce traditional teaching practices, or simply adapt the usual methods to the online format (Alario-Hoyos, Estévez-Ayres, Pérez-Sanagustín, Delgado & Fernández-Panadero, 2017; de Freitas, Morgan & Gibson, 2015; Margaryan, Bianco & Littlejohn, 2015). Accordingly, the need for a thorough evaluation of how MOOCS work in practice and how the different needs of the students are met is needed. In this study, we examine students' experience in a selection of 6 MOOCS, specifically looking at the individual differences in terms of learning intention, motivation and behavior.

Background

The dropout rates of participants in MOOCs range from 90 to 95 percent of the students enrolled, putting into question their educational value (Alario-Hoyos, Estévez-Ayres, Pérez-Sanagustín, Delgado & Fernández-Panadero, 2017; Jordan, 2014; Jordan, 2014; Loizzo, 2015; Perna, Ruby & Boruch, 2014). This has led to study the peculiarities involved in participating in this type of courses. Accordingly, we next review previous research on the role of self-regulation competencies and motivational aspects in educational performance. We also examine individual differences, summarizing the main classifications of user types according to their degree of involvement in training activities.

Self-regulation competences and motivational aspects

MOOCs provide a flexible learning context, in which students decide when, how and from where they access the material, what content they develop and in what activities they participate (Banerjee & Duflo, 2014; Bulger, Bright & Cobo, 2015; Castaño-Muñoz, Kreijns, Kalz & Punie, 2017; Liu, Kang & McKelroy, 2015). Consequently, the individual's ability to regulate his or her own learning process and adjust behavior to context is critical. Self-regulation is based on the student's ability to establish his/her own objectives, deploy effective learning strategies and seek help in case of need (Littlejohn, Hood, Milligan & Mustain, 2016).

Students manage themselves without close supervision by teachers, utilizing their time according to their own interests and in a context of weak commitment, given in most cases they have not paid any registration fees (Radford, Robles, Cataylo, Horn, Thornton & Whitfield, 2014).[4] Adequate performance seems to be connected with the sense of belonging to the users group (Bulger, Bright & Cobo, 2015), along with language management and adaptation to cultural diversity in a heterogeneous group of participants (Literat, 2015; Rambe & Moeti, 2017).[5]

[4] In some cases, it has been observed that the payment of an enrollment in order to obtain a certificate attesting the completion of the course may function as a protective element of abandonment (Alario-Hoyos, Estévez-Ayres, Pérez-Sanagustín, Delgado & Fernández-Panadero, 2017).

[5] The combination with face-to-face study groups seems to promote a sense of community and the exchange of social support, contributes to participant motivation, and reduces dropout rates (Bulger, Bright & Cobo, 2015; Chen & Chen, 2015; de Freitas, Morgan & Gibson, 2015; Liu, Kang & McKelroy, 2015).

Participants in MOOCs are guided by elements of intrinsic motivation, related to learning and accomplishment of the task, or extrinsic, aimed at obtaining a certificate or achieving specific professional purposes. Thus, the objectives of the students range from achieving tangible results at the end of the course such as acquiring expertise in a particular field of competence (with a long-term commitment) to developing personal contacts through active involvement in the discussion forums (Bulger, Bright & Cobo, 2015). The diversity of personal goals is reflected in the indicators of persistence and completion of the course (de Barba, Kennedy & Ainley, 2016). Many students consider MOOCs as a context for open and informal learning. As yet, interest in achieving a pay rise or find a new job can be a decisive factor in the completion of the course (Castaño-Muñoz, Kreijns, Kalz & Punie, 2017).

From the point of view of design, this has resulted in the incorporation of interactive elements or "gamification" (Deterding, Dixon, Khaled & Nacke, 2011), the incorporation of content of a practical nature (Hew, 2016) or payment of symbolic costs of inscription (Alario-Hoyos, Estévez-Ayres, Pérez-Sanagustín, Delgado & Fernández-Panadero, 2017).

Given the enormous diversity of motivations to enroll in a MOOC, the dropout rate cannot be seen as the only parameter of success in the implementation of MOOCs. There are students who make a selective use of the course, only making use of the content which is of interest to them (Cesareni, Micale, Cosmelli, Fiore & Nicolò, 2014; Henderikx, Kreijns & Kalz, 2017; Schmida, Manturukb, Simpkinsc, Goldwasserc & Whitfiel, 2015). Beyond the certificate, some participants explore new ways of learning, experiment with online interaction, seek entertainment, and try to meet a personal challenge or simply enjoy learning (Liu, Kang & McKelroy, 2015). This diversity of behaviors has led to the development of different user typologies.

User profiles in MOOCs

The low completion rates of MOOCs are widespread. However, disengagement and abandonment of this type of courses depend on the profile of the user. Although in an aggregate way there is a process of progressive disengagement, the evolution is different depending on the type of learner. For example, there are users who prefer to focus on video lessons from the beginning, while others undertake course evaluation and follow-up tasks (Kizilcec, Piech & Schneider, 2013). It is likely, that both types of users differ not only in the probability of completing the course, but also in their trajectory of participation throughout the course.

The classification of users in different profiles has usually been made based on the degree of commitment to the activities offered by the course. Learner behavior varies from the selective use of resources to the completion of all tasks. It ranges from passive observation to generation of new content, active participation and interaction with other users. This difference in individual profiles means that some students will be motivated throughout the course, while others are progressively disconnected.

The different typologies, among other profiles, may be distinguished as observers, occasional users, passive consumers and active participants (Table 1). The diversity of profiles identified in the previous research (Cisel, Mano, Bachelet & Silberzahn, 2015; Greene, Oswald & Pomeranz, 2015; Hill, 2013; Kizilcec, Piech & Schneider, 2013; Koller, Ng, Do & Chen, 2013; Milligan, Littlejohn & Margaryan, 2013; Tabaa & Medouri, 2013) may be classified in seven levels, namely: registration in a course with no follow-up; exploration of course materials; evaluation of activities and forms; starting a course actively but disengage later; completion of a course with passive consumption of educational materials; completion of a course through active

participation; and generation of new content for the benefit of the community of users. Each of these levels is described in Table 1.

The completion rates of MOOCS are usually very low, and less than 10 percent of the participants get an accreditation of having completed the course (Daniel, 2012; Kizilcec, Piech, & Schneider, 2013). Many students enroll and do not even start the course. The drop-out rate is also very significant in the early stages of the course. A small group of highly active learners is usually responsible for most of the content and interaction that occurs in the implementation of the course (Cisel et al., 2015). Accordingly, identifying user profiles will enable the detection of the risk of abandonment and is an indirect indicator of motivational aspects.

Moreover, the use of MOOCs is not solely dependent on the motivation of the learners and the way in which they self-regulate throughout the course. The level of participation depends on the student's initial intentions and goals, even before enrollment (Koller et al., 2013). Students can sign up with the objective to obtain a certificate. However, they can also access a MOOC out of curiosity, to explore how the course is structured or to get ideas with which to develop their own content. Individual differences in learning intentions can determine accordingly how they relate to the MOOC. That is, intentions provide a meaningful context for understanding individual differences.

Table 1

Seven levels of user engagement in MOOCs

	Cisel, Mano, Bachelet & Silberzahn (2015)	Kizilcec, Piech & Schneider (2013)	Hill (2013); Tabaa & Medouri (2013)	Milligan, Littlejohn & Margaryan (2013)	Koller, Ng, Do & Chen (2013)	
1. Learners register in the course without accessing later.			*Ghosts*. Students that register to the course but at no time sign in.			
2. Learners who explore the course materials.	*Bystander*. They did not submit homework and watched less than 10 percent of the videos.	*Sampling*. Learners who watched video lectures for only one or two assessment periods.	*Observers*. Students that explore course materials.		*Browsers*. Users with low level of commitment, they register for curiosity and leave at the beginning or in the first weeks.	
3. Learners who do a few activities to check how the course works.	*Auditing*. They did not submit evaluation tasks but watched at least 10 percent of the videos.	*Auditing*. Learners who did assessments infrequently, if at all, and simply watched the video lectures.	*Non-completers* (or drop-in visitors). Students that attempt to use different course resources but do not complete the whole course.			
4. Learners who start the course but leave progressively because of lack of motivation or lack of time.	*Disengaging*. Users who completed at least one course evaluation task.	*Disengaging*. Learners who did assessments at the beginning of the course but eventually decreased in engagement.		*Passive participants.* Students that show frustration and dissatisfaction with the course		
5. Learners who complete the course through the passive consumption of content.	*Completers*. Users who obtain the final certificate, either with a basic or advanced completion of the course activities.	*Completing*. Learners who completed the majority of the assessments offered in the class.	*Passive participants*. Students that use course material but do not participate in course homework and projects.	*Lurkers*. Participants that actively follow the course but do not actively engage with other learners.	*Committed learners*. Users who dedicate a significant number of hours to the course, carrying out activities and relating to other participants.	*Passive participants*. Users who engage through watching lecture videos, and participate little in forums and other tasks.
6. Learners who complete the course through active participation.			*Active participants*. Students that attend lectures, accomplish the homework, interact with other participants and complete evaluation forms.	*Active participants*. Students that maintain active blogs and twitter accounts, regular discussion in the course and interaction with other learners.		*Active participants*. Users complete homework assignments, quiz, exams, and finish the course to obtain the accreditation.
7. Learners who generate and share new content for the benefit of the community of practice.						*Community contributors.* Users who actively participate and generate new content, engage in discussions in forums and provide subtitles in other languages.

The MOOCKNOWLEDGE study: learning intentions and retention in MOOCs

The strategies to improve the retention of participants in a MOOC should be framed in the context of students' intention, so as to make a realistic analysis of the situation (Koller et al., 2013). However, until now the typologies of users have not been based on a previous analysis of the motivation and behavioral intention but on the collection of data of the trainees during their participation in the course. In this study, we aim to develop a classification of MOOCS users based on behavioral intentions and motivations before starting the teaching-learning process. Second, we evaluate the perceived quality of the MOOCS learning experience based on these initial goals.

The MOOCKnowledge project is an initiative of the European Commission's Joint Research Centre (JRC) to build a database on the motivations, intentions and learning experiences of online courses offered by multiple providers.

The project focuses on describing the motivational disposition and intention of the participants in the MOOC, as well as the results in terms of learning experience. It is based on two psychosocial theories: (1) the reasoned-action approach is based on the idea that attitudes towards behavior, perceived norms and perceived behavioral control can determine people's behavioral intention (Fishbein & Ajzen, 2010); and (2) the theory of self-determination distinguishes between intrinsic and extrinsic motivation (Ryan & Deci, 2000). The theoretical model of the MOOCKnowledge study was previously validated with the data of the pilot phase of this project (Kalz, Kreijns, Walhout, Castaño-Muñoz, Espasa & Tovar, 2015).

Research Questions

The purpose of this study was to characterize the different types of learning motives and intentions of participants in a MOOC just after enrollment at the initiation of the course. The research questions were:

1. What are the types of participants in the MOOCs according to the motivation and intentions they declare when initiating them?
2. What are the socio-demographic characteristics of each type of user?
3. How do the different user profiles (of those who finally enroll and participate, at least partially, in a MOOC) differ in the quality of the learning experience?

Method

Courses and participants

In this study, we relied on the survey conducted to participants in 6 different MOOCs. The courses referred to history, information technologies, data analysis, psychology, entrepreneurship and education. The courses were of an Israeli university, a course of an international project with European funding, three courses of a Spanish platform, and a course of a Dutch platform. Between October and December of 2014, a total of 3,629 initial participants in the MOOCs responded to an online questionnaire, during the first week of training. Subsequently, after completing the course, 1,038 completed a survey to assess their learning experience in the MOOC in which they had participated. This second survey took place in the

last week or just a few days after finishing the MOOC. The participation was voluntary and informed consent was obtained from all individual participants included in the study.

For the analysis that follow, we discarded the participants who had not completed the set of 120 items of the motivations and intentions section in the initial questionnaire, which reduced the sample to a total of 1,768 participants, distributed as follows among the six MOOCs: Genocide-H (n = 157), HandsonICT (n = 174), MiriadaXBU (n = 356), MiriadaXea (n = 324), MiriadaXma (n = 727) and Mooc Blend (n = 30). Applying the same criteria, in the second survey we have information of 269 students.

The sub-sample of 1,768 respondents was composed of 805 men (45.6%) and 962 women (54.4%). The average age is 39.89 (12.96). The majority of respondents have completed some type of university studies (80.82%), either first or second cycle. Almost 60 percent is employed (59.89%). More than half of the respondents report a salary below 15,000 euros per year (54.4%).

Instruments and procedure

We used a pre-post design in which the participants were surveyed just at the beginning and just at the end of the course. The pre-MOOC questionnaire has a central module on motivations and intentions, based on the theory of reasoned action (Fishbein & Ajzen, 2010) and the theory of self-determination (Ryan & Deci, 2000). The rest of the modules were designed to gather information about participants' interaction with information technologies, training and professional development, and socio-demographic aspects, among others.

The post-MOOC questionnaire has a central module on learning experiences, in which users evaluated the quality of the training, the usability of the platform and general satisfaction, among other aspects. In addition, information was collected on socio-demographic aspects, as well as their qualitative opinion on the development of the course.

The completion of the pre-MOOC questionnaire lasted approximately 40 minutes, while the post-MOOC questionnaire took about 25 minutes on average. These are instruments that generally show adequate indicators of theoretical consistency, validity and reliability (Kalz et al., 2015). A full description of the design of the study and the rationale of the instruments is available in Kalz et al. (2015).

Items based on the reasoned-action approach and the self-determination theory were evaluated with short and simple sentences, which the respondents scored on a scale from 1 (e. g. extremely unimportant) to 7 (e. g. extremely important). The following are some examples of the items used: "taking a MOOC will increase my opportunities for a promotion" (belief in positive results), "creating a MOOC will reduce my free time with family and friends" (belief in negative results), "my friends and acquaintances have completed one or more MOOCS "(subjective norm),"taking a MOOC is fun" (intrinsic motivation), "I intend to complete one or more MOOCs in the next six months" (intention of conduct, preparation), etcetera. The scales showed a moderate to high consistency in general, with Cronbach's alpha between 0.654 and 0.966 and 84.6% of the subscales above 0.844.

In this study, we first performed an analysis of k-means clusters with the 1,768 respondents with the pre-MOOC questionnaire. The resulting classification is used to compare the learning experience of 269 users in the post-MOOC questionnaire, based on the profiles identified in the first phase. Despite having a wide list of items, the grouping of the respondents based on a few

criterion variables is an efficient strategy, especially if we take into account the high co-linearity and certain tendency to the highest scores of the scale for the whole sample.

Second, to answer our third research question we used a selection of indicators on satisfaction with MOOC, perceived quality, intensity, and usability. In the follow-up questionnaire, the items were also evaluated on a scale of 1 to 7, and high internal consistency indicators were obtained: satisfaction with the MOOC (alpha = 0.897), perceived quality (alpha = 0.844), perceived intensity (alpha = 0.926), perceived usability (alpha = 0.844). Some examples of the 54 items used to evaluate learning experiences were the following: "I am satisfied with the achievement of my learning goals in the MOOC" (satisfaction); "The quality of the video lessons was good" (perceived quality); "The amount of assessment tasks was adequate" (perceived intensity); "It is easy to learn to use the virtual learning environment of this MOOC" (usability).

The behavior was evaluated through 3 items exploring the degree of interaction during the development of the course (e.g. "to what extent has the MOOC facilitated the student-student interaction") (alpha = 0.634) and 8 items based on the educational activities carried out (e.g. "watched all the lecture videos") (alpha = 0.643). Finally, the questionnaire included 7 different questions about obtaining certificates (participation, completion, performance, etc.) that were added through the calculation of the average of the items. The data was analyzed with SPSS Statistics v24.

Results

The respondents generally attribute positive results to the performance of MOOCs (M = 5.35, SD = 1.10), they are more motivated by intrinsic aspects (M = 5.57, SD = 1.16) than extrinsic (M = 3.89, SD = 1.157), they express an intention to carry out online courses (M = 5.94, DT = 1.29), and intend to maintain this behavior in the immediate future (M = 5.76, DT = 1.31).

Below we present the results of the cluster analysis (with data from the first survey, at the start of the course), and the differences observed between profiles (with data from the second survey, upon completion).

User profiles of MOOCs

We carried out a cluster analysis to classify the participants based on the individual differences in motivation and learning intention. For this, we apply the k-means procedure with a maximum of 10 iterations and a convergence criterion of 0.02. As grouping variables we used an indicator that summarizes the 4 items that value internal motivations (e. g. "I make a MOOC to acquire knowledge and skills"), an indicator based on 5 items for external reasons (e. g. "I make a MOOC to get a certificate") and an indicator based on 5 items on the intention of persistence in the MOOC (e.g. "I will do everything possible to participate and complete one or more MOOCs in the next six months "). The items that constitute each indicator are presented in Annex I. Both the correlation table (Annex II) and the exploratory analysis show a greater discriminating power with these three indicators and allowed to effectively address the multicollinearity of the set of items evaluated. In a first exploratory phase, solutions were tested between 2 and 4 categories, with several combinations of the items of the model. The solution of three conglomerates was adjusted to the theoretical expectations of the investigation and showed an adequate distribution of cases by categories (Table 2).

Table 2

Distribution of cases and final centers of the conglomerates.

Variables for classification	Cluster 1 (n = 296)	Cluster 2 (n = 509)	Cluster 3 (n= 963)
Intrinsic motivation (learning, success)	4.32	5.11	6.12
Extrinsic motivation (social pressure, certificate)	3.11	2.24	5
Intention (persistence)	3.45	6.06	6.31

Note. The procedure converged in 7 iterations.

More than half of the participants (54.5%) show a high level of motivation and declare their intention to initiate and complete a MOOC (Cluster 3). It is a group of students who define themselves as very committed before starting the training process. In clear contrast with this profile are respondents (16.7%) who obtained low scores in the three criterion variables (Cluster 1). This group, a priori, is not interested in getting involved in a MOOC. Finally, a third conglomerate corresponds to people with high internal motivation, who intend to complete the full MOOC, but who obtain the lowest scores in external social pressure to participate (Cluster 2). This subgroup, which we have called self-referential, is 28.8 percent. Table 3 summarizes the profile of the three conglomerates.

Table 3

Three profiles of participation commitment before starting a MOOC.

Profile	Description	Characteristics
Low interest (16.7%)	Medium-low levels of motivation and intention of completing the course.	They are less motivated by intrinsic factors and score lower in the intention to initiate and persist in the completion of a MOOC.
Self-referential (28.8%)	Declare intention to persist, more motivated by internal factors than by external factors.	They stand out for attributing less negative consequences to participation in MOOCs. They also feel less influenced by family and friends.
High commitment (54.5%)	High levels of extrinsic motivation, intrinsic motivation and intention of persistence.	They believe that participating in MOOCS has positive results. They are more motivated by extrinsic factors and perceive that in their environment participating in these types of courses is positively valued.

To characterize the members of each profile, we crossed the three conglomerates with the socio-demographic variables. Comparisons of means were also made with the variables of the theory of reasoned action and the theory of self-determination (Table 4). Statistically significant differences were found between the three profiles.

The profile of *highly committed* respondents scored higher than the other two groups in (1) the attribution of positive results to MOOCs, (2) the perception of normative pressure to participate in the courses and (3) the affirmation of extrinsic motivations.

On the other hand, respondents with *little interest* (1) score significantly lower on the intrinsic motivation indicators and (2) they declare themselves less available to start a MOOC and persist in carrying it out.[6]

Finally, the profile of *self-referenced* respondents (1) scores lower than the other two groups in the attribution of negative results to MOOCs, and (2) they feel less pressured by the opinion of family and friends.

Table 4

Differentiation of profiles: comparison of means according to membership conglomerate.

	Total		Cluster 1		Cluster 2		Cluster 3			
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*F*	*p*
Beliefs - positive outcomes	5.35	1.10	4.65	1.08	4.73	1.18	5.89	0.70	339.253	.0001
Beliefs - negative outcomes	2.29	1.11	2.42	1.07	1.97	0.87	2.43	1.19	40.958	.0001
Evaluation positive outcomes	5.35	1.03	4.84	1.00	4.81	1.19	5.79	0.67	234.010	.0001
Evaluation negative outcomes	3.15	1.07	3.07	0.98	2.80	1.14	3.35	1.00	43.547	.0001
Descriptive normative behaviour	3.91	2.15	3.78	2.02	3.44	2.14	4.21	2.14	22.355	.0001
Descriptive normative beliefs	3.97	1.72	3.38	1.47	3.24	1.72	4.54	1.58	130.806	.0001
Descriptive normative control	2.15	1.56	2.06	1.35	1.55	0.99	2.50	1.75	90.265	.0001
Intrinsic motivation	5.57	1.16	4.44	1.25	5.50	1.07	5.95	0.93	191.999	.0001
Integrated motivation	5.53	1.25	4.32	1.31	5.11	1.22	6.12	0.81	349.193	.0001
Identified motivation	5.82	1.13	4.64	1.30	5.51	1.12	6.34	0.66	322.599	.0001
Introjected motivation	3.46	1.42	2.87	1.19	2.87	1.04	3.95	1.47	157.385	.0001
Extrinsic motivation	3.89	1.57	3.11	1.23	2.24	0.86	5.00	0.90	1718.261	.0001
Absence of motivation	1.84	1.17	2.39	1.18	1.69	0.91	1.75	1.24	41.880	.0001
Intention (readiness)	5.94	1.29	4.00	1.48	6.22	0.83	6.38	0.78	353.782	.0001
Intention (persistence)	5.76	1.31	3.45	1.14	6.06	0.74	6.31	0.70	837.580	.0001

Note. We emphasize (shaded) the three criterion variables of the analysis of conglomerates: intrinsic motivation, extrinsic motivation and intention of persistence. After verifying the lack of homogeneity of variances, the Welch ANOVA test was applied to contrast the differences of means. The post-hoc comparisons were made with the Scheffé test.

The three profiles differ systematically in all the items that evaluate (a) the digital competences, (b) the learning experiences and (c) the satisfaction of the training needs in the MOOCs studied in the past; as well as in (d) perceived self-efficacy in relation to those in which they may participate in the future. Specifically, from cluster 1 to cluster 3 respondents declare themselves gradually more competent, more satisfied and more confident in their own capacities.[7] This seems to confirm that these are three clearly differentiated preparation profiles for MOOCs.

[6] It is the only profile with more men than women, against the gender distribution of the sample. Specifically, more than half are men, while for the whole sample it does not reach 46 percent. However, for the group of interviewees, no statistically significant differences were observed with respect to gender (Chi-square = 4.892, p = 0.087).

[7] This observation corresponds to 10 different comparisons of means, in all cases with a significance level of ANOVA of $p < 0.0001$, and post hoc comparisons with the Scheffé test of $p < 0.05$. As regards the 30

In the next section, we examine if this is reflected in the learning experiences that students have later.

Comparison of learning experiences in the three profiles

In the last week or just a few days after finishing the MOOC, 268 of the 1,768 students in the initial sub-sample (that is, 15.21 percent of the total) completed a questionnaire to evaluate their learning experience. The participation in this second survey was significantly different depending on the initial profile (13.319, $p < 0.001$) (Table 5). The lower the initial commitment of the respondents, the less likely they participated in the second survey. Although we do not have a retention indicator in the MOOC, it is possible that the completion of this second questionnaire indirectly reports a differential probability of abandonment in the three motivational profiles.

Table 5

Participation in the follow-up survey and learning experiences according to the belonging conglomerate.

Profile	Participation in the follow-up		Learning experiences
	T1	T2 (%)	
Low interest	296	29 (9.79)	They have scores below the average in satisfaction, quality and intensity of the learning experience.
Self-referential	509	68 (13.35)	
High commitment	963	172 (17.86)	They show significantly higher scores in satisfaction with the MOOC, as well as in the perceived quality and intensity of the training.

Consistent differences are observed in the learning experiences between the three conglomerates, with the application of the Kruskal-Wallis test (Table 6). Once again, from cluster 1 to cluster 3, respondents declare themselves gradually more satisfied with the MOOC, and score higher on perceived quality and intensity indicators. The only aspect in which no significant differences were observed refers to the usability of the MOOC.

Concerning the behavior and use of MOOC educational resources, the only significant difference was observed in the degree of social interaction developed. Specifically, the highly engaged participants reported greater student-student, student-teacher and student-content interaction than the less interested participants (KW = -34.407, $p = 0.014$). No significant differences were observed regarding watching videos, performing tasks, participating in the evaluation. There

subsequent post-hoc comparisons, only one is not significant: the one corresponding to the item "digital competences previously acquired in MOOCS", with respect to conglomerates 2 and 3.

Regarding the two profiles with higher motivation (clusters 2 and 3), the only significant difference seems to be that *committed* users are younger than *self-referential* ones ($F_{2,1762} = 23.652$, $p < 0.01$) and it is more likely to earn a salary below 12,000 euros per year.

were also no differences in obtaining certificates for participating or completing the MOOC or for achieving a certain level of performance (Table 6).[8]

Table 6

Comparison of learning experiences and behavior according to conglomerate.

	Total		Cluster 1		Cluster 2		Cluster 3		
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*K-W*
Learning experiences									
Satisfaction with MOOC	5.46	.74	5.06	.74	5.39	.69	5.56	.74	2*
Perceived quality	5.68	.91	5.30	.90	5.54	.92	5.80	.89	13*
Perceived intensity	5.51	1.17	5.06	1.09	5.13	1.21	5.73	1.12	0*
Perceived usability	5.68	.64	5.54	.60	5.60	.66	5.74	.64	72
Use of the MOOC									
Social interaction	4.45	1.36	3.84	1.37	4.45	1.18	4.56	1.41	48*
Activities developed	5.02	1.10	4.78	1.03	4.89	0.94	5.12	1.18	154
Certification	1.04	0.97	0.93	0.92	1.07	0.97	1.05	0.98	777

** p < .05*

Discussion

The classifications of MOOCS participants have usually been based on the behavior of the students during the course development (Cisel et al., 2015; Greene et al., 2015; Hill, 2013; Kahan, Soffer & Nachmias, 2017; Kizilcec et al., 2013; Koller et al., 2013; Milligan et al., 2013; Tabaa & Medouri, 2013). In this study, we have shown that the evaluation of motivation and intention declared at the beginning of the MOOC can also serve to identify different profiles in terms of competencies, self-efficacy and satisfaction with learning experiences.

With the data of six courses of the *MOOCKnowledge* project of the European Commission, we identified three types of motivational profiles in the users, which seem to correspond to three levels of educational involvement, from low to high: low interest, self-referential and highly committed. Although the factors of extrinsic motivation served empirically to differentiate one of the groups, the three conglomerates systematically discriminated three levels in all the

[8] In the case of accreditation, no significant differences are observed if we analyze each indicator of obtaining certificates separately, either relative to the participation in the course (Chi-square = 1.621, p = .445) or the completion of the course (Chi-square = 1.621, p = .445).

outcome variables used. This is consistent with our interpretation of user typologies in terms of the degree of involvement in educational opportunities offered by MOOCs (see Table 1).

In this sense, the evaluation of motivational profiles before students register in a MOOC is useful to diagnose in advance the benefits and potential barriers that each can find. It can also serve to design or provide personalized training itineraries, putting in place strategies with which to prevent dropouts. Our data seem to indicate that the motivation declared at the beginning of the course is a significant predictor of differential dropout rates and, despite the bias that this introduces, it still allows to differentiate unequal learning experiences in the three types of participants. This is consistent with other studies on the perceived quality of this type of courses (Yang, Shao, Liu & Liu, 2017), as well as the influence of intrinsic interests on student's persistence (Higashi, Schunn & Flot, 2017).

Students with diverse expectations when they start also display different behavior throughout the course, from those who simply browse the available videos to those who are actively involved in the performance of all evaluation activities (Koller et al., 2013). Accordingly, the evaluation of the performance should take into account the needs that led the students to enroll in the course. That is, the degree of achievement of students who only navigate or those who are committed to obtain a good performance is related to the initial individual expectations. Given the high dropout rates and the varied degree of involvement of the participants, the level of educational impact and the pedagogical innovation, originally attributed to MOOCs, is yet to be qualified. While these types of courses have been proposed as tools to promote open education and eliminating access barriers, in practice individual motivational profiles seem to establish significant differences in the opportunities for enrollment, development, completion and benefits obtained from training.

It is interesting to note that the most positive assessment of the MOOC and of the learning experiences is made by those participants who, in addition to a high intrinsic motivation, have some kind of external pressure to complete the course. This subgroup corresponds to a profile of younger users, with lower average income. Accordingly, it seems that *having a need* to do the MOOC, whether for work or as part of career development, becomes an effective incentive for involvement in educational activities.

Limitations and future research

The participants in this study make up a self-selected group, since they are people who have already started a MOOC (in the initial questionnaire) and / or who have completed a significant part of it (in the final questionnaire). This can bias the sample towards users with comparatively higher levels of motivation, leaving out those who signed up but did not even start the course; those who, having started it, did not complete the set of activities; and those who were not sufficiently interested in filling out a second questionnaire about their learning experience. In fact, all the average scores in the learning experiences were located above the intermediate point of the scale. It is also necessary to consider that the response rate to the second questionnaire was different in the three profiles, possibly generating an equalization effect in the scores between categories. In future investigations it would be of interest to evaluate the motivational aspects and the intention of behavior before the beginning of the MOOC. It would also be useful to collect data on retention and abandonment in a systematic way, for the set of initial participants.

Conclusion

The motivations and intentions declared at the beginning of the course are an effective predictor of the degree of involvement and satisfaction that students display throughout a MOOC. Therefore, the evaluation of the initial motivational profile is a useful tool to develop personalized training itineraries. Strategies to increase interaction and participation can be designed individually. The evaluation of the motivation before starting the course can be used to select the participants according to the degree of potential academic achievement. It is also useful to differentiate those participants who will most likely self-regulate effectively throughout the course, from those who need external support or who would benefit from specific incentives to their context of need. Finally, having this information also serves to assess dropout rates more realistically.

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Annex I

List of items to construct the three indicators used as criterion variables in the cluster analysis.

Internal motivations (4 items)
I make a MOOC because it is my preferred way to acquire knowledge and skills
I make a MOOC because it suits my tendency to try new things out
I make a MOOC because it suits my ambition to go with the times
I make a MOOC because it aligns with how I want to learn
Extrinsic motivations (5 items)
I make a MOOC because it is expected of me
I make a MOOC because otherwise I will get a lot of troubles
I make a MOOC because it will give me a certificate
I make a MOOC because I can complete my study program
I make a MOOC because it allows me to get good marks
Intention of persistence (5 items)
I will make every effort to take and complete one or more MOOCs in the next six months
I will try to take and complete one or more MOOCs in the next six months
I will be persistent to take and complete one or more MOOCs in the next six months
I do the best I can to take and complete one or more MOOCs in the next six months
I will go to the extreme to take and complete one or more MOOCs in the next six months

Note. Each indicator is the average of the items that comprise it.

Annex II

Table of correlations of the variables of the theory of reasoned action and the theory of self-determination.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Beliefs - positive outcomes	-														
2. Beliefs - negative outcomes	.179**	-													
3. Evaluation positive outcomes	.769**	.181**	-												
4. Evaluation negative outcomes	.370**	.448**	.398**	-											
5. Descriptive normative behaviour	.273**	.127**	.268**	.199**	-										
6. Descriptive normative beliefs	.565**	.165**	.522**	.318**	.276**	-									
7. Descriptive normative control	.217**	.303**	.199**	.225**	.169**	.339**	-								
8. Intrinsic motivation	.394**	-.066**	.288**	.060*	.044	.176**	.065**	-							
9. Integrated motivation	.590**	.057*	.503**	.231**	.176**	.324**	.145**	.526**	-						
10. Identified motivation	.651**	.027	.574**	.225**	.185**	.373**	.131**	.574**	.703**	-					
11. Introjected motivation	.373**	.350**	.324**	.256**	.146**	.291**	.401**	.262**	.341**	.369**	-				
12. Extrinsic motivation	.624**	.263**	.582**	.300**	.236**	.453**	.366**	.257**	.451**	.485**	.543**	-			
13. Absence of motivation	-.068**	.362**	-.028	.189**	.082**	.006	.226**	-.223**	-.131**	-.194**	.198**	.080**	-		
14. Intention (readiness)	.315**	-.116**	.261**	.011	.044	.192**	-.021	.488**	.433**	.519**	.151**	.245**	-.234**	-	
15. Intention (persistence)	.337**	-.036	.282**	.052*	.021	.214**	.055*	.516**	.434**	.538**	.252**	.303**	-.221**	.824**	-

*P<.05, **p<.01