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Determinants of Loyalty and Completion in MOOCs for Teacher Professional Development: An Integrated Model of Technology Acceptance

José L. Arquero[1], Carmen Fernández-Polvillo[1], Esteban Romero-Frías[2], Salvador del Barrio García[2]

[1]Universidad de Sevilla, [2]Universidad de Granada

Abstract

Teacher professional development is a key factor in improving the quality of education systems. E-learning and especially massive online courses are gaining importance as a support for this training, as they overcome many of the barriers to access to training and encourage cooperative learning. Although the aspects that influence the success of MOOCs have been widely studied, the specific characteristics of teachers as learners make the transferability of these results difficult. Consequently, this paper studies which variables explain the loyalty and the degree of completion of a MOOC aimed at non-university teachers. The proposed model integrates variables widely used in the acceptance literature, including flow state and personal variables, such as anxiety and self-efficacy. Our results indicate that, for teachers, the key variable of the whole system is perceived usefulness and satisfaction with learning, with ease of use having a lower relevance. Contrary to what has been described in the literature, there are no notable differences related to gender. Our model adequately predicts loyalty formation, but the difficulty of explaining effective use remains.

Key words

Teacher professional development; acceptance model; MOOC; anxiety.

Contacto:

José L. Arquero, arquero@us.es, FCEYE, Ramón y Cajal nº 1, 41018, Sevilla.

Factores determinantes de la lealtad y la finalización en MOOCs para el desarrollo profesional del profesorado: un modelo integrado de aceptación tecnológica

Resumen

El desarrollo profesional del profesorado es un factor clave para mejorar la calidad de los sistemas educativos. El e-learning y especialmente los cursos masivos online están adquiriendo un gran peso como soporte para esta formación, ya que permiten superar muchas de las barreras de acceso a la formación y fomentar el aprendizaje cooperativo. Aunque los aspectos que influyen en el éxito de los MOOC están ampliamente estudiados, las características específicas del profesorado como aprendiz dificultan la transferibilidad de esos resultados. Consecuentemente, este trabajo estudia qué variables explican la lealtad y el grado de terminación de un MOOC dirigido a profesorado no universitario. El modelo planteado integra variables relacionadas con la aceptación de la tecnología, incluyendo el estado de flujo, y variables personales como la ansiedad y la autoeficacia. Nuestros resultados indican que, para el profesorado, la variable clave de todo el sistema es la utilidad percibida y la satisfacción con el aprendizaje, teniendo la facilidad de uso una relevancia menor. Al contrario que lo descrito en la literatura, no hay diferencias resaltables relativas al sexo. Nuestro modelo predice adecuadamente la formación de la lealtad, pero persiste la dificultad de explicar el uso efectivo.

Palabras clave

desarrollo profesional del profesorado; modelo de aceptación; MOOC; ansiedad.

Introducción

Teachers are the cornerstone of any educational system (Misra, 2018), and teacher quality is the factor that determines the maximum of excellence that any education system can reach (OECD, 2010). As the TALIS report (OECD, 2019) points out, teachers have a significant influence on student performance. In this regard, Hattie's (2015) meta-analysis of studies on factors affecting learning and performance concludes that the factors with the greatest impact are directly related to teachers. Therefore, education systems face a multiple challenge: not only to attract the best possible candidates, but also to ensure that these professionals receive quality initial and in-service training, supporting teachers in their professional development (Ministerio de Educación y Formación Profesional, 2019).

Misra (2018) highlights the international consensus among education policy researchers, developers, and analysts on the positive impact that improving the skills and commitment of educators has on the education system as a whole. Furthermore, he underscores the enormous importance of professional development in improving the quality of education.

The concept of teacher professional development (hereafter referred to as TPD) is quite broad. Brugha et al. (2024) define it as a long-term process that takes place throughout an educator's professional life. TPD can cover formal apprenticeships, in-service training, and even informal collaborations with colleagues, all with the aim of continuously improving practice. Following Luneta (2012), TPD programmes and courses typically review, assess and extend educators' content and pedagogical knowledge, skills, attitudes, and pedagogical approaches.

Sancar et al. (2021) integrate in their definition of teacher professional development (TPD) both initial and in-service training activities aimed at optimising teaching practice and teaching outcomes. However, it is in-service training that allows teachers to adapt to a constantly changing professional reality (Evers et al., 2016) and to face new challenges, from responding to changing student characteristics to incorporating innovative methodologies (Bauer and Prenzel, 2012). The OECD (2009) highlights that 'no matter how good previous training is, it cannot be expected to prepare them for all the challenges they will face throughout their careers' (p.49), so it is up to education systems to provide continuous training to maintain teaching quality standards and retain human capital. Consequently, TPD activities are considered by international institutions (e.g., OECD or UNESCO) as a feasible way to meet teacher education needs (Ma et al., 2023).

Castaño-Muñoz et al. (2018) indicate that TPD activities can take many forms, including formal courses, workshops, peer-to-peer learning within or between schools, informal events, etc. However, Hertz et al. (2022), analysing various OECD reports, point out that the most frequent formats for CPD activities are face-to-face courses, conferences or seminars (OECD, 2019), and that many teachers find it difficult to carry them out due to conflicts with work schedules. This difficulty seems to be particularly prevalent in some European countries, with 75 % of Portuguese teachers and 60 % of Italian and Spanish teachers reporting this limitation (OECD, 2014). Huang (2018) adds time constraints, space constraints, budget constraints, support resources, and difficulties in personalising learning as factors hindering access to or effectiveness of these training actions.

In response to the limitations, online TPD activities have become ubiquitous around the world, as they solve many of the problems, especially scheduling (Brugha et al., 2024). Among the possible online formats to enhance professional development and lifelong learning, Massive Online Courses -MOOC- stand out (Castaño-Muñoz et al., 2017; Herranen et al., 2021); which have become a viable and efficient way to support professional teaching actions for teachers by enabling cooperative learning through the exchange of ideas, co-construction of professional knowledge and co-regulation of learning through the use of the wide range of collaborative tools -discussion forums, blogs, social networks, shared documents, *peer review*, etc.- that are usually integrated in the courses (Elizondo-García & Gallardo, 2020; Ma et al., 2023).

However, despite the great potential of these courses, and their increasing use, there is no extensive body of research on the characteristics of participating teachers (Castaño-Muñoz et al., 2018). It should be noted that the characteristics of teachers participating in a MOOC are substantially different from those of participants in other courses (Ma et al., 2023). Participating teachers tend to have expertise in the topics covered, show a particular interest in collaborating and communicating with other participants, and, above all, have high expectations to put what they have learnt into practice. This suggests that the factors influencing teachers' choice of this format and persistence-dropout are structured differently from the average participant in other MOOCs.

This paper focusses on studying which factors are related to the choice (loyalty) and degree of completion of a MOOC designed and aimed at nonuniversity teachers. To this end, we have chosen a set of variables that the literature considers to be explanatory of the acceptance and use of educational resources with a technological base, proposing a developed model of acceptance that integrates these key variables. The structure of the remainder of the paper is as follows. After the introduction, the second section is devoted to a review of the literature and the formulation of hypotheses, culminating in the proposal of the theoretical model. The third section deals with the methodology, explaining the context, the sample, the development and administration of the instrument, followed by the results, conclusions, and references.

Literature review and hypotheses development

MOOC and TPD

According to Romero-Frías et al. (2023) and Joo et al. (2018), MOOCs emerge as an educational experiment led by George Siemens and Stephen Downes (Siemens, 2005) to implement their ideas on connectivism. These ideas were discussed at length at the CCK08 seminar 'Connectivism and Connective Knowledge', which is attended by 2200 people online for free. MOOCs are going through a period of explosive expansion in their use, which has led to them being described as anything from disruptive innovation (the New York Times calls 2012 the year of the MOOC) to a fad. However, it is safe to say that they are currently at a stage of maturity that allows them to be presented as an open and collaborative alternative of particular relevance.

Huang (2018) notes that while there are many conventional online courses and learning platforms that share certain characteristics with MOOCs, such as flexibility of time and place and adaptive pedagogy, MOOCs are distinguished by other key aspects. In particular, they are free and available to all, have an enormous breadth of choice in terms of variety of resources, can cater to a very large number of learners, allow for personalisation of learning, and take advantage of cooperative learning. With these characteristics, it can be stated, following Castaño-Muñoz et al. (2018) that MOOCs have become an excellent option for the professional development of teachers, allowing them to overcome many of the barriers of other training models, leading to an increase in their use in different parts of the world (Misra, 2018), especially in those countries that have a shortage of means and methods to provide other TPD opportunities to a large number of teachers.

The results of work by Laurillard (2016), Koukis and Jimoyiannis (2019), Chen et al. (2020), among others, show that teachers themselves consider MOOCs to be an effective alternative for TPD. These results are not surprising, as teachers are regular users of these courses, regardless of their subject matter and target audience (Herz et al., 2022). Thus, the results of Ho et al. (2015) on a large panel of MOOCs offered by MIT and Harvard indicated that almost 40% of users were or had been, teachers.

However, despite the specificities of teachers as MOOC participants, the problem of low completion rates is still present and is a general limitation widely supported by the MOOC literature (Arquero et al., 2022; Ma et al., 2023). Castaño-Muñoz et al. (2018) report an average completion rate of less than 6% for the MOOCs analysed, so their call for more empirical and analytical research to identify the potential success and challenges of using MOOCs for teacher education is fully justified.

MOOC acceptance models and key variables

Arquero et al. (2022) indicate that the characteristics of MOOCs -open enrolment and participation, variety of motivations and expectations, non-formal interaction between participant and instructor- make the success of a MOOC depend on how users react to it and to what extent they accept it. The technological component of online learning, and specifically of MOOCs, justifies the relevance of acceptance models to explain user behaviour (Romero-Frías et al., 2023). This acceptance has been extensively studied using various models, with the TAM (Technology Acceptance Model) proposed by Davis et al. (1989) being one of the most widely used due to its predictive validity (Sánchez-Franco, 2010). This success has led different authors to propose evolutions incorporating different variables, such as UTAUT (Venkatesh et al., 2003), WAM (Castañeda et al., 2007), PLE2.0AM (del Barrio-García et al., 2015), or GETAMEL (Abdullah & Ward, 2016), among others.

The aim of these models, applied to learning resources, is to measure the impact of certain variables on the formation of loyalty - intention to use and, ultimately, to explain the effective use of the resource or the degree to which the course is completed. Loyalty, defined as a user's commitment to an educational resource, such that they are willing to use it again and recommend others to use it, is an essential concept in MOOCs (Arquero et al., 2022).

The main explanatory variables of TAM-based models are (Davis et al., 1989): Perceived Usefulness (PU), which is defined as the degree to which an individual believes that the use of a particular system will improve his or her performance in an activity; and Perceived Ease of Use (PEU), defined as the extent to which the user of a technology believes that its use is effortless. These two variables make it possible to develop a favourable attitude towards the use of the resource which, in the case of educational resources, generates satisfaction with the learning experience. The hypotheses that are derived, and which are basic to these models, are as follows:

> Perceived Ease of use affects perceived usefulness (H1: PEU→PU), satisfaction (H2: PEU→SAT) and loyalty (H3: PEU→LOY).
>
> Perceived usefulness affects satisfaction (H4: PU→SAT) and loyalty (H5: PEU→LOY).

Satisfaction (SAT), conceptualised as a participant's overall positive evaluation of their learning experience, has been shown to have a positive impact on loyalty formation (Arquero et al., 2022; Roca et al., 2006), especially in participants with high intrinsic motivation (Romero-Frías et al., 2023), such as teachers. The hypothesis derived is as follows:

> H6: Satisfaction affects loyalty (SAT→LOY).

Following Arquero et al. (2022), in the context of a MOOC, flow state is defined as the degree to which the participant is involved in following the course, reaching a state of concentration and enjoyment that isolates him/her from any distractions. Operationally, these authors define it through two factors: enjoyment (DISF) and perceived control (PCtrl). Their results, like those of Mulik et al. (2020) indicate a positive relationship between flow, satisfaction and loyalty in the case of MOOCs. According to Arquero et al. (2022), the hypotheses derived from the incorporation of flow state in an acceptance model are:

> Flow variables impact satisfaction (H7: PCtrl→SAT; H9: DISF→SAT) and control affects enjoyment (H8: PCtrl→DISF).

The existence of technical support (TS) that can solve possible problems or doubts that arise in the use of a particular technological resource has a positive effect on key variables of the acceptance of technologies in education, such as usefulness and ease of use (Arteaga Sánchez & Duarte Hueros, 2010; Ngai et al., 2007). Thus, the following hypotheses are proposed:

> The perception of adequate technical support affects perceived usefulness (H11: TS→PU) and ease of use (H12: TS→PEU).

Among the so-called personal factors, i.e. those related to the participant, we consider anxiety and self-efficacy to be relevant.

Anxiety (ANX) toward the use of a technological resource is one of the 10 most common external factors that appear in the literature review by Abdullah and Ward (2016). Anxiety elicits a negative emotional response to the use of a resource or technology that results in a reduced likelihood of use, rejection, or avoidance (Venkatesh et al., 2003; Park et al., 2012), usually impacting perceived ease of use. Considering that anxiety towards the use of technological resources is not a trait (Chua et al., 1999), it is expected that facilitating resources would decrease this anxiety. Thus, the following hypotheses are proposed:

H10: Perception of better support impacts on anxiety (TS→ANX,) and H13: Anxiety impacts on ease of use (ANX→PEU).

Ma et al. (2023) highlight the relevance of self-efficacy (S_Eff), an individual's assessment of his or her own ability to perform a task or complete an assignment, in these contexts, due to the great autonomy that MOOC participants have. Thus, it is a variable that has been widely studied to explain satisfaction (Rabin et al., 2020), persistence (Handoko et al., 2019), or course completion (Lee et al., 2023), being the most powerful predictor of the PEU variable (Abdullah & Ward, 2016). In this sense, self-efficacy is posited to have an impact on ease of use (H14: S_eff→PEU).

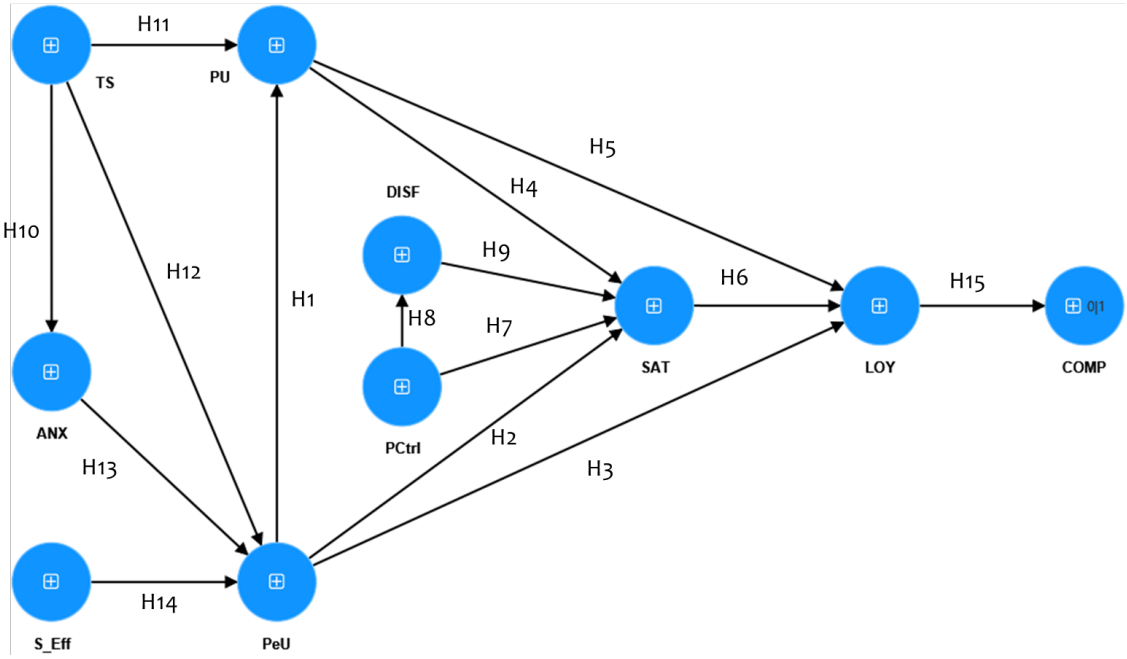
The last hypothesis posits, in line with acceptance models (Yousafzai et al., 2007) that loyalty (intention to use a MOOC again to obtain training and willingness to recommend other teachers to use that resource) affects behaviour, or effective use, in this case defined as the degree of course completion (H15: LOY→COMP).

Additionally, Goswami and Dutta's (2015) meta-analysis found that in the context of IT and e-learning use, gender is associated with differences in acceptance, with males being more likely to use these resources. Lakhal and Khechine (2021) confirm a moderating effect of gender on the relationship patterns of explanatory variables for persistence in online courses. In the same vein, Yuen and Ma (2002) found significant differences due to gender in the acceptance of technology use, specifically for teachers. We therefore consider it appropriate to use gender as a control variable, which is operationalised by adding the variable as antecedents of loyalty and completion.

Theoretical model proposed

The hypotheses posed above define the theoretical model depicted in Figure 1.

Figure 1.
Hypotheses and proposed model



Methodology

Context and sample

The sample is composed of participants in a MOOC on instructional methodologies of the National Institute of Educational Technologies and Teacher Training (INTEF), a unit of the Ministry of Education and Vocational Training responsible for the integration of digital technologies and teacher training in non-university educational stages. The course, organised in 7 units of weekly duration, is explicitly defined as an opportunity for teacher professional development through participation in a massive on-line learning network and the design of a learning project in a collaborative environment, allowing one to obtain digital badges depending on the degree of completion of the programme. Apart from the platform hosting the course, various tools (blogs, Procomún...) and social networks (Facebook, X, Pinterest...) are also used to foster the active and collaborative nature of the course.

The sample is composed of the 135 participants who responded to the survey, after the course ended, and who had completed at least one module. 69.9% of the sample are women. The average age of the participants ranged from 25 to 60 years, with a median of 47 and a mean of 46 years (with no differences in age by sex). The vast majority of participants indicated prior experience as an active user of one of the social networks used in the course (91%) or having a blog (83%). Previous experience with MOOC courses is lower, with 56% having previously taken one. Regarding the degree of follow-up or completion, 72% of the respondents completed the entire course, 10% completed between 4 and 6 units, and 18% completed three or less.

Measures

The questionnaire is based on instruments that have already been validated in the literature to measure the variables under study, preferably adaptations used in contexts similar to those of the study (see the Appendix). Thus, for the scales of perceived usefulness (PU, 3 items), ease of use (PEU, 4 items), satisfaction with the experience (SAT, 2 items) and loyalty (LOY, 4 items) we use the adaptations to the acceptance of a MOOC proposed in Romero-Frías et al. (2023). The variables defining flow state, enjoyment (3 items), and perceived control (4 items) come from the adaptation by Arquero et al. (2022).

The anxiety scale (ANX, 3 items) is adapted from Barbeite and Weiss (2004) and the technological support scale (4 items) from Arteaga Sánchez and Duarte Hueros (2010). The self-efficacy scale (3 items) was developed specifically for this study following the recommendations of Bandura (2006). All items were answered on a 5-point scale. The degree of completion is defined with three levels: three or fewer units, between 3 and 6 units completed and all units finished.

The questionnaire was administered using a Google form, sent by email after the end of the course, with a general reminder message a week later. These messages, to protect confidentiality, were managed by the course organisers. The need to send the message after the end of the MOOC and only use responses from participants who have completed a module is because the acceptance variables measure perceptions of a resource that has already been used.

The message began with a brief introduction of the purpose of the study, without suggesting relationships between variables, indicating that the responses were confidential and would be treated at an aggregate level for research purposes only. It also stressed the importance of obtaining complete and honest responses.

Data treatment and statistical analyses

To test the hypotheses proposed in the theoretical model, we opted for partial least squares (PLS) structural equation models calculated with SmartPLS 4.1 software (Ringle et al., 2022). Following Del Barrio and Luque (2012), PLS is the most appropriate analytical method when dealing with this type of study: predictive purposes and relatively small samples with complex models. The *bootstrapping* technique included in SmartPLS was used to estimate the significance of the relationships (*paths*). For all other calculations and tests, SPSS is used.

Results

Table 1 presents the data that allow us to confirm the validity of the model and its reliability. Following the criteria of Fornell and Larcker (1981) we can confirm the discriminant validity, verifying that the root of the mean variance extracted from each construct (diagonal of the table, in italics) is greater than the correlations with the other constructs. The composite reliability values (rho_C) and average variance extracted (AVE) exceed the cut-off values of 0.7 (Hair et al., 2019) and 0.5 (Becker et al., 2018), respectively, suggesting adequate reliability and convergent validity. Furthermore, although the table of results is not shown, the HTMT (Heterotrait-Monotrait) ratio matrix is calculated, showing values below 0.85; which provide further evidence of discriminant validity (Henseler et al., 2015).

The descriptive data indicate a high acceptance of the format by participants, with an average loyalty of 4.7 indicating that participants would recommend this type of course to other teachers and would repeat with a similar format. Regarding the key variables of the acceptance models, participants find the course very useful (PU: 4.8) and the format and associated tools easy to use (PEU: 4.2), resulting in a satisfactory experience (SAT: 4.6). Participants perceive that there is adequate support from tutors and other technical staff to help them use of the different tools (TS: 4.6) and regarding the variables that define the flow state, they report high enjoyment of the experience (DISF: 4.5) and a high perceived control (PCtrl: 4.2).

Regarding the personal variables, the participants have a high confidence in their ability to use the course tools appropriately (S_Eff: 4.3) and present a relatively low level of anxiety (ANX: 2.3).

Table 1.
Correlations btween variables, square of AVE, composite reliability and AVE.

	ANX	*DISF*	*LOY*	*PCtrl*	*PU*	*PeU*	*SAT*	*S_Eff*	*TS*
ANX	*0,78*								
DISF	-0,04	*0,87*							
LOY	-0,23	0,51	*0,90*						
PCtrl	-0,31	0,49	0,54	*0,86*					
PU	-0,12	0,55	0,74	0,45	*0,88*				
PeU	-0,35	0,48	0,53	0,74	0,55	*0,91*			
SAT	-0,11	0,55	0,62	0,47	0,60	0,44	*0,93*		
S_Eff	-0,15	0,39	0,34	0,41	0,46	0,51	0,32	*0,76*	
TS	-0,09	0,35	0,31	0,43	0,40	0,46	0,51	0,50	*0,89*
CR	0,82	0,90	0,94	0,92	0,91	0,95	0,93	0,81	0,94
AVE	0,61	0,75	0,80	0,73	0,78	0,82	0,87	0,58	0,80

Given that we proposed to control for the sex variable, we judged it appropriate to test for differences in means (Welch's robust test of equality of means) of the variables incorporated into the model. Only perceived usefulness is significantly different by sex, with women perceiving a slightly higher perceived usefulness (PU: 4.8 vs. 4.6, sig. 0.002).

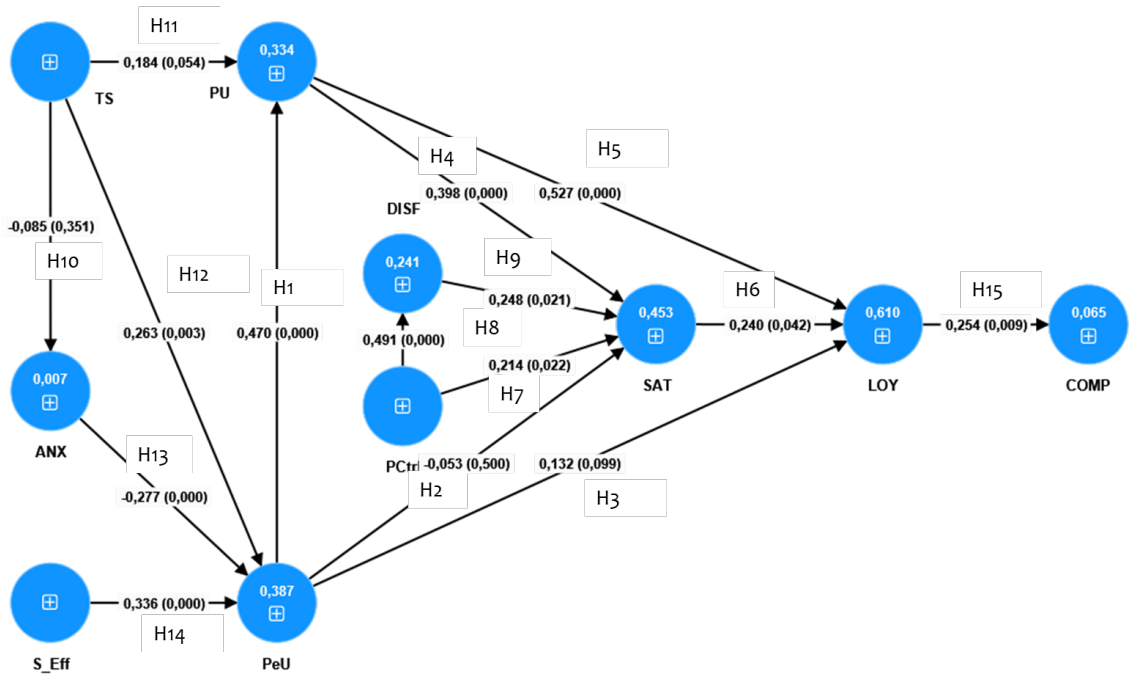
Regarding the hypotheses posed, the graphical results are shown in Figure 2. Each line, or effect, shows which hypothesis it corresponds to, the standardised value of the effect and the significance. Since the hypotheses were not posed with a given direction (leaving open the existence of a positive or negative influence), the tests show the bilateral significance. The coefficient of determination R^2 is shown in the circle representing each variable, provided it has an antecedent.

The sex variable, which was introduced as a control variable, loading directly on the variables to be explained (LOY and COMP) turned out not to have a statistically significant impact on any of them.

Of the hypotheses corresponding to the core of the acceptance model, extended with the flow variables, all are fulfilled with two exceptions, related to ease of use. Thus, H1 is confirmed, finding a positive PeU→PU relationship. ($\beta_{PEU \rightarrow PU}$: .47; p < .001). The positive effect of usefulness on the formation of satisfaction with the learning experience (H4, $\beta_{PU \rightarrow SAT}$: .398; p < .001) and loyalty (H5, $\beta_{PU \rightarrow LOY}$: .527; p < .001) is also confirmed. Flow variables also have a positive effect on satisfaction (control, H7, $\beta_{PCtrl \rightarrow SAT}$: .214; p < .05 and enjoyment, H9 $\beta_{DISF \rightarrow SAT}$: .248; p < .05), both being positively related (H8, $\beta_{PCtrl \rightarrow DISF}$: .491; p < .001), as Arquero et al. (2022) argued.

However, for the participants (teachers) ease of use does not directly and significantly influence satisfaction with the training experience (H2) or loyalty (H3), contrary to what is consistently reported in the literature (Yousafzai et al., 2007). It certainly has a significant overall impact, but it is channelled through the PeU→PU link.

Figure 2.
Structural model (standardised effects, p-values and R^2)



Perception of technical support has a positive impact on ease of use (H12, $\beta_{TS \rightarrow PEU}$: .263; $p < .005$) and marginally on usefulness (H11, $\beta_{TS \rightarrow PU}$: .263; $p < .1$); however, there is no significant relationship between technical support and anxiety (H10); it is negative, but with a very low weight and not significant.

Regarding the impact of personal variables, anxiety has a negative impact on ease of use (H13, $\beta_{ANX \rightarrow PEU}$: -0.277; $p < .001$) and self-efficacy has a positive influence on PEU (H14, $\beta_{S\_eff \rightarrow PEU}$: .336; $p < .001$).

Finally, the relationship between loyalty and course completion is positive and significant (H15, $\beta_{LOY \rightarrow COMP}$: .254; $p < .01$). Thus, although the set of variables included in the model are able to explain adequately loyalty formation (R^2: .610) and satisfaction with the MOOC (R^2: .453), do not provide an acceptable explanation of the MOOC completion rate (R^2: .065).

In addition to the direct effects obtained in the model, Table 2 presents the values obtained for the total effects on the variables to be explained that have been found to be significant. These total effects take into account both the direct effect, when it exists, and the indirect effects, in which other variables act as mediators.

Thus, for the formation of teacher loyalty (LOY) to a MOOC-based training action, the most important aspect is perceived usefulness. Ease of use, self-efficacy and perception of adequate support are relevant, but they act basically through perceived usefulness, as the direct connections of PeU with the key variables are not significant. Regarding the course completion rate (COMP), the only significant total effect (apart from the direct effect of loyalty, shown in Figure 2 as a direct effect) is that of perceived usefulness, which becomes the key variable to explain the success of a teacher-oriented MOOC of these characteristics. Perception of adequate support has a low, but marginally significant impact.

Table 2.
Total effects on loyalty and completion.

	Effect	*SD.*	*Sig.*
PU → LOY	0,616	0,082	0,000
PeU → LOY	0,399	0,101	0,000
SAT → LOY (d)	0,266	0,118	0,042
TS → LOY	0,228	0,066	0,000
S_Eff → LOY	0,136	0,047	0,004
ANX → LOY	-0,115	0,044	0,010
LOY → COMP (d)	0,253	0,097	0,009
PU → COMP	0,158	0,067	0,018
TS → COMP	0,059	0,031	0,056

Notes: The reported effect is the average of the samples obtained in the bootstrapping.
(d) Direct effect.

Discussion and conclusions

The institutionalisation of teacher professional development systems that overcome the barriers of traditional training is a necessity if quality education is to be maintained and human talent is to be retained.

Online TPD activities have established themselves as an efficient alternative to support teacher training. These actions enable collaborative learning through the exchange of ideas, the co-construction of professional knowledge, and the co-regulation of learning, using a

wide range of collaborative tools. Among these alternatives is the use of massive online courses, which are being used more and more frequently. As an example of the context of application of our study, INTEF offers only for October 2024 seven MOOCs, and during 2023 more than 45,000 teachers enrolled in their courses.

However, empirical and analytical research to identify the potential success and challenges of using MOOCs for teacher education is still scarce, especially when the specific characteristics of teachers as learners mean that results obtained with other audiences are not easily transferable.

In order to focus the research on teacher training, we developed a model of acceptance of technology-based educational resources applied to a sample of non-university teachers in a MOOC designed for specific teacher training. The resulting sample is, in terms of gender and age, a reflection of the population of non-university teachers in Spain, composed, according to statistics from the Ministry of Education and Vocational Training (2023), of 70% women, with the most frequent age range being 40-49 years old.

Having obtained the results on the proposed model, we can highlight the following conclusions. The literature on acceptance in e-learning systematically finds differences associated with the gender of the participant (Goswami and Dutta, 2015; Lakhal and Khechine, 2021). However, our results do not find significant influence on either loyalty or effective use. Additional mean difference analysis applied to all variables only finds a difference in perceived usefulness (slightly higher for women), so we rule out the existence of a gap related to this variable.

In loyalty formation, we confirm the positive influence of perceived usefulness, which is the factor with the largest total effect, and satisfaction with the training experience (direct effect). Ease of use, although it does not have a significant direct impact on satisfaction or loyalty formation, does have an indirect impact. This result also contrasts with those obtained in the literature for other types of participants (Abdullah and Ward, 2016; Lee, 2010; Liu et al., 2010). The perception of adequate support from tutors and other technical staff is the third most important variable in loyalty formation (considering total effects). The variables that have the most weight in the degree of course completion are loyalty, as advocated by acceptance models (Yousafzai et al., 2007), and the variable that has the most weight in loyalty formation, perceived usefulness of the course.

Overall, the model has an adequate predictive ability to explain loyalty formation (intention to use and to recommend use to others), but it is not able to adequately explain the variability of reasons why users complete the course, although variables with a significant impact have been identified.

Implications

Appova and Arbaugh (2018) explore the motivations for taking training, the most important being that the training will improve their students' learning and meet their needs. The second most frequently cited is the collaborative aspect: the possibility of learning with and from other teachers, with whom they share concerns and problems. The third is an extrinsic motivator: meeting external training requirements. These motivations, together with the results obtained, make it possible to associate the perceived usefulness of an action or course with the possibility that (I) it is perceived as applicable to improving student learning, and (II) it is implemented collaboratively with other teachers. Therefore, it is essential that courses are designed to address topics that faculty already consider relevant or that the potential relevance of the content is clearly communicated. In addition, it is crucial to maintain collaborative environments, as these are highly valued by participants. A third way to

increase perceived usefulness, in line with Appova and Arbaugh (2018), is to enable formal recognition of courses, rather than simply obtaining internal badges. In this regard, it should be remembered that strong intrinsic motivation is not incompatible with the existence of extrinsic motivators, such as a formal certification (Romero-Frías et al., 2023), which could constitute the final motivator for completing the training actions. Finally, the results of Castaño-Muñoz et al. (2018) analysing the courses offered by INTEF indicate that the completion rates of short courses (NOOC) are much higher than those of 'classic' MOOCs (25% vs. 6%), so that courses of an intermediate duration between the 6 weeks of a typical MOOC and the 3 hours of a nano-MOOC can increase completion rates. Finally, given the negative effect of anxiety on ease of use, it is recommended to incorporate resources that increase the technological confidence of teachers, such as initial tutorials, orientation sessions, or simulations of the tools used in the course. This can also be achieved by promoting self-efficacy through mechanisms such as positive feedback.

Limitations and further research lines

This study focusses on a single MOOC of the classical type, and the questionnaire was administered at the end of the course. This may limit the generalisability of the results to other training actions, especially if they have substantially different characteristics, and also prevents addressing the issue of attrition, one of the main research topics related to MOOCs (Deshpande and Chukhlomin, 2017); also present in teacher-oriented courses (Castaño-Muñoz et al., 2018). Future lines of work arise from the limitations. Replication of the study in other types of training actions (e.g. NOOCs) would allow validation of the results obtained. Access to enrolments at the beginning of the course, with instruments designed to measure preconceptions rather than ex post facto perceptions, could allow the study of dropout. To investigate factors not included in the model that may also explain completion rates, we believe that the approach should be qualitative and exploratory, given that typical variables, although significantly relevant, leave much of the phenomenon unexplained.

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Appendix

Measurement scales, items, composite reliability (CR) and average variance extracted (AVE)

Acceptance, PU, perceived utility (CR: 0,91 – AVE: 0,78)
The MOOC and the tools used in it (e.g. the central course platform, networks, blogs, etc.) are useful.
The MOOC and the tools used in it are interesting.
The MOOC and the tools used in it enhance my learning.
Acceptance, PeU, perceived ease of use (CR: 0,95 – AVE: 0,82)
My interaction with the tools used in the MOOC is clear and understandable.
Learning to use the tools used in the MOOC is easy.
Acquiring the ability to use the tools used in the MOOC is easy.
In general, I find the tools used in the MOOC easy to use.
Acceptance, satisfaction (CR: 0,93 – AVE: 0,87)
Overall, after the experience with the course tools I feel very satisfied.
Overall, after the experience with the course tools I feel very satisfied.
Acceptance, loyalty (CR: 0,94 – AVE: 0,80)
After getting to know the course tools, I will tell other people about the positive aspects of the tools.
After learning about the course tools, I will recommend them to anyone who asks me for advice.
After learning about the course tools, I will encourage my colleagues to use them.
After learning about the course tools, I will use them again.
Flow, enjoyment (CR: 0,90 – AVE: 0,75)
I found the MOOC format course pleasing.
Doing the course has been an enjoyable experience.
I had a good time doing the course.
Flow, perception of control (CR: 0,92 – AVE: 0,73)
I have mastered the tools used during the MOOC.
I have the necessary resources to use the tools used during the MOOC.
Given the resources and knowledge required for the MOOC it is easy for me to use.
The tools used in the MOOC are compatible with other tools I use.
IT Anxiety (CR: 0,82 – AVE: 0,61)
Working with digital technologies makes me very nervous.
Digital technologies make me feel uncomfortable.
Digital technologies make me uneasy.
Self-efficacy (CR: 0,81 – AVE: 0,58)
I am confident in using the MOOC platform.
I am confident in using PROCOMUN for collaborative work.
I am confident in overcoming the problems that have arisen in the MOOC.
Technical support (CR: 0,94 – AVE: 0,80)
Tutors provide adequate help when there is a technical or operational problem with the platforms.
If there are problems of this kind I can count on adequate help at any time.
If there are problems of this kind I can count on help through various channels.
The platforms provide good technical or operational support.

Note: items, used originally in Spanish, are answered from 1 (total disagreement) to 5 (total agreement), being 3 the indifference point.