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## **What drives students' loyalty-formation in social media learning within a personal learning environment approach? The moderating role of need for cognition**

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### **Short bios**

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### **Keywords**

Student loyalty; learning satisfaction; personal learning environment; social media learning; need for cognition.

## **Abstract**

Our study analyzes an educational experience based on the integrated use of social media within a higher education course under a personal learning environment (PLE) approach, and investigates the factors that determine students' loyalty to social media learning. We examined the moderating role of need for cognition (NFC) in students' formation of attitudes, satisfaction and loyalty toward this learning experience.

The results indicate that NFC has an influence on these variables, significantly moderating how loyalty toward social media learning is formed. For high-NFC students, satisfaction with the learning experience is the most important variable to explain loyalty; whereas for low-NFC students, attitudes have a stronger effect.

Different strategies are suggested, according to the learners' NFC levels, for increasing the use of social media in PLEs. Practical implications for improving the integration of such informal resources into formal education are discussed.

## **1. Introduction**

The last two decades have witnessed a significant increase in the development of innovative approaches to education using information and communication technologies (ICT) (Lee, 2010). Since the emergence of Web 2.0 (O'Reilly, 2005), social media have dominated trends in the use of digital technology around the world and have become extremely popular particularly among new generations of students. In a recent report, the Pew Research Center (Perrin, 2015) reviewed the adoption of digital technology in the USA from 2005 to the present day, finding that 65% of the entire American population now uses social networking sites, in contrast with just 7% in 2005. And among young adults (aged 18 to 29) the figure currently stands at 90%. The situation in Spain, where the present study takes place, follows the same pattern. According to the national media survey (EGM) published by the Spanish Association for Communication Media Research (AIMC) for the period October–November 2014, 62.6% of the population accessed the Internet at least once every day, and over 85% had accessed a social network during the previous week.

In the European context, the European Commission (2012) highlighted the opportunities that technology offers for improving quality, access and equity in education, and called for greater digital competence among students of all ages. In this line, social media undoubtedly generate new opportunities to engage students in higher education (Romero-Frías, & Arquero, 2013; Selwyn, 2007; Tess, 2013) as they are remarkably effective at connecting people and facilitating the exchange of information. Moreover, according to the literature (Ajjan, & Hartshorne, 2008; Mason, 2006; Selwyn, 2007, 2012), social media services support educational activities by facilitating interaction, collaboration, creativity, active participation, information- and resource-sharing and critical thinking context.

The strategic position of ICT in European education policy, the high level of usage of social media among students (Perrin, 2015) and the advantages of their use in education require the integration of these technologies into learning programs in order to increase students' digital competence and engagement with the academic experience. In turn, this integration requires an understanding of the students' experience in order to increase their satisfaction and loyalty to the use of ICT in their learning processes.

The success of any educational use of social media depends upon the reactions and acceptance of users toward these media, and the ability to generate loyalty among students such that they use the available resources and recommend their use. The formation of loyalty toward a product, a service or an experience depends on two main antecedents: firstly, user satisfaction generated after a positive experience (Bailey, & Pearson, 1983; Ives, Olson, & Baroudi, 1983; Melone, 1990); and secondly, positive attitudes of the user toward the experience, as emphasized in robust theories such as the theory of planned behavior (Ajzen, 1991) or the technology acceptance model (TAM) (Davis, Bagozzi, & Warshaw, 1989).

Additionally, given that social media open up the students' learning environment to numerous information resources and relations with other people, need for cognition (NFC) (Cacioppo, & Petty, 1982) could play a determining role in students' loyalty-formation. NFC refers to the need to structure relevant situations in meaningful and

integrated ways (Cohen, Stotland, & Wolfe, 1955), and is linked to external information-search behavior in both offline (Verplanken, 1993) and online contexts (Das et al., 2003). The role of NFC as a moderating variable helps us understand how different types of students adopt social media for learning purposes.

Our study reports an educational experience based on the integration of social media tools into a higher education course under a personal learning environment (PLE) approach. We refer to this particular approach as 'social media learning'. The importance of analyzing social media for education, instead of traditional Learning Management Systems (LMS) specially designed for education, is that social media already constitutes a part of the informational environment of students and therefore its educational success is not so dependent on the formal context as when using tools that do not have any other social use in their lives. The study investigates the factors that determine students' loyalty to social media learning, as a means of improving the effective adoption of ICT in higher education and particularly in the informal learning practices that in the future could support their lifelong learning. The originality of this study lies in the type of educational experience under study and its examination of the moderating role of NFC in users' formation of attitudes, satisfaction and loyalty toward this learning experience.

## **2. Theoretical background, development of hypotheses and research model**

### **2.1. Social media in higher education and personal learning environments**

Following Dabbagh, and Kitsantas (2012, p. 3) we define social media as 'a variety of networked tools or technologies that emphasize the social aspects of the Internet as a channel for communication, collaboration, and creative expression [that] is often interchangeable with the terms Web 2.0 and social software'. Many works have pointed to the positive impact of social media on education (e.g. Richardson, 2009; Selwyn, 2012; Solomon, & Schrum, 2007). For instance, Redecker et al. (2010) considered social networking sites to be effective at developing essential skills (selecting relevant information, critically interpreting and analyzing the socio-cultural context, working collaboratively, sharing knowledge, etc.). Arquero, and Romero-Frías (2013) highlighted that social constructivism is regarded by some as a way to interpret and assess some of the potential benefits of social media in education.

The experience under study integrates different social media within the conceptual approach of PLE (Attwell, 2007; Castañeda, & Adell, 2013). PLE is a concept that refers to the set of tools, devices, connections and networks that people use to learn (Romero-Frías, & Arquero, 2013). According to the EDUCAUSE Learning Initiative (2009, p. 1) a PLE is defined as the set of 'tools, communities, and services that constitute the individual educational platforms that learners use to direct their own learning and pursue educational goals'. Nowadays many of these tools are based on social software— that is, software that is specially designed for social collaboration. Attwell (2007, p. 1) refers to PLE as a 'new approach to using technologies for learning'.

Unlike LMS, closed platforms particularly designed for instruction such as Moodle or Blackboard, a PLE represents an ecosystem of strategies, relations and tools that is created and managed autonomously by students to match their own learning needs. Therefore, the development of a PLE using social media allows students to engage with the real-world context by exploring services that could be re-used for personal and professional purposes after the end of the formal education period (Attwell, 2007). Similarly, the use of social media in higher education allows informal education to be incorporated into formal settings as a way to foster lifelong learning (Bull et al., 2008; Dabbagh, & Kitsantas, 2012; Meyers, Erickson, & Small, 2013). Given this advantage, some experts (Dabbagh, & Reo, 2011; McGloughlin, & Lee, 2010; Selwyn, 2007) consider that universities should integrate social media into their learning programs to facilitate the creation of PLEs that support more learner-centered education systems.

Despite the call for an increased use of social media in educational settings, there is still a research gap in relation to the use of social media within a PLE approach and the formation of associated attitudes and loyalty. There is literature, however, focusing in the acceptance of LMS by students (e.g. Ngai, Poon, & Chan, 2007; Liu, Liao, & Pratt, 2009; Arteaga, & Duarte, 2010; Sanchez-Franco, 2010; Liu et al., 2010).

## **2.2. Student attitudes and loyalty-formation. The mediating role of learning satisfaction**

Loyalty is a construct widely used in the literature across many areas, particularly in management studies. According to Dick, and Basu (1994), loyalty is the relation between the attitude towards a brand or service and its repeated purchase; and is defined by Jones, and Sasser (1995) as the feeling of attachment to, or affection for, a company's people, products or services. It has been found that loyal customers are more likely to recommend products and services to friends and other potential customers, giving rise to a positive word-of-mouth process (Shoemaker, & Lewis, 1999).

Han, and Ryu (2009) highlighted the multidimensional nature of the construct, which encompasses user attitudes focused on perceptions, evaluations and feelings. Many authors consider attitudes to be the most important antecedent of loyalty (Bowen, & Chen 2001; Han, & Ryu, 2009)<sup>1</sup>. Although student loyalty has been researched in higher education contexts, the focus to date has been on loyalty toward the institution (Ali et al., 2016; Annamdevula, & Bellamkonda, 2016; Hennig-Thurau, Langer, & Hansen, 2001; Helgesen, & Nasset, 2007a; Sultan, & Wong, 2014; Wong, 2016) rather than to a particular educational experience or technology such as social networking sites (Ku, Chen, & Zhang, 2013; Lin, Fan, & Chau, 2014; Park, 2014; Xu, Ryan, Prybutok, & Wen, 2012).

In our study, loyalty has a relevant role to understand the future impact of social media in learning situations. Given the general purpose of these media and the control that students exert over them, the more loyal they are to their use for learning the more chances we have to generate a personal learning environment that might be used in future learning situations with independence of the specific setting. The use of social media for learning may empower students to control their own learning in many different situations, from a formal education context (as reported in this study) to informal education contexts to which they will be exposed to in their personal and professional lives.

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<sup>1</sup> The role of attitudes as an antecedent of loyalty is widely supported by many studies and theories, such as the theory of reasoned action (Fishbein, & Ajzen, 1975), the theory of planned behaviour (Ajzen, 1991) and the technology acceptance model (TAM) (Davis, Bagozzi, & Warshaw, 1989).

Based on these premises, this research proposes the following hypothesis:

*H1. Students' attitude toward social media usage is positively related to their loyalty toward social media.*

Satisfaction can be defined in various ways (Giese, & Cote, 2000). According to Mano, and Oliver (1993), it refers to an evaluative, affective or emotional response provoked by the experience a consumer has with a product or service. It results from the comparison between perceptions of a product or service, once consumed, and prior expectations (Hunt, 1977).

Satisfaction has been studied as a mediator in the processing of online information (Casaló, Flaviánand Guinalú, 2008a, 2008b; Castañeda, Rodríguez, & Luque, 2009; Szymanski, & Hise, 2000) and also as a determinant of success and usage of ICT (Bailey, & Pearson, 1983; Bhattacharjee, 2001a, 2001b; Hayashi et al., 2004; Lin, Wu, & Tsai, 2005). In this regard, dissatisfaction would lead to a decrease in the intention to purchase (Evanschitzky, & Wunderlich, 2006) or, in our case, in the intention to repeat this learning experience in the future. Numerous studies indicate that satisfaction is positively associated with behavioral intention and with the inclination to recommend (Cronin, & Taylor, 1992; Gotlieb, Grewal, & Brown, 1994; Gupta, & Stewart, 1996; Tam 2000; Petrick, 2004) and, therefore, with loyalty-formation.

The equivalent concept in education (learning satisfaction or student satisfaction) can be defined as a student's overall positive assessment of his or her learning experience (Keller, 1983). Elliot, and Healy (2001) indicated that satisfaction is a short-term attitude that results from the evaluation of a student's experience with the education service received. Learning satisfaction is thought to be positively related to students' loyalty (Athiyaman, 1997; Schertzer, & Schertzer, 2004; Marzo-Navarro, Pedraja-Iglesias, & Rivera-Torres, 2005; Helgesen, & Nasset, 2007a).



Regarding the use of technologies for educational purposes, Roca, Chiuband Martínez (2006) and Shu-Sheng, and Hsiu-Mei (2011) found a significant relationship between learning satisfaction and the intention to continue using e-learning.

Therefore, we propose the following hypothesis:

*H2. Student satisfaction with social media is positively related to student loyalty toward social media.*

Many studies have demonstrated the role of attitudes as an antecedent of satisfaction-formation in different areas of knowledge. For example, Lim, Benbasat, and Ward (2000) found that overall perceptions of a profession influence the satisfaction felt when exercising it – that is, employees that perceived their profession to be prestigious showed a high level of job satisfaction. Other studies have observed that overall attitude toward a brand has a strong influence on customer satisfaction (Andreassen, & Lindestad, 1998; Hildebrandt, 1998; Mazursky, & Jacoby, 1986). Ekinci, and Riley (2003) argued that satisfaction is influenced by pre-purchase attitudes. In higher education contexts, Ozkan, and Koseler (2009) highlighted the importance of understanding and identifying the attitudes of learners toward the LMS when investigating their satisfaction.

Therefore, we formulate the following hypothesis:

*H3. Student attitude toward social media is positively related to student satisfaction with social media.*

### **2.3. The role of need for cognition**

Evans, Kirby, and Fabrigar (2003) highlighted that educational researchers have naturally been interested in how students learn and process information within the academic context. The concept of NFC, which appeared for the first time in the work of Cohen, Scotland, and Wolfe (1955), is an attempt to conceptualize this process. These authors described NFC as the need to structure relevant situations in meaningful, integrated ways – where ‘need’ is used in the sense of a likelihood or tendency, rather



than in a biological sense (Evans, Kirby, & Fabrigar, 2003). Given the strong relationship between NFC and motivation, Petty, and Cacioppo (1981) introduced NFC in their elaboration likelihood model (ELM) as a relevant moderator in information processing. In a later paper, they used this concept (Cacioppo, & Petty, 1982) when investigating differences between individuals in their tendency to engage in, and enjoy, thinking.

High\_NFC individuals (*cognizers*) tend to seek, acquire, think about and reflect back on information to make sense of stimuli and events, producing a more stable cognitive change. By contrast, low\_NFC individuals (*cognitive misers*) are more likely to rely on others (such as celebrities and experts), cognitive heuristics, secondary stimuli or social comparison processes to acquire meaning (Cacioppo et al., 1996; Evans, Kirby, & Fabrigar, 2003), thereby producing a temporary, unstable or unpredictable cognitive change. Therefore, to some extent this variable determines the ability and desire to make a cognitive effort (Zhang, & Buda, 1999). It has also been related to learning approaches, mainly high levels of NFC with deep approaches (Evans, Kirby, & Fabrigar, 2003) and to growth goals, defined as the desire to understand one's environment and to develop the skills necessary to affect the environment to meet the higher-level self-goals (DeShon, & Gillespie, 2005).

Since the initial development of NFC, it has been extensively studied in a variety of contexts (Cacioppo et al., 1996; Close, Lacey, & Cornwell, 2015; Hill et al., 2013; Sicilia, Ruiz, & Munuera, 2005; Wu, Parker, & De Jong, 2014). Nevertheless, there are very few studies analyzing the effects of NFC in the use of social media. People who are intrinsically interested in analyzing and processing information (high\_NFC) may be more likely to form positive attitudes, and thus behavioral intention, toward using social media, bearing in mind that such websites provide access to high volumes of information. In contrast, people who are more attracted to the design of a website than to the content (low\_NFC) may process messages differently and thus form their attitude toward social media by linking them with peripheral cues (Gangadharbatla, 2008). Gangadharbatla (2008) found that students' NFC level was positively related to attitude and intention to use Facebook. Hughes et al. (2012) found that the level of NFC was

connected to the use of social networking sites as an information source but not necessarily for social use. More specifically, they found that those who access Twitter for informational purposes are doing so for its utilitarian value and cognitive stimulation.

Although there is relevant literature examining the role of NFC in the context of acceptance in e-learning (Chen, & Wu, 2012; Del Barrio-García, Arquero, & Romero-Frías, 2015; Evans, Kirby, & Fabrigar, 2003; Kühl, Eitel, Damnik, & Körndle, 2014; Turner, & Croucher, 2013; Kai-Wen, 2011), to our knowledge no previous research has investigated the moderating role of NFC in the loyalty-formation process of students toward the use of social media within a PLE approach in higher education.

Therefore, we formulate the following hypothesis:

*H4. NFC moderates students' loyalty-formation toward social media learning.*

Figure 1 depicts the four hypothesis based on the literature review and presents a theoretical model to understand the formation of student loyalty in using social media learning. Student satisfaction is considered a mediating variable between the students' attitude toward using social media and their loyalty.

-Insert Figure 1 here-

Based on the results of Gangadharbatla (2008), and in the context of the effect of NFC on the main variables of the model, we propose the following hypothesis:

*H5. There are differences in the main variables of the model (attitudes, learning satisfaction, student loyalty, behavioral intention to use and willingness to recommend) that are attributable to student NFC levels.*

### **3. Methodology**

#### **3.1. Sample and context**

The sample comprised 202 students taking an elective subject on a Business and Administration Degree at the University of Granada (Spain). By gender, the composition of the sample was 31% male and 69% female. The subjects were aged between 20 and 43 years old, with a mean of 23.

The data were gathered through a Web-based questionnaire using the service SurveyMonkey at the end of the course, before the final grades were communicated to students in order to avoid bias in their responses.

A typical concern in such surveys is that information collected from respondents might have a problem of common method variance. We attempted to control this problem by means of procedural and statistical techniques. Following the recommendations by Podsakoff et al. (2003), we initially addressed the minimization of common method variance via research design. First, the survey began with a brief introduction explaining the main objectives without suggesting any relationship between variables. Second, the survey indicated that all responses were confidential and only to be treated for research purposes at an aggregated level. Third, we emphasized that respondents should answer the survey questions as honestly as possible, that there were no correct or incorrect answers and that the information provided would not have any impact on the course assessment. In terms of good statistical procedure, and in order to prevent any possible bias among the respondents, the Harman's single factor test (McFarlin and Sweeny, 1992) was applied to all the relevant variables in the model, using the 'eigenvalue greater than one' criterion. This in fact revealed three factors as opposed to just one. To guarantee absence of bias, the results must show a low fit of the estimated factors. The results of this combination of procedures and statistical tests suggest that the common method bias in the data was relatively limited (Podsakoff et al., 2003).

As mentioned earlier, the pedagogical approach, based on social constructivism, was operationalized through the concept of the PLE (Chatti, Jarke, & Specht, 2011; Häkkinen, & Härmäläinen, 2011; Romero-Frías, & Arquero, 2013; Tu, Sujo-Montes et al., 2012; Wilson et al., 2009). A PLE is a personal set of resources used by individuals to pursue their own learning objectives. To create the PLE for our study we proposed a combination of digital tools that were already used by the majority of students (Facebook or Twitter) with others that, although known by most of them, were not so frequently used (blogs or wikis). This approach was more straightforward to implement than adapting the entire course design to a new set of tools. Furthermore, the

students continued to use their existing profiles if they already had presence in the different services (for example, those with a Twitter account or blog were not required to create new ones). The objective was to help them develop their academic and professional presence in social networking sites that were already employed by them for social purposes and to present them with new tools with the potential to improve lifelong learning.

Instructional sessions were carried out at the beginning of the course to present the PLE concept and before each activity to teach the students the basics of the different tools. The social media services that, together, formed the suggested PLE for the course in question and the corresponding activities were as follows:

- Facebook. A closed group was created to communicate and coordinate activities on the course. The students were instructed to publish freely, not only about the topic under study but about any particular interest they would like to share. No moderation policy was applied. The purpose was to create a learning community where informal learning could emerge alongside the course content. In addition, the group was used by the teacher to distribute messages concerning the course. The activities carried out via Facebook had no bearing on marks.
- Twitter. Twitter was used as a network for informal liaison between students, and between the students and the teacher. A hashtag was established to publish messages related to the course. For example, Twitter was used in class to revise and summarize the main content of the syllabus in order to prepare for the final exam (again, no bearing on marks).
- Blogs. Personal blogs were maintained by the students to generate and publish content from a critical point of view. Different activities were undertaken and assessed in this format (accounting for 30% of the final mark awarded for the elective course), for example: writing a critical post about business issues, producing an analysis of a text on financial reporting or reflecting on their own PLE.

- Wiki. An open business encyclopedia that replicates the Wikipedia model was used during the course (Descuadrando – <http://descuadrando.com>). Students were tasked with creating encyclopedic-style entries (20% of the final mark).

In addition to these activities, the students sat a final exam (50% of the final mark).

The learning environment approach that we study justifies the use of a set of tools that offer complementary functions and opportunities to develop different competences. By contrast to LMS, where all the functions needed in a course are concentrated in a single platform, the PLE approach is based in a distributed model. This approach adds more complexity to the learning experience but at the same time generates a model that is directly applicable to other courses and informal learning situations. Nevertheless, to assure the feasibility of the experience, the course previous to the one we analyse was also based in a similar approach. The results and the experience of the students were successful, validating the continuity and the interest in analysing the experience, as we are doing in this study.

### 3.2. Measures

All measures were obtained by adapting scales previously used in relevant studies to the educational context (all scales and items are shown in the annex):

The Attitude Toward Using (ATU) scale used in this paper is an adaptation of the 3-item scale proposed by Chen, Gillenson, and Sherrell (2002).

To measure Student Loyalty (LOY), the classic 4-item scale developed by Zeithaml, Berry, and Parasuraman (1996) was used. The scale has two components: the behavioral intention to use social media-based learning (BIU) and the willingness to recommend it (WIR). Similar scales have been used in other studies (Helgesen, & Nettet, 2007b; Li, & Hung, 2009; Thomas, 2011).

Learning Satisfaction (SAT) was measured using the 2-item scale proposed by Szymanski, and Hise (2000), later used in Szymanski, and Henard (2001), Evanschitzky et al. (2004) and Jayawardhena (2004).

With regard to the Need for Cognition (NFC), the original scales proposed by Cacioppo, and Petty (1982) and Cacioppo, Petty, and Kao (1984) were too large (34 and 18 items, respectively) to be used in a multi-scale design. Therefore, we opted to use a shortened version of the original NFC scale in the light of various studies (Gangadharbatla, 2008; Hughes et al., 2012; Del Barrio-García, Arquero, & Romero-Frías, 2015). Specifically, we used the 5-item version proposed by Del Barrio-García, Arquero, and Romero-Frías (2015) in an education context.

Respondents were asked to answer to the questionnaire items on a 7-point Likert scale, ranging from (1) 'strongly disagree' to (7) 'strongly agree', except learning satisfaction where a 7 point semantic differential scale was used.

### **3.3. Statistical procedure**

Techniques or statistical procedures for estimating a causal model differ depending on the aims of the analysis, the statistical suppositions on which they are based and the nature of the fit statistics they provide (Barroso, Cepeda, & Roldán, 2010). On the one hand we find the covariance-based SEM (Lisrel, Amos, Mplus), which seeks to estimate the parameters of the model, minimizing the discrepancies between the initial covariance matrix of the data and the covariance matrix estimated by the proposed models (Bagozzi, 1980; Jöreskog, 1973). On the other hand, partial least squares path modeling (PLS-PM) provides an alternative to covariance-based SEM (Chin, 1998; Lohmöller, 1989; Wold, 1982). The aim of PLS-PM is to predict dependent variables, maximizing their explained variance. The advantages of PLS over covariance-based SEM include the minimum assumptions made for measurement scales, specification of measurement models (reflective or formative indicators), sample size and data distribution (Chin, Marcolin, & Newsted, 1996). The theoretical model proposed in this study is therefore much better suited to the conditions for application of the PLS-PM technique, especially since our sample is relatively small (Chin, & Newsted, 1999;

Rigdon, 2013). Also our model is not complex as it uses scales with few items, and PLS-PM can assure robustness of results (Qureshi, & Compeau, 2009).

SmartPLS 3.2.4, developed by Ringle, Wende, and Becker (2015), was used to estimate the model to perform the PLS multi-group analysis (PLS-MGA) (High NFC vs Low NFC) and to assess the measurement invariance through the measurement invariance assessment procedure (MICOM).

The PLS multi-group analysis allows testing if pre-defined data groups have significant differences in their group-specific parameter estimates, providing outcomes of different approaches that are based on bootstrapping results from every group. Sarstedt, Henseler, & Ringle (2011) describe the multi-group analysis methods in detail. Likewise, measurement invariance is an important issue when conducting PLS multi-group analyses. Group comparisons can be misleading unless researchers establish the invariance of their measures. Henseler, Ringle, & Sarstedt (2016) introduce a procedure to assess measurement invariance of composite models (MICOM) before undertaking multi-group analyses in PLS-SEM. In addition, a bootstrapping procedure was used in all cases.

Furthermore, the K-means cluster analysis procedure was used to classify the respondents by NFC score. Two significantly different groups emerged: HIGH-NFC, 124 students with an NFC score of between 4.30 and 3.90; and LOW-NFC, 78 students with an NFC score of between 3.22 and 2.33. Our NFC scale showed adequate internal reliability (Cronbach's alpha: .727).

#### **4. Results**

The evaluation of the structural model has, in turn, three phases. The first one analyses the psychometric properties of the scales used and the discriminant validity of the constructs. The second compares the strength of the hypotheses by analyzing the estimated coefficients between the latent variables (paths). Finally, the third evaluates the model fit assessment and their predictive capacity.



Table 1 shows the adequate psychometric properties of the scales used to measure attitudes toward using, learning satisfaction and loyalty (willingness to recommend and behavioral intention to use) in both groups. All the loadings were significant, and the composite reliability (CR) and average variance extracted (AVE) values were above the recommended limits (.8 and .5) (Del Barrio, & Luque, 2013; Hair, Hult, Ringle, & Sarstedt, 2017). The discriminant validity of the constructs in each group was tested following the procedure proposed by Fornell, and Larcker (1981), in which the square root of the AVEs must be greater than the correlations between constructs. In addition, the Heterotrait-Monotrait (HTMT) ratio (Henseler, Ringle & Sarstedt 2015) was computed for each pair of constructs on the basis of the item correlations. The computation yielded values below 1 or the most conservative criterion 0.90 (Gold, Malhotra & Segars, 2001), thus providing evidence of discriminant validity (see Table 2).

-Insert Table 1 here-

-Insert Table 2 here-

Hult et al. (2008) noted that failure to establish measurement equivalence is a potential source of measurement error, which reduces the power of statistical tests of hypotheses and provides misleading results. Therefore, before testing the hypotheses, the measurement equivalence between groups was assessed applying the measurement invariance assessment procedure (MICOM) (Henseler, Ringle, & Sarstedt, 2016). All the latent variables show compositional invariance, as long as there are no significant differences in the indicator weights for measurement paths between groups (HIGH\_NFC vs. LOW\_NFC) ( $p > .05$ ) (see Table 3).

-Insert Table 3 here-

Once the properties of the scales had been examined the hypotheses were tested. Figure 2 shows the results of the structural (inner) model for the two groups of students, including the estimated coefficients and p-values resulting from the application of the bootstrap resampling procedure to 5,000 sub-samples (Hair et al., 2017).

H1 proposes that students' attitude toward social media usage is positively related to their loyalty toward social media. This hypothesis was confirmed only for the Low\_NFC students, with a positive and significant coefficient ( $\beta_{ATU \rightarrow LOY\_LOW\_NFC}$ : .37,  $p < .01$ ). However, for High\_NFC students attitude toward the using does not seem to determine loyalty as the coefficient was found to be positive but non-significant ( $\beta_{ATU \rightarrow LOY\_HIGH\_NFC}$ : .06,  $p > .01$ ). Meanwhile, H2 proposes that student satisfaction with social media is positively related to student loyalty toward social media. In this case this hypothesis is supported in both NFC groups as the coefficients were significant, high and positive ( $\beta_{SAT \rightarrow LOY\_HIGH\_NFC}$ : .70,  $p < .01$ ;  $\beta_{SAT \rightarrow LOY\_LOW\_NFC}$ : .39,  $p < .01$ ), although much more strongly for High-NFC students.

H3 proposes that student attitude toward social media is positively related to student satisfaction with social media. Once again the hypothesis is supported in the two NFC groups with coefficients high, positive and significant ( $\beta_{ATU \rightarrow SAT\_HIGH\_NFC}$ : .57,  $p < .01$ ;  $\beta_{ATU \rightarrow SAT\_LOW\_NFC}$ : .79,  $p < .01$ ). Unlike H2 the relationship between attitude toward the using and satisfaction was stronger for Low\_NFC students.

To examine H4, which states that NFC is a relevant moderator in the formation of students' loyalty toward social media learning, we tested whether the observed differences in the coefficients between the High\_NFC and Low\_NFC groups were significant. The multi-group invariance analysis (PLS-MGA) (Sarstedt, Henseler, & Ringle, 2011) shows the existence of significant differences for the suggested relations between ATU, SAT and LOY (see Table 4 and Figure 2). Particularly, the effect of ATU on SAT is significantly greater for Low\_NFC students than for High\_NFC students (Diff.  $ATU \rightarrow SAT$  (High vs Low): .214,  $p < .01$ ). Nevertheless, the effect of SAT on LOY is greater for High\_NFC students than for Low\_NFC students (Diff.  $SAT \rightarrow LOY$  (High vs Low): .308,  $p < .05$ ). The effect of ATU on LOY is significantly greater ( $p < .05$ ) for Low\_NFC students; but it is not significant for High\_NFC students (Diff.  $ATU \rightarrow LOY$  (High vs Low): .310,  $p < .05$ ). No differences between groups were found for the two dimensions of loyalty: behavioral intention to use (Diff.  $LOY \rightarrow BIU$  (High vs Low): .033,  $p > .05$ ) and

willingness to recommend (Diff.  $LOY \rightarrow WIR$  (High vs Low): .004,  $p > .05$ ). These results support H4, indicating that the perception of social media learning and the way that loyalty toward the system is formed depend on the level of NFC.

-Figure 2 here-

-Insert Table 4 here-

These findings indicate that the loyalty of High\_NFC students toward social media learning depends on the satisfaction they have derived from using these services. By contrast, for Low\_NFC students, loyalty depends mainly on previous attitudes (and, to a lesser extent, on the satisfaction they have derived from social media learning). The total effects between the constructs (Table 5) reflect this difference. The relevance, in terms of total effects, of attitude toward the use of social media on satisfaction and loyalty (and its components) is greater for Low\_NFC students.

Working to develop the student's satisfaction with the educational experience is much more important among High\_NFC learners to foster loyalty toward social media learning. To conclude, we observed a moderated mediation effect in which student satisfaction acts as a mediator between attitudes and intentions, and where NFC moderates the level of this mediation. Learning satisfaction exerts full mediation in the relationship between attitudes toward using and student loyalty for Low\_NFC students, whereas it exerts only partial mediation for High\_NFC students.

-Insert Table 5 here-

Finally, table 6 presents the descriptive statistics for the main variables in the model by NFC group and the significance of the differences (ANOVA). It is to be noted that all the differences are statistically significant, supporting H5. High\_NFC students present higher levels of attitude towards using, learning satisfaction, behavioral intention to use and willingness to recommend – suggesting better acceptance of this kind of innovation.

-Insert Table 6 here-

Having tested the hypotheses, the next and final stage consisted of evaluating the model fit and its predictive capacity.

It is to be noted that the assessment of the goodness of fit is not an objective of PLS-PM and that these measures must be used with caution (Hair et al., 2017). However, Henseler et al. (2014) introduced the standardized root mean square residual (SRMR) as a goodness of fit measure for PLS-PM, to date one of the most accepted model fit assessment criteria. The SRMR is defined as the difference between the observed correlation and the model implied correlation matrix. Thus, it allows assessing the average magnitude of the discrepancies between observed and expected correlations as an absolute measure of (model) fit criterion and can be used to avoid model misspecification. A value less than .10 (.08 in a more conservative approach; see Hu & Bentler, 1999) are considered a good fit. The results obtained in both groups lead to the conclusion that the model provides adequate goodness of fit ( $SRMR_{HIGH\_NFC}$ : .079;  $SRMR_{LOW\_NFC}$ : .087).

The evaluation of the predictive capacity of the model involves the examination of the percentage of explained variance of the dependent constructs ( $R^2$ ), as well as their predictive relevance using the Stone-Geisser  $Q^2$  value (Stone, 1974; Geisser, 1974). It is established that if  $Q^2 > 0$ , the model has predictive relevance. By analyzing the results obtained for the four dependent variables of our model (see Figure 2), we can conclude that all of them present suitable percentages of explained variance and predictive relevance in both groups (Hair et al., 2017).

## 5. Discussion and conclusion

During the last two decades, different labels have been used to define new generations of students who have grown up with digital technologies: 'digital natives' (Prensky, 2001), 'Net generation' (Tapscott, 1998) and 'millenials' (Howe, & Strauss, 2000, 2003), among others. One negative effect of these conceptualizations based on a disruptive view of the technological change in education is the assumption that there is one single set of learning preferences and styles associated with a whole generation (Bennet, Maton, & Kervin, 2008). Given that digital technology usage for *social*

purposes among young people is very high (Perrin, 2015), educators might usefully take advantage of these resources and incorporate social media into their courses, for *educational* purposes. However, in order to design effective e-learning environments it is vital for instructors to understand the target group's needs and motivations and to adopt strategies that facilitate learners' adoption of the technology for educational ends and future professional use (Liaw et al., 2007). On this premise, the main aim of the present study is to understand how loyalty to such systems is formed and how learners' personal levels of NFC moderate this loyalty-formation through a model that combines simplicity, clarity and, particularly, predictive relevance. While the use of social media is not a goal in itself, it does constitute an ambitious strategy for preparing students for lifelong learning through the PLE approach. PLEs provide, as previously indicated, an innovative perspective that helps students become more self-aware in their learning processes and preferences, through the integration of services that are generally used by them for social purposes.

Our results highlight that certain characteristics of students – NFC in this case – can have a significant influence on the success of educational experiences using social media and how the experiences are perceived. High-NFC students present higher levels of positive attitude toward the use of social media, behavioral intention to use them and also willingness to recommend their use to their colleagues, in comparison to low-NFC students. High-NFC students also perceive the experience as more satisfactory (that is, they present higher levels of learning satisfaction).

The level of NFC not only exerts an influence on the main variables in the model, as noted, but also affects how these variables interact, significantly moderating the formation of loyalty toward social medial learning. For high-NFC students, the learning satisfaction with the experience is the most important variable to explain loyalty; whereas for low-NFC students the importance of learning satisfaction is much lower, and attitudes have a stronger effect on loyalty.

These results have educational implications. In order to improve the acceptance of social media learning, different strategies could be implemented depending on the NFC

level of students. As stated earlier, educational experiences based on the use of PLEs give students flexibility to set and pursue their own learning objectives. In formal education settings this approach is flexible enough for instructors to design the optimal conditions for improving the loyalty level of the students.

On the one hand, high-NFC individuals can benefit from a learning approach that can be adapted to their own interests and therefore increase their overall positive assessment of their learning experience (Keller, 1983). On the other hand, low-NFC individuals have a preference for particular characteristics related to their attitude towards using technologies (if the use of the tools is comfortable, safe or if it saves time, for instance). Teachers should be able to provide students with different educational experiences in the use of technology in order to improve its acceptance.

Previous literature provides some useful insights into possible alternatives. Cacioppo et al. (1996) suggest that high-NFC individuals, in comparison to low-NFC individuals, prefer engaging in complex situations and are more confident and persuasive in championing their ideas. They also have a preference for situations that offer novelty, complexity and uncertainty. Curiosity to seek new information and opportunities and to create new knowledge (Evans, Kirby, & Fabrigar, 2003) is another characteristic of high-NFC individuals. Activities designed to expose students to vast amounts of information in social media that is accessible to be discovered, filtered and used in creative ways can increase their satisfaction.

Along similar lines, Dollinger (2003) stated that NFC is positively related to self-reported creative behaviors. According to Nair, and Ramnarayan (2000), high-NFC people can quickly process information that is helpful in generating new ideas and solving complex problems. Methodologies using social media that require creative and proactive solutions, such as project-based learning, could well suit high-NFC students.

Low-NFC students, by contrast, are more dependent on others, provide less information to solve problems (particularly when it is contradicting) and show less engagement in cognitive tasks (Kaynar, & Amichai-Hamburger, 2008). For them, an overall positive

assessment of the learning experience is not as relevant as for high-NFC individuals. For low-NFC students, interventions that positively shape their attitudes toward the technology used and the prospects for their future in terms of employability and lifelong learning can be more useful. On this note, Thompson, Chaiken, and Hazlewood (1993) highlighted that NFC involves intrinsic motivation for effortful cognitive processing; therefore low-NFC students could be more strongly driven by external motives. A stronger link between performance in activities and external rewards in terms of grades could be a useful measure to motivate low-NFC students.

In short, different strategies followed by the instructor may lead to an increase in loyalty toward social media learning, improving the development of students' PLEs. If teachers were able to determine the NFC profiles of their students prior to undertaking a course or learning experience they could use this data to create homogeneous groups within the overall class and provide personalized learning according to NFC level. Hence, the students would benefit from tailored input about social media learning and the importance of developing their PLE for their professional careers, focusing either on their attitudes toward the technology or on the level of satisfaction with the experience.

## **6. Limitations and further research**

The study has two main limitations. First, it was conducted in one country only (Spain), among students from one particular area of knowledge. Students' profile from other areas of knowledge could generate different results. Therefore, it is necessary to extend this type of experience and research to other cases. Second, the size of the sample is relatively low, albeit big enough to generalize the results.

Further research should take into account the factors influencing teaching strategies used in the classroom (Anderson, Groulx, & Maninger, 2011; Li, Li, & Franklin, 2016), as long as it might be determinant to understand the final adoption by students. Also we recognise the practical interest in elaborating a more qualitative and applied resource that could provide teachers with strategies and tools that could be adapted to their specific circumstances. Further research should also explore other measures of users' approach to learning – for example, as an alternative to NFC, students' learning styles could be assessed (Biggs,



1987). Also, the key role of learning satisfaction for high-NFC students implies that, in this case, the characteristics of the PLE that are linked to greater learning satisfaction need to be studied in some depth. For all the students (high- and low-NFC), the characteristics of the PLE that impact on attitudes toward social media in education should also be examined. Finally, research on the maintenance of these learning practices along the students' professional lives are needed in order to assess the impact in lifelong learning.

Nevertheless, although significantly different, the scores for both high- and low-NFC students were relatively high. These positive values in both groups might be due to the fact that the study was carried out in an elective subject in the final year of the degree. Further research may be needed to test these differences earlier in the degree program and with a greater diversity of students.

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The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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## Annex. Scales and Items

<i>Attitude Toward Using</i>	<i>After using the Web 2.0 tools employed on this course, I think that... (1: strongly disagree; 7: strongly agree)</i>
ATU1	...working with them is comfortable
ATU2	...working with them saves me time
ATU3	...working with them is safe
<i>Students' Loyalty</i>	<i>After getting to know the Web 2.0 tools employed on this course... (1: strongly disagree; 7: strongly agree)</i>
WIR1	... I will make positive comment about them to other people
WIR2	... I will recommend them to other people asking me for advice
WIR3	... I will encourage my classmates to use them
BIU1	... I will use them again
<i>Learning Satisfaction</i>	<i>In general terms, after my experience of using the Web 2.0 tools employed on this course...</i>
SAT1	I feel: (1) very dissatisfied ... (7) very satisfied
SAT2	I feel: (1) very upset ... (7) very happy
<i>Need for Cognition</i>	<i>Please indicate the extent to which you agree with the following statements (1: strongly disagree; 7: strongly agree)</i>
NFC1	I prefer complex problems to simple ones
NFC2	Thinking is fun
NFC3	I derive satisfaction from thinking reflectively for hours on end
NFC4	I only think as hard as I have to
NFC5	I would prefer a task that is intellectual, difficult and important to one that is somewhat important but does not require much thought

Table 1: Analysis of the psychometric properties of the scales (standardized solution)

Observed Variables	Latent Variables	<i>HIGH_NFC</i>		<i>LOW_NFC</i>		<i>AVE</i>		<i>CR</i>	
		Loadings	t-value	Loadings	t-value	HIGH-NFC	LOW-NFC	HIGH-NFC	LOW-NFC
ATU1	ATU	.89	35.78	.93	57.39	.76	.82	.86	.90
ATU2		.85	17.81	.88	17.85				
SAT1	SAT	.92	63.99	.91	37.21	.84	.83	.91	.91
SAT2		.91	54.95	.90	27.65				
WIR1	WIR	.90	51.16	.93	53.88	.83	.86	.93	.95
WIR2		.92	53.17	.93	47.25				
WIR3		.91	49.30	.91	48.80				
BIU1	BIU	1.00	---	1.00	---	1.00	1.00	1.00	1.00

ATU: Attitude Toward Using, SAT: Learning Satisfaction, WIR: Willingness to Recommend, BIU: Behavioral Intention to Use

Table 2: The heterotrait-monotrait (HTMT) ratio of correlations

	ATU	SAT	BIU	WIR
ATU	--			
SAT	0.85	--		
BIU	0.58	0.69	--	
WIR	0.68	0.82	0.76	--

Table 3: Measurement invariance assessment test (MICOM)

	Original Correlation	Correlation Permutation Mean	5.0%	Permutation p-values
ATU	1.000	.998	.994	.686
WIR	1.000	1.000	1.000	.825
BIU	1.000	1.000	1.000	.483
LOY	1.000	1.000	1.000	.575
SAT	1.000	1.000	.999	.907

MICOM Test returns confidence intervals that allow determining if a construct has a correlation in Group High\_NFC and Group Low\_NFC that is significantly lower than one. If this is not the case, the construct does not differ much in both groups and compositional invariance has been established (Henseler et al., 2016)



Table 4: Multigroup invariance analysis results (PLS-MGA)

<i>Relationships</i>	<i>Coefficients HIGH_NFC</i>	<i>Coefficients LOW_NFC</i>	<i>Path coefficients difference</i>	<i>p-value<sup>†</sup></i>
ATU→LOY	.06	.37	.310	.975*
ATU→SAT	.57	.79	.214	.995**
LOY→WIR	.98	.98	.004	.769
LOY→BIU	.82	.86	.033	.774
SAT→LOY	.70	.39	.308	.019*

Note: This method is a non-parametric significance test for the difference of group-specific results that builds on PLS bootstrapping results. A result is significant at the 5% probability of error level, if the p-value is smaller than .05 or larger than .95 for a certain difference of group-specific path coefficients.

† \*\*p<.01; \*p<.05

Table 5: Standardized Total Effects

<i>Relationships</i>	<i>Total effects HIGH_NFC</i>	<i>Total effects LOW_NFC</i>	<i>Total effects differences</i>	<i>p-value<sup>†</sup></i>
ATU→WIR	.45	.67	.215	.987**
ATU→BIU	.38	.58	.202	.984*
ATU→LOY	.46	.68	.217	.988**
ATU→SAT	.57	.79	.214	.995**
LOY→WIR	.98	.98	.004	.769
LOY→BIU	.82	.86	.033	.774
SAT→WIR	.68	.38	.300	.020*
SAT→BIU	.58	.33	.242	.032*
SAT→LOY	.70	.39	.308	.019*

† \*\*p<.01; \*p<.05

Table 6. Perceived impact of students' experience

	<i>Groups</i>	<i>Mean</i>	<i>Standard Deviation</i>	<i>p-value</i>
Attitude Toward Using	Low NFC	3.89	.72	.02
	High NFC	4.13	.63	
Learning Satisfaction	Low NFC	3.87	.76	.00
	High NFC	4.14	.66	
Behavioral Intention to Use	Low NFC	3.95	.97	.00
	High NFC	4.32	.80	
Willingness to Recommend	Low NFC	3.80	.82	.00
	High NFC	4.16	.75	

Figure 1: Proposed theoretical model of student loyalty-formation

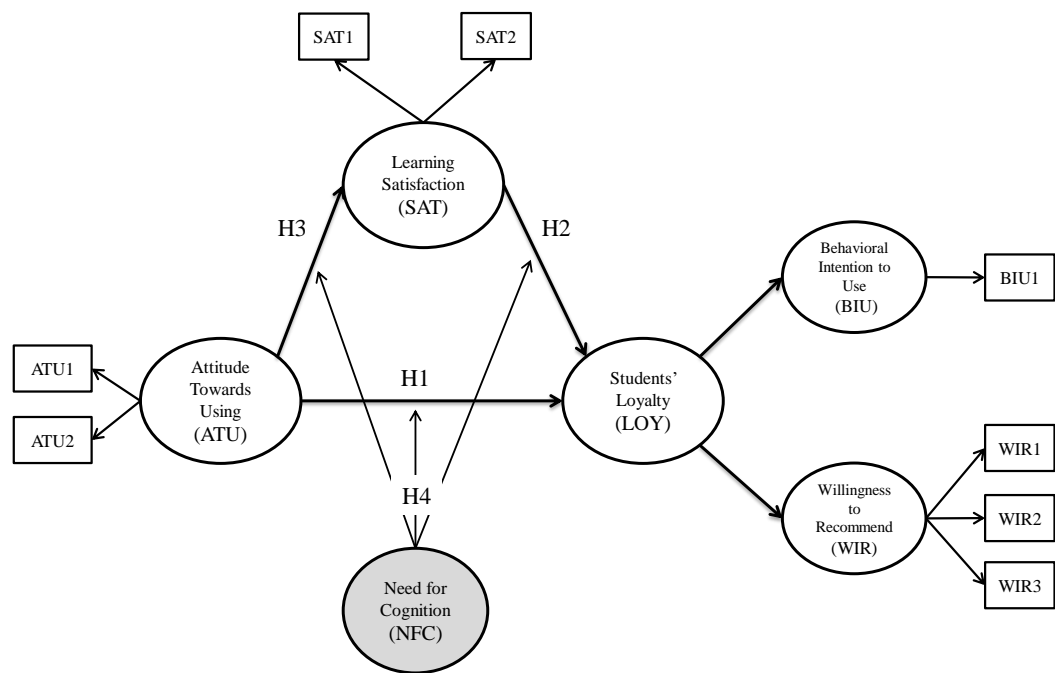


Figure 2: Estimated structural model – inner model (standardized solution)

