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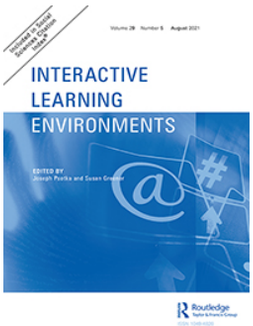

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Is the smart mobile phone transforming university educational reality?

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ABSTRACT

Smartphones (SMPs) play a vital role in the lives of young people and in the university classroom. There are few studies of the use of SMPs by university students, and the existing knowledge is inconsistent and lacking consensus. This article shows the validity of a theoretical model of the use of SMPs in higher education, in the context of the theory of uses and gratifications, and the knowledge gained from previous studies on the use of SMPs by adolescents. The results suggest the existence of a specific educational function for the use of SMPs in university classrooms. Despite the emergent nature of this function, the educational use of SMPs in higher education presents potential consolidation as a source of gratification and satisfaction of educational needs. Their inclusion in the everyday activity of university classrooms will require considerable effort to adapt the educational system, and the training of students and teaching staff must be improved in order to reduce possible interference in learning the communicative and expressive play functions of SMPs.

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Smart mobile phone; media in education; uses of mobile phones in education; social issues of technology use; higher education

Introduction

The smart mobile phone (SMP), or smartphone, is the information and communication technology that currently enjoys the greatest presence in the world population and on which young people spend the most time (Ditrendia, 2017). It has become an essential device in everyday life not only because of the multitude of applications and services it offers (Abdullah & Anshari, 2017), but also because of features such as portability (El-Hussein & Cronje, 2010; UNESCO, 2012), its small size, low cost (UNESCO, 2012), great connectivity to information networks (Organista-Sandoval, McAnally-Salas, & Favigne, 2013), immediacy in interpersonal communication (Pedrero, Rodríguez, & Ruíz, 2012), and the possibility of wireless connections (El-Hussein & Cronje, 2010; Organista-Sandoval, Serrano-Santollo, McAnally-Salas, & Favigne, 2013).

Moreover, the use of mobile technology in teaching, and particularly in higher education, has enabled it to become individualised and focused on the student rather than on the teacher, and this use has also allowed content, services, and information to be delivered beyond the classroom (Çelik & Yavuz, 2018).

Although there is no doubt that the SMP has made life easier for us in many aspects and has had a positive impact on personal and social development, there are also numerous studies about its negative effects on adolescents and young people, derived from its uncontrolled (Çelik & Yavuz, 2018) and improper use (Carbonell, Fúster, Chamorro, & Oberst, 2012; Oliva, 2007; Olivencia-Carrión, Pérez-Marfil, Ramos-Revelles, & López-Torrecillas, 2016).

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The majority of university students are in the so-called "emerging adulthood" age range. Almost all of them attend classes with an SMP (Organista-Sandoval, Serrano-Santollo, et al., 2013; Ruíz de Miguel, 2016); they are in a state of continuous connectivity and can use the SMP at any time, even if they are not authorised to do so. Educational research has been interested in knowing the influence of the use of the SMP, whether positive or negative, in the learning processes, the dynamics and transformation, as well as in students' academic performance, observing different positions. On the one hand, researchers highlight the usefulness and advantages offered for learning, considering it a support resource for the teaching-learning process (Organista-Sandoval, Serrano-Santollo, et al., 2013), or a pedagogical instrument that provides a new environment for learning, that is, m-learning or mobile learning (Figueroa, 2016). This latter term refers to the mobility of the technology, the learner, learning processes, and information flows (El-Hussein & Cronje, 2010). UNESCO (2012) highlights the enormous potential of applying mobile technology to education to extend access to it where it cannot be reached by other means, although this requires updating the pedagogical models and considering end users, both students and teachers.

On the other hand, the detractors of the use of the SMP during classes highlight that it has a great power of distraction (Organista-Sandoval, Serrano-Santollo, et al., 2013) and therefore can negatively affect not only the learning outcome but also the students themselves (Hawi & Samaha, 2016; Kuznekoff & Titsworth, 2013). Some researchers who share this view highlight the harmful effects of multitasking or divided attention, and the commutation of non-sequential tasks on academic performance (Junco & Cotten, 2011; Wood et al., 2012). This behaviour has been called "cyberloafing," in reference to the practice of activities that are not related to the task in hand, and that include sending messages, connecting to social networks, browsing the internet, and making purchases online, among others (Gökçearslan, Mumcu, Haşlaman, & Çevik, 2016; Tindell & Bohlander, 2012). A more recent work by Darghan and Strommer (2018) points out that not only is there a negative relationship between the total time devoted to the use of the SMP and academic performance, but that that effect almost doubles when only the time when it is used in class is considered.

There are several approaches to try to explain what can lead to making the use of SMPs problematic. Some studies have associated it with the personality traits of users that make them more vulnerable, such as extraversion (Bianchi & Phillips, 2005; Hong, Chiu, & Huang, 2012; Olivencia-Carrión et al., 2016) and impulsivity (Billieux, Van der Linden, & Rochat, 2008). While behavioural theorists point out the reinforcement involved in their use (Arias, Gallego, Rodríguez, & Del Pozo, 2012), more social perspectives suggest that the human being needs to be accepted and achieve recognition by the group. In any case, it is noted that both the increase in the time of daily use of the device and the pattern of use, referring to the type of application used and its purpose, are the strongest evidence found by research in relation to the problems that the SMP generates, including the decrease in academic performance of university students (Lepp, Barkley, & Karpinski, 2015).

With the intention of determining the university students' pattern of SMP use, studies have been carried out in several countries, such as those of Anshari, Almunawar, Shahrill, Wicaksono, and Huda (2017) in Brunei; Henríquez, Gonzáles, and Organista (2014) and Organista-Sandoval, Serrano-Santollo, et al. (2013) in México; Rodríguez, Restrepo, and García (2017) in Colombia; and Ruíz de Miguel (2016) in Spain. While all the authors point out that short messages on WhatsApp occupy the first place in frequency of use, this unanimity not only disappears when talking about other frequent uses, such as the music player, videos and photos, social networks, email, internet browsing, online learning, managing contacts, games, e-commerce, and other applications, but some of them are not even collected in all works. These discrepancies may be due to the disparity and ambiguity of the terminology used to obtain the data. However, these divergences disappear once one investigates the use of these devices as tools for learning (Anshari et al., 2017). Again, there is agreement that, with the intention of accessing the required information and communicating and organising with each other for the learning activity, they mainly use e-mail, social networks and WhatsApp messages (Figueroa, 2016; Gutiérrez-Porlán, Román-García, & Sánchez-Vera, 2018; Organista-Sandoval, Serrano-Santollo, et al., 2013). This may be due to the fact that higher education presents

training dynamics and performance characteristics inherent in the university system itself, similar in different countries, and that may give rise to particular uses of the SMP different from those that the university student can make of it in other areas. As Billieux, Maurage, Lopez-Fernández, Kuss, and Griffiths (2015) point out, the patterns of SMP use can change due to the influence of variables such as age, whether or not one has a partner, the occurrence of any important life event, and the occupation of the person (for example, being employed or unemployed, whether on holiday or working), we may think that being a university student can also be a variable that intervenes in the pattern of use.

Looking at age, García and Monferrer (2009) have provided a first paradigm for research into adolescents' SMP use. They developed a "typical-ideal" theoretical analysis proposal (2009, p. 87) of the use made of this instrument, responding to the functions it fulfils for them. This model is based on the idea that the SMP represents two dimensions in the adolescent. The first is a symbolic one, related to its appearance, the brand, the services offered, and the price. Adolescents use it to situate themselves socially in relation to their reference group and on it rests both the search for differentiation and the self-assertion of identity. The second is instrumental, which reflects that the SMP is a multipurpose tool with a double function: communication and play-expression. Communication integrates the conversational use through social networks of friends and family and other communications that respond to specific needs for a service, such as taxi, police, or ambulance, as well as being located. In play-expression, it is possible to differentiate between the play-expression use of the telephone to play games, listen to music or the radio, and the creative-expressive one that includes making or viewing photos and videos. This symbolic value has also been seen as responsible for the interest elicited in such devices among youths that perceive smart phones as a status symbol (Abdullah & Anshari, 2017) as well as young adults who are undertaking university studies and perceive the SMP as indicator of privilege, well-being, luxury, and modernity (El-Hussein & Cronje, 2010).

The study of Abdullah and Anshari (2017), also about SMP habits among youths but contextualised within the framework of the uses and gratification theory (UGT), noted the high relevance of SMP for youths by its usefulness as communication device as a mean to contact with family and friends, but also to get help in emergency and insecurity situations. In this way, and according to the UGT in the previous study, the use of the SMP by youths is not passive, meets their needs, and provides gratification.

Adopting a theoretical approach that is more focused on identifying SMP uses in higher education, Trinder (2005) notes the features of communication (e.g. calls, text messages, and e-mail), relaxation (e.g. watching films and personal videos; looking at photos and electronic documents; playing brain-training games; listening to audiobooks and music), organisation (e.g. calendar/schedule, address book, and to-do list), information management (e.g. addresses, internet browser, GPS, channels) and application use (e.g. text editors, file managers, databases, e-document readers). He highlights the sending of multimedia messages and short messages as the most popular uses in higher education.

The approaches taken by García and Monferrer (2009), El-Hussein and Cronje (2010), and Trinder (2005) mentioned above are consistent with the UGT, which helps us to understand the functions and uses of mobile phones based on the expectations and needs that they can satisfy. Moreover, the theory allows us to situate these in an interactive context in which SMP use is attributed to a combination of dispositions, psychological factors and environmental conditions (Katz, Blumler, & Gurevitch, 1974). Use of the SMP in the educational environment is, according to this theory, a way to satisfy the needs that arise in students' daily lives owing to psychological and environmental factors.

Based on the studies reviewed, the purpose of this work, unlike the approaches observed in previous research, is to verify empirically the presence of a model that integrates the different uses of the SMP while enabling us to know its specific uses in higher education. We have focused on the instrumental dimension with a double objective: on the one hand, to verify empirically if the theoretical model proposed by García and Monferrer (2009) for adolescents' use of SMP can be extended to the use that young people make of it in the context of higher education; and on the other hand,

to explore whether the model allows integration of the educational function for which university students use it. Being emerging adults, and given that these devices are currently so similar that the functional differences that may exist between them barely acquire a nuance of social differentiation in the university population, the symbolic dimension of the SMP has not been explored.

Given the instrumental nature of SMP use (García & Monferrer, 2009); the special link between the SMP and this generation's habits, lifestyle, and culture (Konstam, 2015); and its usefulness and benefits as a tool for learning (Organista-Sandoval, Serrano-Santollo, et al., 2013), our hope, which we put forward as a hypothesis, is that the educational dimension will emerge as a specific function of the instrumental dimension that is distinct from functions linked to communication and entertainment (i.e. play-expression). This will moreover demonstrate that, in the university context, SMP use of a relational nature (e.g. raising queries with classmates or creating work groups) or as a support in the execution of specific tasks (i.e. executive use such as translating or uploading and sending documents to professors) fulfils a specifically educational role that is distinct from the other instrumental functions (i.e. communicative and play-expressive).

Unlike previous investigations that are theoretically oriented (e.g. El-Hussein & Cronje, 2010) and focused on specific uses (e.g. Çelik & Yavuz, 2018), this study extends previous research to emerging adults, and it addresses the educational uses and functions of the SMP in higher education.

Method

Participants

A convenience sample which represented the total population of students enrolled in the first year of the four degrees that are taught in the Faculty of Education Sciences of the University of Granada was used.

To calculate the sample size, the simple random probabilistic sampling for the finite population of Tagliacarne (1968) was applied, this being representative of the population studied at a confidence level of 95%. Out of a total of 1,143 Spanish university students, 844 students participated in this study. Of these, 12% belonged to the degree of Pedagogy, 58.4% to Primary Education, 18.7% to Pre-school Education, and 10.9% to Social Education. The average age of the participants was 20.32 years (SD = 3.71, mean age = 18–46), with a distribution by gender of women = 76%, men = 24%, similar to that indicated in other research carried out with undergraduate students of degrees linked to the field of education (Puy, 2018).

Instruments

Instruments used to collect the data from this study were put together in a questionnaire that included socio-demographic and characterisation aspects of the sample, as well as uses and functions of the SMP.

"Sociodemographic data." Participants' age, year of study, and degree in which they were enrolled were collected through open questions. Gender, however, was obtained using a closed question.

"Functions of use of the smart mobile phone." In order to measure the use made of functions of the SMP by university students, two short ad hoc, independent questionnaires were prepared, which were answered using a Likert scale of four points (1 = nothing/never, 4 = always). The first, based on the theoretical distinction made by García and Monferrer (2009), had the purpose of measuring the differential use of the SMP for communication and as an element of play-expression. The second, however, evaluated its use as a resource of educational support. The items were drafted after the review of different works (Anshari et al., 2017; García & Monferrer, 2009; Henríquez et al., 2014; Organista-Sandoval, Serrano-Santollo, et al., 2013; Rodríguez et al., 2017; Ruíz de Miguel, 2016).

The first questionnaire consisted of seven statements that included different activities and the students had to indicate to what extent they used the SMP for them. After verifying the existence of a

matrix of significant correlations between the indicators, as well as the relevance of making the factorial analysis through the KMO test (.716) and the Bartlett sphericity test ($\chi^2 = 667.815$; df = 36; $n = 422$, $p < .001$), an exploratory factorial analysis of principal components and varimax rotation was carried out. The resulting factorial structure, as shown in Table 1, was composed of two factors that explained 54.65% of the variance.

The first factor, which grouped together activities linked to the play-expression function, was composed of three items. It presented a reliability coefficient for the sample of $\alpha = .72$ and explained 33.38% of the variance. The second factor, composed of four items ($\alpha = .60$), collected activities of a communicative nature and contributed 21.27% of the total variance. A confirmatory factor analysis offered satisfactory indexes of fit of the model ($\chi^2 = 87.07$; χ^2 / df = 13, $p < .001$; GFI = .93; AGFI = .94; RMR = .05; RMSEA = .08), thus showing the validity of the questionnaire.

For the measurement of the educational function, another questionnaire was drawn up with an initial version composed of seven statements (Table 2) that included activities of SMP use, and the student had to indicate to what extent they were carried out. After verifying the existence of a matrix of significant correlations between the indicators as well as the relevance of the realisation of the factorial analysis through the KMO test (.745) and the Bartlett sphericity test ($\chi^2 = 665.791$; df = 15; $n = 422$, $p < .001$), an exploratory factorial analysis of principal components and varimax rotation was carried out. The resulting factor structure was composed of two factors that explained 65.91% of the variance.

The first factor, composed of 3 items ($\alpha = .74$), explained 33.03% by variance, and referred to an executive academic use, that is, use of the SMP as a support tool in addressing university tasks. It brought together items that show the use of SMP as an instrument that supports learning. The second factor, constituted by three other items ($\alpha = .73$), showed the related academic use and explained 32.88% of the variance. A confirmatory factor analysis showed satisfactory indexes of fit of the model ($\chi^2 = 57.31$; χ^2 / df = 8, $p < .001$; GFI = .98; AGFI = .94; RMR = .05; RMSEA = .09).

With the intention of obtaining more complete information, these questionnaires included an open question in which each of the participants was asked to consider whether it was appropriate to specify other uses for which the SMP was used and, if so, what.

''Applications of the smart mobile phone.'' For the identification not only of the uses of the SMP but of the relative importance that each of them has for the student, there was a question listing thirteen of the students' most frequent uses. Each participant had to order them according to the use they made of each of them: make/receive calls, send text messages, games, banking or shopping, check email, video calls, social networks (Facebook or similar), view/post photos (Instagram or similar), browse the internet, listen to music/the radio, read, localisation, academic tasks, and others. This last option, as in the previous case, was an open option in which the students, if they considered it appropriate, could specify other uses of the SMP in their daily lives that were not previously indicated.

Table 1. Factorial saturations of each of the items referred to as the activities for which the SMP is used.

	Factores	
	1	2
View / display photos	.902	
Connect to social networks (eg Facebook or similar)	.900	
Browse the Internet	.477	
Make purchases or bank transactions		.755
Check the email		.663
Make / receive calls		.638
Make video-calls		.519

Table 2. Factorial saturation of the items referred to as the activities for which the SMP is used in the university academic field.

	Component	
	1	2
Translation	.856	
Solve spelling or gramatical questions	.849	
Upload / send documents to teachers or other students	.645	
Communicate with my colleagues when it comes to organising and agreing to do a task		.827
Consult my colleagues about my doubts		.795
Make working groups		.747

Design and procedure

The work presented here is framed in the context of a broader line of research focused on the study of factors that affect the personal development of emerging adults in educational and developmental contexts. In this case, we focus on understanding the relevance of the SMP in university education.

In this research, the survey form of the descriptive method is used (Cohen & Manion, 1990). Consistent with this method, for the collection of data (Mcmillan & Schumacher, 2005), as we have already explained, we designed a questionnaire that was presented to the respondents in a single paper booklet. It was administered during the month of May 2017 and before the students received it they were informed of the characteristics and purpose of the study, of its voluntary nature, and of the possibility of leaving the task at any time if they considered it appropriate. Those who decided to participate did not receive any kind of compensation for it. They answered the questionnaire in person in a theory class in some of the compulsory subjects of their degree. As an initial criterion for inclusion in the research, it was decided to include in the study only those students who said that they had a SMP, although in the end no one was excluded because everybody said they had one.

Data analysis

In order to avoid possible interference in the results of the study as a consequence of using the same sample of subjects for creating the instruments and for the collection of data associated with the objectives, the sample was randomly divided into two parts. Half of it was used for the process of preparing the measurement instruments, as a pilot study, and the other for the collection of data and its subsequent analysis in relation to the objectives of the research.

With the general aim of assessing the degree of correspondence between the theoretical models that are the focus of the analysis and that represent a theory that expresses relations between variables (that is, the different functions and uses of the SMP) and the data obtained from a sample, using goodness of fit indexes (Corral, Frías, & González, 2001), a confirmatory factorial analysis was carried out using structural equation techniques, using the maximum likelihood method. Data were analysed using the IBM SPSS Amos 21.0.0 programme.

Two models were evaluated: (1) a model based on an instrumental dimension and three functions called play-expression, communication, and education, distinguishing in the last between a relational and an executive use; and (2) a model based on an instrumental dimension and two use-functions of the SMP: play-expression and communication.

To measure the goodness of fit of each of the proposed models, the Chi-Square statistical indicator (χ^2) was used in order to estimate the difference between the proposed (theoretical) model and the saturated models formed by the relationships between the observed variables. In the event that the theoretical model is adequate, the value of the Chi-square statistic will be high and not significant ($p > .05$). To avoid possible effects derived from sample size (Bentler, 1990), two types of goodness-of-fit indexes were used. The RMSEA (Root mean square error of

approximation) was used as an absolute index, considering those lower than .08 as acceptable values of adjustment of the model (Browne & Cudeck, 1993) and those lower than .05 as well adjusted (Hu & Bentler, 1999). The CFI (Comparative fit index) (Bentler, 1990) and NFI (Normed fit index) (Bentler & Bonnett, 1980) were used as relative indexes, whose acceptable values are those higher than .90 (Hoyle, 1995). A comparative and parsimony index (AIC, Akaike information criterion) was also used (Akaike, 1987), which compares non-nested or non-hierarchical models, the better model having lower indexes.

To identify the importance given by students to the most frequent uses of the SMP collected in this work, popularity was used. Subsequently, each of the uses was ordered based on this statistic. The frequency of response was the statistic used to describe the different SMP uses, both in everyday life and in the academic context, not collected by the ad hoc questionnaires.

Results

Comparison between the models

The SMP use model based on an instrumental dimension composed of three functions, communication, play-expression, and education, the last distinguishing between a relational and an executive educational use, showed empirical support in the data ($\chi^2 = 138.53$; df = 61; $p < .001$, RMSEA = .05, CFI = .94, GFI = .95, NFI = .91, AIC = 198.53). However, the model based on an instrumental dimension with two functions, play-expression and communication, showed a poorer adjustment ($\chi^2 = 138.53$, df = 61, $p < .001$, RMSEA = .08, CFI = .93, GFI = .97, NFI = .91; AIC = 76.58). The graphic representations of the models as well as their solutions can be seen in Figures 1 and 2.

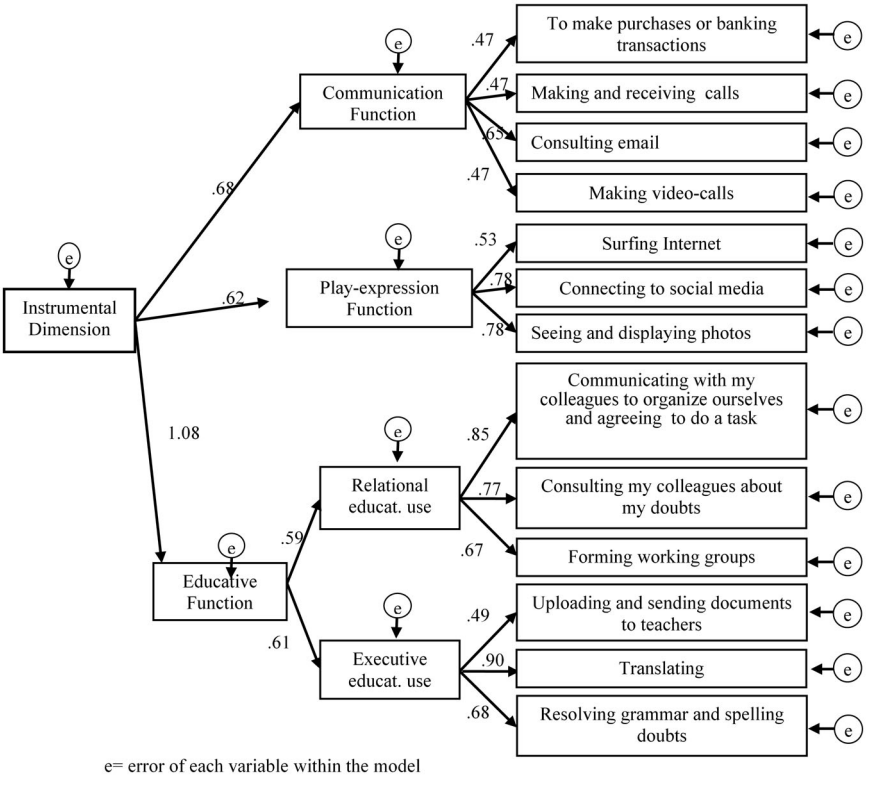

Figure 1. Model 1 made up of one instrumental dimension and three functions of use of the SMP (communication function, play expression and educational function).

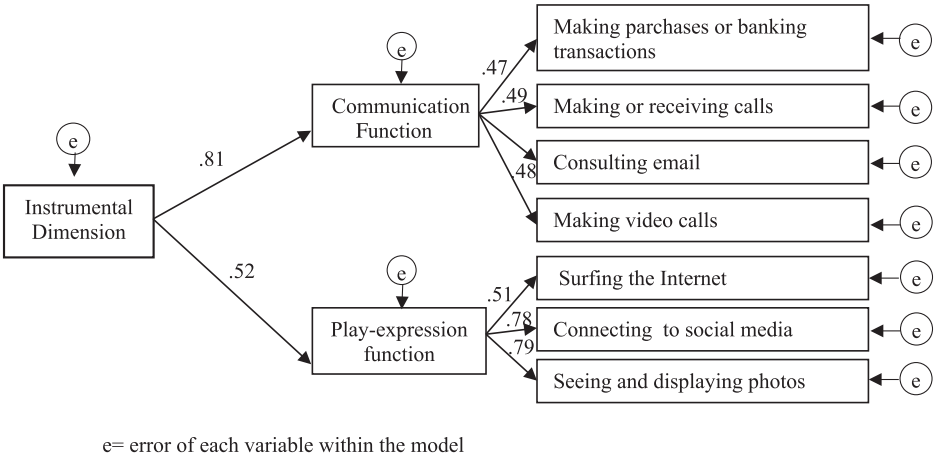

Figure 2. Model made up of one instrumental dimension and two functions of use of the SMP (communication function and play-expression functions).

Uses of the SMP by the university student

The most frequent uses that the university student makes of the SMP are the three functions indicated above. As can be seen in Graph 3, the most common are those of the communication function, with text messages occupying the first position. Although the educational use is present, it does not seem to be a priority.

The open questions about uses of the SMP not included in the questionnaires showed results consistent with the functions and uses reported in them.

Only 27 out of a total of 844 participants in the study gave additional educational uses of the SMP, which illustrates their limited use for this purpose. The responses included in its executive use reflect its use as a tool to search for information that allows them to resolve doubts (7), identify synonyms (5), consult notes (1), access teletraining platforms (6), and consult the university website (1) and on-line documentary sources (3). Likewise, the relational use included its use to write documents (e.g. Google Drive) (2) and to distribute tasks among classmates in the context of collaborative works (2) (Figure 3).

In contrast, 91 students added other uses of the SMP in everyday life different from those already mentioned, highlighting those corresponding to the play-expression function. Among these, they referred to viewing videos on YouTube (11), watching series or movies (3) and pornographic videos (3), reading the press, news, or other documents (14), finding the meaning of words (4), taking photos or videos (7), using it as a clock or alarm (6) or as a schedule or dairy (3), calculator (2), GPS (1), searching for work (2), exercising (1), taking a driving test (1), checking the time (1), and looking at clothing applications (without purchase) (1). The communicative function involved contacting family and friends using the Twitter and Snapchat communication applications (5).

Discussion and conclusions

The irrepressible technological development of the SMP seems to have intruded extensively in all fields of life of the university students, as the results of this study show by demonstrating the diversity of observed uses. These results are consistent with those of other works (e.g. Henríquez et al., 2014; Rodríguez et al., 2017; Ruíz de Miguel, 2016), in which its uses are collected daily, such as: surfing the internet, using the alarm clock, calculator, or calendar, accessing social networks, using email, games, taking photos and videos, and sending and receiving instant text messages on WhatsApp, among other applications, the latter being the most frequent use.

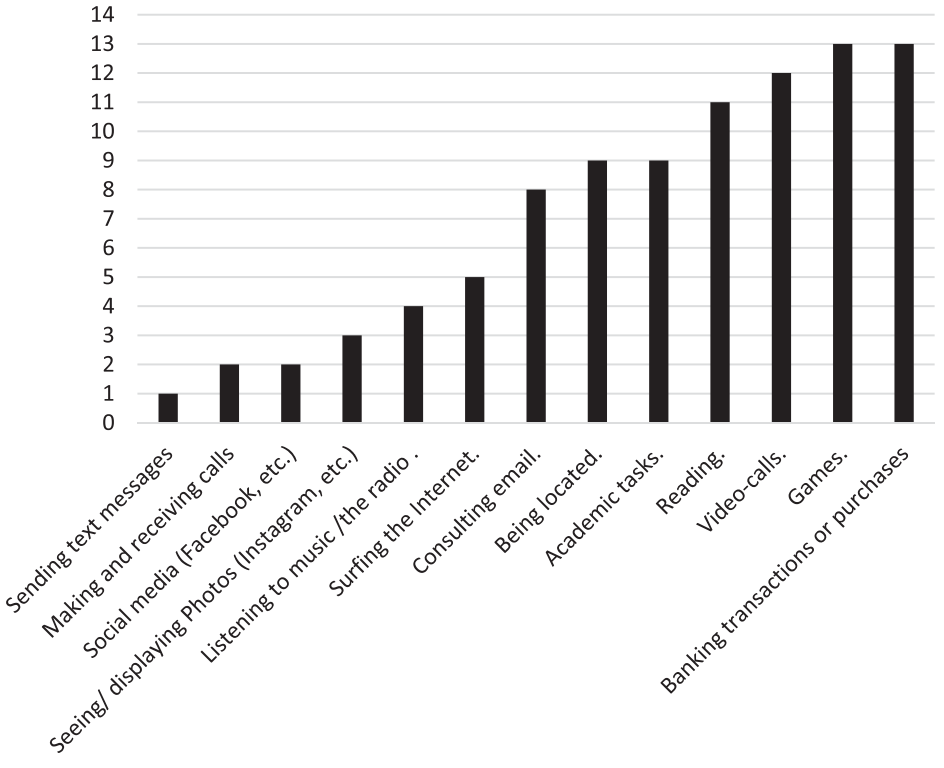

Figure 3. Uses of the SMP ordered according to the frequency of use [1 = 1st position] to least used [13 = Thirdteenth position].

A very significant part of the lives of these young people is academic, so the purpose of this work was to investigate the degree of penetration of the SMP in the university context through the uses made of it. In this area and taking as a reference the theoretical model for adolescents of García and Monferrer (2009), the objective was to establish empirically a model that would integrate the different uses, including the educational, that in some investigations was beginning to become evident. The results of this study showed not only that the model of use of the SMP proposed by the authors can be extended to higher education, but that it is improved and completed by including in it an educational function with two different uses. One is the relational, which refers to the communication aspects of academic and organisational issues among students; and the other, the executive, that considers it a support tool for educational tasks. This confirms the idea that the dynamics of the university context promote the educational use of this device, a use that seems to be specific to higher education.

This assertion is in line with the uses and gratifications approach, which argues that the social context that surrounds the person is related to the content that that person chooses from different media (Katz et al., 1974; Ruggiero, 2000). Therefore, we can say that being a university student is a variable that contributes to determining the pattern of use of the SMP, as is the case in other contexts (e.g. having a partner versus being single, or being employed versus being unemployed; Billieux et al., 2015).

According to the UGT, the subject selects the features of the medium that allow his or her needs to be met and therefore gratification to be achieved. Although the model's play-expression and communication functions offer a response to the needs to relax, socialise, be entertained, and escape, and thus feel gratified, the SMP's educational function contributes to the student's adaptation to the working methodologies and requirements that are particular to the university context. Therefore, the relational educational use allows the need to work cooperatively to be satisfied by getting

around time- and space-related drawbacks, whereas the executive use seems to answer the need for autonomy in learning. In both uses, gratification lies in the achievement of personal and collective goals of an academic nature, and not only in the satisfaction of the needs for communication or security (see Abdullah & Anshari, 2017) which are individual, defined in a general way, and without educative content.

In short, the educational function responds to motivations for SMP use that are of an instrumental nature – that is, a task-focused use.

On the other hand, these educational uses are not only consistent with those reported in other works (Anshari et al., 2017; Figueroa, 2016; Organista-Sandoval, Serrano-Santollo, et al., 2013), but also coincide with what Brown (2005) considers the two axes of mobile learning or m-learning: communication and access to information.

In the same line as the contributions of Anshari et al. (2017), we can say that although all the students in the sample have an SMP and take it to class, the data reveal that their use of it for educational purposes is very limited. What they say they use it for is only a small part of the actual use that can be given to this device for the purpose of enriching learning. Although this educational function is limited, the data show robust empirical support for its inclusion in the proposed use model. This may indicate that we are witnessing an incipient inclusion of this device in the learning dynamics of the university student, and therefore a transformation of the educational reality of universities. For this change to be possible, there must be a change in teaching methodologies. Given that this technology has modified even the knowledge hierarchy, it is necessary to investigate pedagogical use of it.

While it may be valuable to take advantage of the potential offered by the SMP to optimise learning, it is no less important to consider the effect that its other uses may have. Thus, as the data from our study provide, coinciding with those of Organista-Sandoval, Serrano-Santollo, et al. (2013), the main function of the SMP is play-expression, and it is necessary to take into account its presence in the classroom context to avoid interference in learning, such as distraction and "cyberloafing" (Gökçearslan et al., 2016; Tindell & Bohlander, 2012). And, as Chun, Golomb, & Turk-Browne (2011), and Mayer & Moreno (2003) cited in Junco & Cotten (2011) point out, sustained attention to the material is necessary for a time if there is to be learning.

In view of the above, the university education system cannot afford to ignore the presence of the SMP. A technology that, at a dizzying pace, is setting different patterns of learning and personal development in students cannot be ignored. In this context, future research should explore the conditions in which learning is fostered and enriched by the use of SMPs and those in which it is not. This is not a trivial issue either in terms of personal development, especially for the most vulnerable students. If the tendency to suffer disorders such as addiction to SMPs is directly proportional to the time of use of the device (Augner & Hacker, 2012; Martinotti et al., 2011), it would be advisable to assess whether promoting its use, even for academic purposes, can contribute unintentionally to the development of behaviours that converge in disorders. The objective of educational technology is to provide educational efficiency (Anshari et al., 2017), although it should not be at any price.

Therefore, indications of an educational nature that encourage its responsible use are necessary, and this can only be done from an explanatory framework, such as the one presented here, that allows the research to be oriented towards environmental factors that promote mismatched behaviours and an understanding of them from an evolutionary perspective (Kwan & Leung 2015, in Pedrero-Pérez et al., 2018).

Finally, we would say that this work has some limitations. One refers to the disparity and lack of terminological specificity found in the different studies, which has raised two issues: (1) that expressions such as instant messages, text messages, or WhatsApp did not have a common reference; (2) that the same use of the SMP could respond to different functions. Another limitation refers to the fact that the number of items with a closed question format used to obtain the information was insufficient, as shown by the answers given to the open questions that have been formulated in the questionnaires, although this option has given the opportunity to contemplate them.

This work is the first to offer a framework within which to analyse the uses and functions of the SMP in higher education, highlighting its rudimentary educational function. However, it is necessary to continue the research in order to develop this function and generate a paradigm that is sufficiently broad and flexible to accommodate the expansion of the uses of this device.

Disclosure statement

No potential conflict of interest was reported by the authors.

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