


Article

Future Teachers' Smartphone Uses and Dependence

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Abstract: Smartphones are indeed becoming an essential tool in the daily lives and relations of their users in recent years, thanks to their uses and potential. However, excessive and inappropriate use can lead to dependence syndromes. The objectives of our study were to ascertain how these devices are being used and whether students are at risk of addiction. The study was carried out based on a survey with students—future teachers—from two Spanish universities. A sample of 453 students between the ages of 18 and 47 was analyzed, 76.8% female and 23.2% male. Smartphones were found to be the preferred Internet connection device for 80% of students, 38% of students connect to the Internet five hours or more a day (which can be considered an addiction) and smartphones are used primarily to connect with others (social media and instant messaging). The abusive use of smartphones affects men's behavior more than women and can lead them to neglect other activities, while smartphones affect women more in the emotional field, in matters related to boredom, impatience, and irritability.

Keywords: smartphone usage; smartphone addiction; higher education; mobile digital devices; gender

1. Introduction

In the past years, the number of active mobile lines has rocketed to the point of exceeding the world's current population for the first time [1]. Having said that, there are significant differences between regions. Central and Eastern Europe (151%), Western Europe (129%) and South America (124%) have the highest penetration [2]. In Western countries, mobile telephone lines reach penetration rates close to 100% of the population. In Spain, specifically, there were 110.9 lines per 100 inhabitants in 2017 [3].

These figures explain the fact that smartphones are used every day by a large part of society and that they have changed the way we work and relate to each other, becoming increasingly indispensable instruments. Studies indicate that 92.8% of Spaniards use a smartphone every day to access the Internet [4], a percentage that rises to 99% in the case of young people. Sixty-one percent admit to checking their phones within the first five minutes after waking up, in the US, this percentage is 46% [5], but it increases to 66% if we look at young people between 18 and 24 years.

2. Literature Review

The use of smartphones has become a core part of university students' lives. They use smartphones in their academic activity to exchange information, coordinate group work, and consult services [6] and, in their daily life, to communicate, manage information, entertain themselves, play games, etc. [4,7]. This phenomenon is favored by the increasingly prominent features of this type of device: Touch

screens, Internet access, the possibility of installing all kinds of applications, digital cameras, GPS navigation, etc.

The vast potential of smartphones is coupled with their ability to multitask—understood as doing more than one thing at a time [8]—especially for students, as they are often connected to social media or chatting with friends while studying or working on academic activities. This situation adversely influences effective learning, as it is a major source of distraction [9] and can lead to poor academic performance.

Unsurprisingly, the use of computers decreases, giving way to the use of mobile devices such as tablets or smartphones [10]. 94.6% of Spaniards [4] use the smartphone to access the Internet, and this generates various problems: Physical pain in the neck [11,12], sleep disorders [13] or road traffic accidents affecting pedestrians and/or drivers [14–16]. Figures prompt reflection, such as the fact that between 2011 and 2017, 259 people died when doing a selfie [17]. On top of this, we have the problematic use [18] of these devices, understood as the compulsive use that leads to a disorder and deterioration of social relations, physical health, emotional well-being, or academic or work performance [19–22].

As for the educational use of smartphones, education is still held up in a “parallel” process in which these technological resources have not yet been analyzed, understood, or even included. Therefore, we find that some educational institutions are considering banning them completely in classrooms but others, on the other hand, welcome them and include them as another resource. Some studies say that the ban increases student achievement and that, because such increases are higher in students with lower levels, the smartphone ban can help reduce educational inequalities [23]. However, some experts say that smartphones should not be thought of as an object of distraction but as elements bearing education potential. If used in the latter way, a positive relationship could be found in students’ learning outcomes [24].

Regardless of this controversy, educational institutions, in today’s world, must tend to develop the capabilities that are demanded of individuals: Flexibility, connectivity, team player, etc. Therefore, this field still requires of further studies to analyze the use of devices, such as smartphones, in future teachers and ascertain whether they represent a problem in the activity and relationships of those who use them.

The objectives, therefore, of our study with future teachers were:

1. Ascertain their use of the Internet.
2. Find out about smartphone applications.
3. Determine whether students presented a problematic use of smartphones.
4. Analyze whether the gender variable is influential or not.

3. Material and Methods

3.1. Population and Sampling

We undertook a comparative, non-experimental study of Internet use and smartphone dependence in the university context.

An incidental accessibility sampling was carried out among university students of Education Sciences corresponding to two Spanish universities (Table 1), for them to complete a questionnaire. The participants made up a sample of 453 students, after having discarded 65 incomplete questionnaires.

Table 1. Universities and participants.

University	Participants
Malaga University	258
Autonomous University of Madrid	195

Of these, 105 were men (23.2%) and 348 women (76.8%), all between the ages of 18 and 47 ($M = 20.67$, $SD = 4.89$).

3.2. Instruments

A questionnaire was prepared for electronic and anonymous completion by the students to collect information. The data collection was carried out between February and May 2018. The students were duly informed, and their consent to participate in the questionnaire was sought beforehand in class. The link to the questionnaire was sent to them by email.

The questionnaire was made up of a total of 74 items divided into several sections:

1. Personal and connection data (university, gender, age, daily Internet connection time, device and place of connection). We relied on the items of Vega et al. for this section [25].
2. Use of the smartphone. We asked about the frequency of use of 11 types of functions, as proposed by Elhai et al. [26]: “Making and receiving voice and/or video calls”, “Sending and receiving instant text messages”, “Sending and receiving emails”, “Using social media sites”, “Surfing the Internet/Websites”, “Playing games”, “Listening to music/podcasts/radio”, “Taking pictures and/or videos”, “Watching videos/TV/movies”, “Reading books/magazines/newspapers”, “Viewing maps/navigation”.
3. Problematic use of smartphones. We used the smartphone addiction scale (SAS) by Kwon et al. [27], which consists of 48 elements.

For Sections 2 and 3, we used a six-point Likert scale from 1 = Never to 6 = Very often. The Cronbach alpha was applied to both, which yielded values of 0.942 for both.

3.3. Data Analysis

The data were analysed using SPSS v.20, which calculated the frequency and percentage of the variables regarding Internet use. A bivariate analysis was carried out using the χ^2 test between these and the gender variable. The mean and standard deviation were calculated for the use of smartphones. Finally, a factorial analysis was carried out for smartphone addiction items.

4. Results

The findings obtained in the research are presented in the following sections.

4.1. Internet Usage

In response to our first objective, which was to describe Internet usage, we analyzed the percentages of each of the items. The data obtained indicate that a large part of the student body is quite connected: 82.1% more than three hours a day ($n = 372$), 38.4% ($n = 174$) more than five hours (Table 2).

Table 2. Connection hours per day.

	Gender		Total	Percentage
	Female	Male		
Less than 1 h	0	3	3	0.7%
From 1 to 2 h	33	3	36	7.9%
From 2 to 3 h	39	3	42	9.3%
From 3 to 4 h	78	27	105	23.2%
From 4 to 5 h	75	18	93	20.5%
More than 5 h	123	51	174	38.4%
Total	348	105	453	100%

Significant differences are seen for gender and hours of connection per day ($\chi^2(5, N = 453) = 0.000$, $p < 0.005$), where women are seen to connect to the Internet for a higher number of hours than men.

To find out the incidence of the use of smartphones as a device to connect to the Internet, we asked students what means they used (Table 3). The most widely used is the smartphone (94.7%) followed by the netbook (68.9%).

Table 3. Internet connection device.

	Gender		Total	Percentage
	Female	Male		
Netbook	225	9	303	68.9%
Tablet	39	9	48	10.6%
Smartphone	342	87	429	94.7%
Personal computer	4	2	6	1.3%
TV/Console	3	3	6	1.3%

There are no significant differences regarding gender and connection device for netbooks and tablets, but there are in the use of smartphones ($\chi^2(1, N = 453) = 0.000, p < 0.005$), where a higher percentage of women (98.3%) use this device to connect to the Internet compared to men (82.9%).

Concerning where and how often they use the smartphone, a Likert scale with five points was used: 1 = Never, 2 = A few days a month, 3 = a few days a week, 4 = almost every day, and 5 = daily (Table 4).

Table 4. Where and how often you use your smartphone.

	Gender									
	Female					Male				
	1	2	3	4	5	1	2	3	4	5
At home			6 1.7%	15 4.3%	327 94%				9 8.6%	96 91.4%
In the University	3 0.9%	12 3.4%	42 12.1%	105 30.2%	186 53.4%	3 2.9%	12 11.4%	6 5.7%	33 31.4%	51 48.6%
While I move	21 6%	27 7.8%	54 15.5%	72 20.7%	174 50%	12 11.4%	9 8.6%	12 11.4%	18 17.1%	54 51.4%
On the street	18 5.2%	15 4.3%	60 17.2%	108 31%	147 42.2%	6 5.7%	6 5.7%	12 11.4%	30 28.6%	51 48.6%
In places of leisure and fun	42 12.1%	72 20.7%	93 26.7%	66 19%	75 21.6%	9 8.6%	30 28.6%	21 20%	18 17.1%	27 25.5%

There are no significant differences between gender and place of connection in any of the cases. The place where the smartphone is most used on a daily basis is the place of residence for both men and women (92.7% on a daily basis), the university (81.8% almost every day or daily) and means of transport (69.6% practically every day or daily).

4.2. Smartphone Applications

A Likert scale with 6 points was used to determine the frequency of use of the following phone functions: 1 = Never, 2 = Rarely, 3 = Occasionally, 4 = Somewhat often, 5 = Often and 6 = Very often. Table 5 shows that the most frequent uses are social media, instant messaging, Internet browsing and listening to music/podcast/radio. The least frequent uses are to play games, read (books, magazines, newspapers) and consult maps.

Table 5. Smartphone functions.

Functions	Average	Standard Deviation
Make and receive voice and/or video calls	3.61	1.293
Send and receive instant text messages	5.34	1.262
Send and receive emails	4.26	1.137
Use social media sites	5.35	1.070
Surfing the Internet/Websites	4.92	1.047
Play games	2.78	1.372
Listen to music/podcasts/radio	4.72	1.360
Take pictures and/or videos	4.27	1.457
Watch videos/TV/movies	4.38	1.461
Read books/magazines/newspapers	3.40	1.278
Consult maps/navigation	3.40	1.142

There are no significant differences between gender and phone functions in any of the cases.

4.3. Problematic Use of Smartphones

For the 48 items that make up the SAS of Kwon et al. [27], a factorial analysis was used, in particular, the rotation technique because it is assumed that they are correlated with each other, therefore, they are not independent.

For the anti-image analysis, variable 27 was eliminated, as it had the lowest correlation value. Using Bartlett's spherical contrast (χ^2 (gl = 1081, $N = 453$) = 14,785.035, $p = 0.000$), there are grounds to say that they correlate in the subjects studied, so the correlation matrix is suitable for factorisation. The Kaiser–Meyer–Olkin sample adequacy measure (KMO = 0.901) also indicated that the correlation matrix was suitable for analysis.

A non-excessive number of factors is essential to achieve a clear factor structure. In this case and due to a large number of variables, if the analysis of the main components with Varimax rotation with Kaiser is used as an extraction method, it would result in 10 components with values greater than one. If the Cattell Scree test [28] procedure is chosen, which uses the sedimentation graph to see in which factor a clear inflection in the descending line is observed, we would have three factors. The latter method does not explain a large percentage of the variance. An intermediate solution considering six factors, which explained 57.074% of the variance (Table 6), was chosen in the end.

The rotated component matrix was used to check which items made up each of the factors. Table 7 shows the labels used for each one, the items that compose them and a brief explanation of them.

The first explained 35.35% of the variance and consisted of items 45, 46, 5, 47, 4, 44, 8, 2, 3, 34, and 48 of the questionnaire. Considering its content, this first factor was labeled as *excessive use and physical consequences*, as they refer to overuse and its physical implications.

The second factor, composed of eight items (21, 23, 19, 20, 25, 26, 15, and 28), explained 6.8% of the variance. It was labeled as *emotional consequences* when grouping items in which irritability, impatience, depression, and stress were manifested when using a smartphone or experiencing the impossibility of doing so.

The third factor explained 4.18% of the variance and consisted of items 18, 14, 7, 38, 6, 39, 17, 16, and 9. They refer to attributing fun or tolerance to smartphone use or inability to perform tasks and duties due to excessive use. This factor was labeled as *feelings and non-compliances*.

Items 10, 11, 12, 13, and 30 make up the fourth factor, labelled as *safety/wellness*, by attributing safety or well-being to the use of the smartphone. They explain 3.92% of the variance.

The fifth factor, labelled as the *physical proximity of the device*, is comprised of items 24, 40, 35, 41, 29, 43, and 42 and explained 3.55% of the variance. They encompass the need to have the smartphone physically close by and use it repeatedly.

Table 6. Total variance explained.

Component	Initial Self-Values			Sum of the Extraction Saturations Squared			Sum of the Rotation Saturations Squared		
	Total	% of variance	% cumulative	Total	% of variance	% cumulative	Total	% of variance	% cumulative
1	16,615	35,351	35,351	16,615	35,351	35,351	5,786	12,312	12,312
2	3200	6809	42,160	3200	6809	42,160	5749	12,233	24,544
3	1967	4185	46,345	1967	4185	46,345	4523	9623	34,167
4	1846	3928	50,274	1846	3928	50,274	3671	7810	41,977
5	1672	3557	53,831	1672	3557	53,831	3602	7664	49,641
6	1524	3243	57,074	1524	3243	57,074	3493	7433	57,074
7	1461	3109	60,182						
8	1366	2906	63,088						
9	1132	2409	65,496						
10	1120	2383	67,879						
11	991	2108	69,987						
12	934	1988	71,975						
13	881	1876	73,850						
14	813	1729	75,580						
15	738	1570	77,150						
16	714	1520	78,670						
17	694	1476	80,146						
18	650	1382	81,528						
19	638	1358	82,886						
20	551	1173	84,059						
21	528	1124	85,183						
22	523	1112	86,295						
23	482	1025	87,320						
24	465	990	88,310						
25	428	911	89,221						
26	397	846	90,066						
27	386	821	90,887						
28	381	810	91,697						
29	364	775	92,472						
30	327	695	93,167						
31	316	671	93,838						
32	299	637	94,475						
33	277	588	95,063						
34	245	522	95,585						
35	233	496	96,081						
36	231	492	96,573						
37	215	457	97,030						
38	194	413	97,443						
39	187	399	97,842						
40	176	373	98,215						
41	163	346	98,561						
42	140	298	98,860						
43	129	275	99,135						
44	119	252	99,387						
45	115	244	99,631						
46	93	198	99,829						
47	81	171	100,000						

Finally, the sixth factor explained 3.24% of the variance and consisted of items, 33, 37, 36, 32, 31, 1, and 22. They refer to the difficulty of curbing the use of telephones and the family problems they entail.

Concerning gender, there are significant differences in factors 2 and 3 (see Table 8: ANOVA one-way analysis of variance).

Table 7. Factors.

Component	Variance	Items Forming It	Description
1. Excessive use and physical consequences	35.351	45, 46, 5, 47, 4, 44, 8, 2, 3, 34, 48	<p>I've tried over and over again to shorten the time I use my phone, but I don't seem to manage it</p> <p>I always think I should shorten the time I use my phone for</p> <p>I feel tired and sleepless due to excessive phone use</p> <p>The people around me tell me that I use my phone too much</p> <p>I feel pain in my wrists or behind my neck while using the phone</p> <p>I feel the need to use my phone again after I stop using it</p> <p>I have family conflicts due to my use of the telephone</p> <p>I have trouble concentrating in class, while doing homework or while working due to telephone use</p> <p>I experience dizziness or blurred vision due to excessive telephone use</p> <p>I constantly check my phone, so I don't miss conversations between other people on Twitter, Facebook, WhatsApp ...</p> <p>I prefer web browsing on my phone to doing it on computers</p>
2. Emotional Consequences	6.809	21, 23, 19, 20, 25, 26, 15, 28	<p>I think about my phone even when I'm not using it</p> <p>I get irritated when people bother me while I'm using my phone</p> <p>I can't be without a phone</p> <p>I feel impatient and upset when I'm not using my phone</p> <p>I feel depressed, anxious, or hypersensitive when I can't use my phone</p> <p>I feel stressed when I'm not in a Wi-Fi area or don't have data</p> <p>I have used the phone just to feel good</p> <p>I feel bored while doing other things without my phone</p>
3. Feelings and breaches	4.185	18, 14, 7, 38, 6, 39, 17, 16, 9	<p>Using a phone is the most entertaining thing you can do</p> <p>There's nothing more fun to do in my life than to use the phone</p> <p>Due to the use of the phone, I neglect other matters, even when there are many other things to do</p> <p>I try to hide what I've been doing with my phone</p> <p>I feel unable to do anything without a phone, such as timetables and personal matters that I keep on the phone</p> <p>I can't keep my appointments due to excessive phone use</p> <p>I feel more tolerant while using a phone</p> <p>My life would be empty without my phone</p> <p>I experience auditory hallucinations of telephone sounds while I am not using it</p>
4. Safety/well-being	3.928	10, 11, 12, 13, 30.	<p>I feel at peace or calm while using the phone</p> <p>I feel good or excited while using the phone</p> <p>I feel safe while using the phone</p> <p>I am able to get rid of stress by using the phone</p> <p>I feel great meeting people over the phone</p>

Table 7. Cont.

Component	Variance	Items Forming It	Description
5. Physical proximity of the device	3.557	24, 40, 35, 41, 29, 43, 42	I take my phone to the bathroom, even when I'm in a hurry to get there I have used my phone when I shouldn't (in class, during a meeting, etc.) I check social media feeds like Twitter, Facebook or WhatsApp as soon as I wake up I'd rather search with my phone than ask other people I feel relieved with my phone next to my bed when I go to sleep I use my phone for longer than I expected My fully charged battery doesn't last an entire day
6. Relationships	3.243	33, 37, 36, 32, 31, 1, 22	I feel that my "phone" friends understand me better than my real-life friends I don't mind spending money on phone apps I'd rather hang out talking with my friends on the phone than with real-life friends or other family members Not being able to use my phone would be as painful as losing a friend I feel that my relationships with my friends over the phone are more intimate than my relationships with my real-life friends I miss/do not go to scheduled work events due to telephone use I will never give up using my phone, even though my daily life has already been greatly affected by it

Table 8. Differences according to gender.

	Gender	Average	Standard Deviation	F	p
1. Excessive use and physical consequences	Female	-0.021	0.95	0.719	0.397
	Male	0.072	1.13		
2. Emotional Consequences	Female	0.093	0.98	13.517	0.000
	Male	-0.31	0.97		
3. Feelings and breaches	Female	-0.13	0.90	31.346	0.000
	Male	0.46	1.16		
4. Safety/well-being	Female	0.01	0.98	0.585	0.445
	Male	-0.06	1.04		
5. Physical proximity of the device	Female	0.014	1.00	0.297	0.586
	Male	-0.04	0.98		
6. Relationships	Female	-0.05	1.02	4.026	0.045
	Male	0.17	0.88		

5. Discussion

Internet access has undoubtedly become a core part of our daily lives regardless of our age, whether we are at home, work or school, and for all purposes such as leisure, communication, information, etc.

This phenomenon has become all the more visible in teenagers and young adults. It is a fact that is generating a social alarm, to the extent of becoming labelled as an addiction if used excessive and inappropriately. Some authors have set the limit of such addiction at about 30 h a week [29]. Bearing in mind that 38.4% of our students spend 35 h a week (five or more hours a day) connected

to the Internet (in line with other studies [30–33]), we could safely say that they have addiction problems and that they may be prone to developing adverse symptoms at physiological, cognitive and behavioral [34–37] levels.

As far as gender is concerned, men spend more time connected to the Internet than women, along the lines of other studies [25].

As for the device used to connect to the Internet, the preferred one by more than 80% is the smartphone [25,38,39], where more women (98.3%) use it compared to men (82.9%), followed by the netbook.

The most commonplace of daily connection is people's homes (92.7%) and university (51%), followed by means of transport (50.7%) [32,40].

The most frequent uses of the smartphone are: Connecting with others (social media and instant messaging) [32,41,42], searching for information and listening to music. The least frequent are: Games and reading. It is precisely the multiple activities that can be carried out at the same time, that feed two types of needs (social interaction and solitary stimulation), that in turn, feeds the addiction to the Internet. Eighty-five percent of students say they use instant messaging often or very often and 83% use social media and highlight their need to keep in constant contact with their peers [31,43,44].

When it comes to problematic smartphone use, women, on the one hand, are more emotionally involved than men (they cannot be without the smartphone, they think about it, get impatient, get bored and depressed when they do not use it, they feel good about using it and get irritated if bothered). On the other hand, more and more men consider the use of smartphones as the most fun and entertaining activity, without which their life would be empty, to the point of neglecting other issues and missing appointments and feeling unable to do anything without their smartphone, because of their dependence on the device. They would even try to hide what they have been doing with the phone and experience auditory hallucinations of phone sounds while they are not using it [45].

6. Limitations of the Present Study

Regarding the limitations of the study, first, the restrictions of transversal research should be highlighted, such as the difficulty of clearly establishing cause and effect relationships. Secondly, there were sampling issues because the sample is small and comes from two universities, which makes any generalization of results somewhat challenging. It would, therefore, be advisable to continue with longitudinal studies, of larger samples and using other forms of measurement beyond self-reporting.

7. Conclusions

The use of mobile phones by future teachers makes it clear that we are facing a reality to which we have to respond from the faculties of education. Offering good practices and appropriate training to the learning environments in which they will work in the future.

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