The New Educational Review

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Educational Uses of Mobile Phones by University Students in Spain

Abstract

This article describes some of the results obtained from the MICINN EDU 2010–17420 research project. One aspect focuses on the academic use of mobile telephones by Spanish students in 2012. The data collection techniques used for the study were questionnaires, discussion groups and "life histories". The sample comprised students from five Spanish universities (342 participants). Analysis of the results highlighted the different academic uses of smartphones compared to non-smartphones.

Keywords: *telematic obesity, nomophobia, ubiquitousness, non-smartphones, smartphone*

1. Introduction

Since 2010, the Spanish Ministry of Science and Innovation has been trying to find out what use is being made of information and communication technology (ICT) in Spain. The UNED Consolidated Research Group (RADTE) has been carrying out research into this issue since 2004 through R&D projects SEJ 204–06803 and MICINN EDU 2010–17420. The interests of both organisations converged in a study undertaken by RADTE in 2013 at the universities of Oviedo, Vigo, Granada, Universidad Nacional de Educación a Distancia (UNED) and Complutense de Madrid (Spain). The topic of our study seeks to respond to ministerial concerns. Research activity has focused on the ubiquitous learning undertaken by higher education students in Spain via a number of mobile devices.

The academic world takes the view that there is a direct link between the notion of ubiquitous learning and the ability of mobile devices to supply highly interconnected educational environments. Some research studies (Meawad & Stubbs, 2008; Marin & Mohan, 2009; Kukulska-hulme, 2009; Liu & Hwang, 2009; Hwang, Kuo, Yin & Chuang, 2010; Liaw, Hatala & Huang, 2010) indicate that learning anywhere anytime is equivalent to some form of *mobile learning. Ubiquitous learning* (u-learning) has led to a new paradigm shift towards collaborative, connective and heterarchical learning. The RADTE Research Group supports these conclusions, as did Sakamura & Koshiznka (2005). These researchers found that ubiquitous learning seemed to be a new educational paradigm made possible with the use of new digital media.

To ascertain the level of ubiquitous learning of higher education students in Spanish universities, a representative sample from this group were asked questions about the academic use they make of their mobile devices. A sample of three hundred and forty-two (342) higher education students enrolled on humanities and social sciences courses was selected from the five Spanish state universities studied. Students in the sample completed a questionnaire, took part in a discussion group and gave their own personal account. The topics covered by the data collection tools centred on the academic use that the students made of each of the mobile devices that could provide ubiquitous learning. Analysis of the data collected led to quantitative and qualitative conclusions.

This article describes the academic use of mobile telephones by the study sample. Mobile phones might be regarded as being unsuitable hardware for use in ubiquitous learning. The results obtained show that they are indeed suitable. It will also make a comparison between the type of use of the non-smartphone and the smartphone.

A smartphone is a mobile telephone equipped with a series of advanced data handling and storage capabilities. It has integrated personal information management software enabling specific software to be downloaded from internet sites. In short, a smartphone can be regarded as a new type of hardware that is similar to a laptop computer incorporated into a mobile telephone. This device is the latest manifestation of the idea of wireless communication formulated by Marconi in 1884 with the invention of the radio. Nowadays, wireless communication that first appeared in the radio is used for all mobile and landline telephone hardware. The range of uses of mobile phones has broadened. They are not used solely for communicating verbally with another person. Neither are they used for sending voicemail or text messages. The mobile phone has evolved. Current mobile phone technology has resulted in a new concept of multidirectional communication via intelligent phones, or smartphones.

Table 1 shows examples of this multidirectional communication in some of the smartphone functions used by university students in Spain.

Table 1. Smartphone functions used by university students

Functions	Tasks
Multimedia	Playing compressed music, playing compressed videos, using stills and video camera, accessing radio and TV
Gaming	Accessing games controlled by touchscreen or keyboard
Electronic diary	Managing notes, using wake-up alarm, tasks, telephone directory, calendar, etc.
Office automation	Word processing, spread sheets, PDF file reader
Communication	Internet access, Wi-Fi data transmission, SMS and MMS, multimedia messaging systems
Connection interface	Tethering or using the mobile phone as modem to access the Internet on a conventional computer
PTT function	Enables person-person or person-group communication
GPS function	Device tracking and sending specific geographic coordinates

Excessive or uncontrolled mobile phone use can give rise to certain disorders in users with a particular profile (*telematic obesity*). In addition to addictions, it can also be the cause of mental illness, which may be manifested in the symptoms of *nomophobia*. The term *telematic obesity* is the name given to the obsessive compulsive disorder involving the irrational acquisition of every item of hardware and software appearing on the market. It does not apply only to mobile phones. *Nomophobia* is described in the latest clinical psychology as the irrational fear of being out of mobile phone contact. This psychological imbalance suffered by mobile phone addicts has symptoms similar to any other psychosocial disorder: anxiety, mood swings, irritability and lack of concentration in the person affected.

The study concentrated on both distorting factors. To give the study more general validity, the consistency of the sample was strengthened from the time of its selection. The 0.02% of Spanish students who admitted to suffering from nomophobia or telematic obesity were excluded from the study. The aseptic constitution of the sample allows for the extrapolation of the results obtained to the whole Spanish university student population in the 2012/2013 academic year.

1.1. Ubiquitous learning

University has traditionally been thought of as a learning environment. The main feature of learning has always been transfer activity. Knowledge transfer

manifested itself in the mobility of the object containing the information. Historically, the mobility of learning has successively taken the form of the transfer of written works, printed books and computing devices developed on static media. Now, these circumstances have changed. A new form of learning has emerged: mobile learning. Mobile learning is a method strategy that does away with the fixed nature of learning material while safeguarding permanent access to instruction. Education has made the most of the constant interaction that this teaching model sets up between all levels of the education community (Vázquez Cano, Sevillano García, Méndez Pérez, 2011: 183). Mobile learning has revolutionised people's lives and their academic excellence (Lozano, Marcos & Támez, 2009).

Mobile learning enables current education to be ubiquitously available because of the proliferation of services it offers based on audio and video. Mobile learning and the principle of ubiquity (Weiser, 1993) applied to teaching are producing evolution in the basic features of conventional e-learning. Conventional e-learning along with the extraordinary development of digital devices means that ubiquitous learning is not merely a practical possibility. Ubiquitous learning can now be regarded as a social imperative (Cope & Kalantzis, 2009).

The ubiquitous tool is conceived as a complementary tool to classroom education. This tool allows teachers to offer educational support and suggest educational activities to their students in different curricular timetables. Ubiquitous learning produces an educational environment that can adapt to dramatic technological change. This learning model demands that everyone involved, managers, teachers and students alike, play an active part in virtual educational communities. This is where interaction with the sociocultural background takes place.

There are very few ubiquitous learning initiatives. Villa, Tapia & López (2010) argue that ubiquitous learning is beneficial for students. This type of learning enables individually tailored teaching to be delivered. It is an "anywhere anytime" method of teaching, both in spatial and temporal terms, if active mobile devices with Internet access are available. In Spanish universities, the change in teaching behaviour between digital natives and e-users is tangible. Today's university students take an approach to education that avoids the search for specific data (McLester, 2007). They base their learning on exploring, looking up and summarising knowledge. They avoid absorbing content supplied by a single validated source of knowledge, like that delivered by a book or by a teacher giving lectures (Dede, 2005). The change in their attitudes to teaching, together with the proliferation of mobile audio and video services makes ubiquitous learning easy for today's university students. Mobile phones are the most frequently used devices for ubiquitous learning.

2. Research Methodology

The study was designed as mixed research, using techniques with varying levels of structure, ranging from quantitative to qualitative. The main data collection techniques used were surveys to obtain quantitative data on the use of mobile devices by higher education students. The sample consisted of a broad range of ethnic groups to understand the sociocultural dynamics underpinning the use of mobile devices in the study population. The ethnographic method was used to collect "life histories". In-depth interviews were carried out to understand subjects' own perspectives and experiences and to obtain direct information about the object of the study.

The study population consisted of higher education students who were mobile device users. The sample selection involved a segmentation process that ensured Spanish higher education institutions were properly represented. The sample scope was that of students at the universities of Vigo, Oviedo, Granada, Universidad Nacional de Educación a Distancia (UNED) and Complutense de Madrid not affected by telematic obesity or nomophobia.

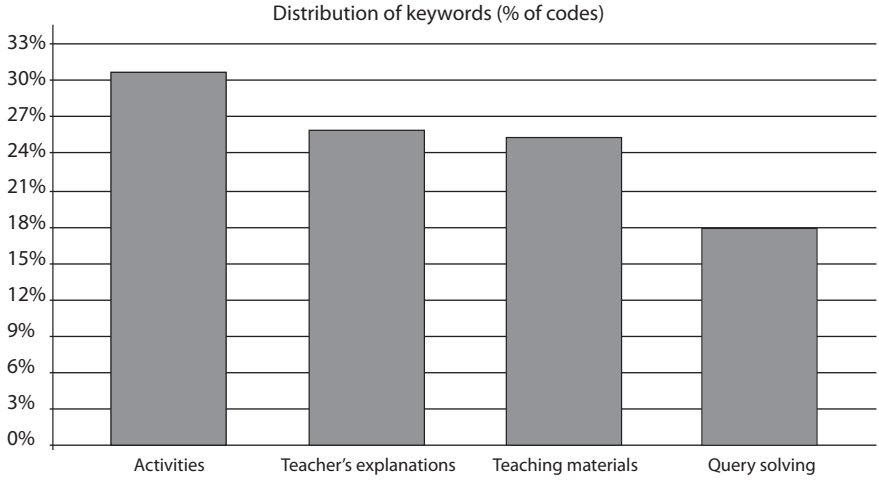
2.1. Procedure

Analysis of the protocols showed the actual situation and a series of concepts that exceeded and transcended the generic idea of the mobile phone. Impacts were grouped by type or variant. This step provided a segmented view suggesting that a category prototype should be drawn up. The category prototype enabled subcategories within the learning macro-concept to be identified, which explained and clarified the main category. These subcategories were referred to as: activities carried out to acquire knowledge. Benefits encountered in the use of mobile phones. Problems encountered in the use of mobile phones. Skills gained from using mobile telephones for educational purposes. In terms of methodology, key, identifying and situational terms were sought that could encapsulate the overall existential context obtained. It was decided to use random choice of protocols by applying the n-1 formula (n was given the initial value of 20). The protocols selected were 1, 19, 38, 57, 76, 95, 114, 133, 152, 171, 190, 209, 228, 247, 266, 285, 304, 323, 342, etc. The methods for extraction and analysis enabled the texts grouped by type of device to be identified in narrative format and grouped in categories. Interviewees had responded with their own personal accounts to the question "learning obtained by using various mobile devices that could be applied ubiquitously".

2. Research Results

The questionnaire responses are shown in two bar charts.

Graph 1. Uses of non-smartphones



Graph 2. Smartphone uses

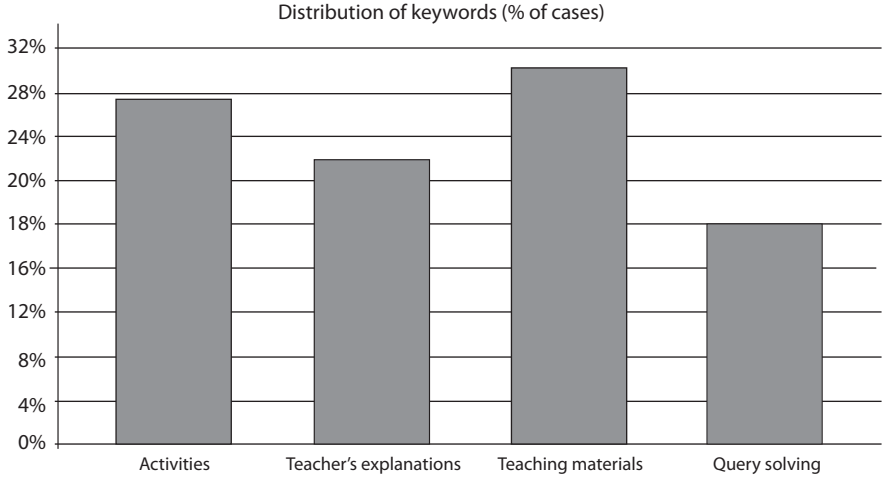


Table 2 shows the academic uses of non-smartphones and smartphones in descending order.

Table 2. Academic uses of non-smartphones and smartphones

ACADEMIC USES OF MOBILE PHONES (% cases)		
ORDER	NON-SMARTPHONES	SMARTPHONES
1	Carrying out activities (36.3%)	Access to teaching material (34.1%)
2	Teacher's explanations (27.4%)	Carrying out activities (31.1%)
3	Access to teaching material (27.4%)	Teacher's explanations (25.9%)
4	Query solving (20.0%)	Query solving (20.0%)

The information in Table 2 is expanded with conclusions drawn from discussion groups and "life histories". These qualitative data collection techniques specified the activities carried out, mainly, on each type of device. Their contributions are shown in Table 3.

Table 3. Educational activities with non-smartphones and smartphones

ACADEMIC ACTIVITIES CARRIED OUT	
NON-SMARTPHONES	SMARTPHONES
Reading newspapers via text messages (instant messaging)	Reading digital editions of newspapers
Communicating with classmates (instant messaging)	Conceptual query solving on Internet sites
Arranging to meet classmates (agenda)	Synchronising e-mail to the smartphone
Jotting down exam dates and essay deadlines (agenda)	Using Facebook and Twitter social networks
Making notes of things to remember (notepad)	Learning languages
Searching for terms in the dictionary	Group calls
Listening to the radio	Using WhatsApp
Tracking time during exams (clock)	Playing images, sound, videos and films
Sending images via Bluetooth	Writing with the word processor
Doing calculations (calculator)	Sharing notes with classmates
Recording classes (sound recorder)	Recording videos
Developing coordination and logic (games)	Taking photos and finding out about the monument photographed
Taking photos	Accessing the virtual campus for a particular subject
	Graphic designs
	Doing complex mathematical calculations
	Using the smartphone as a computer

Table 4 shows the method used to follow the teacher's explanations via non-smartphones and smartphones. The data was obtained using qualitative data collection techniques.

Table 4. Teacher's explanations with non-smartphones and smartphones

TEACHER'S EXPLANATIONS	
NON-SMARTPHONES	**SMARTPHONES**
Jotting down exam dates and essay deadlines (agenda)	Taking photos and finding out about the monument photographed
Making notes of things to remember (notepad)	Conceptual query solving on Internet sites
Searching for terms (dictionary)	Writing with the word processor
Communicating with classmates (instant messaging)	Accessing the virtual campus for a particular subject
Taking photos	Making a video recording of the class
	Sharing notes with classmates
	Doing complex mathematical calculations
	Group calls
	Using the smartphone as a computer
	Using social networks
	Graphic designs

Table 5 shows the strategies for accessing teaching material via non-smartphones and smartphones described in the discussion groups and the "life histories".

Table 5. Accessing teaching material

ACCESSING TEACHING MATERIALS	
NON-SMARTPHONES	**SMARTPHONES**
Making a note of where to find them (notepad)	Accessing the virtual campus for a particular subject
Asking classmates for them (instant messaging)	Accessing web sites
Taking photos	Writing with the word processor
	Making a video recording of the class
	Sharing notes with classmates
	Using the smartphone as a computer
	Accessing social networks

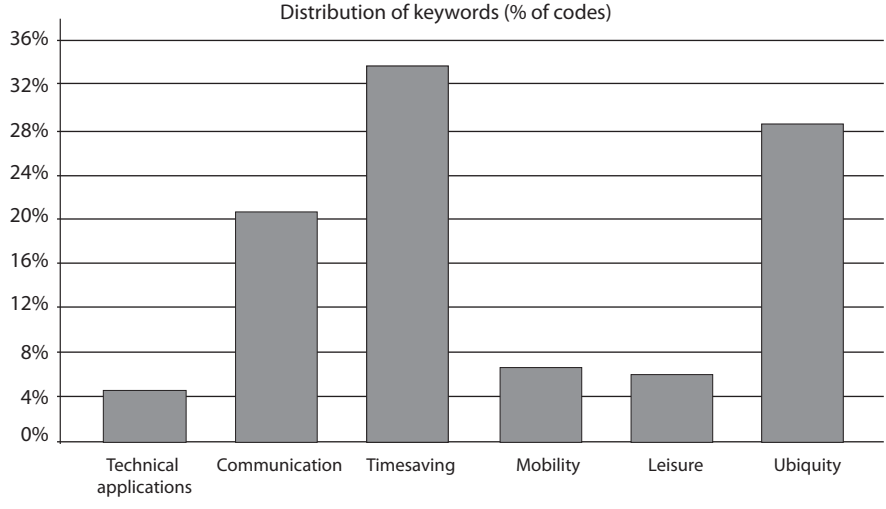
Table 6 shows the academic use made of non-smartphones and smartphones for query solving, as described in the discussion groups and "life histories".

Table 6. Query solving

QUERY SOLVING	
NON-SMARTPHONES	SMARTPHONES
Asking classmates (instant messaging)	Accessing the virtual campus for a particular subject
Checking the dictionary	Accessing web sites
	Playing the video of the class
	Accessing social networks
	Sharing notes with classmates
	Using the smartphone as a computer

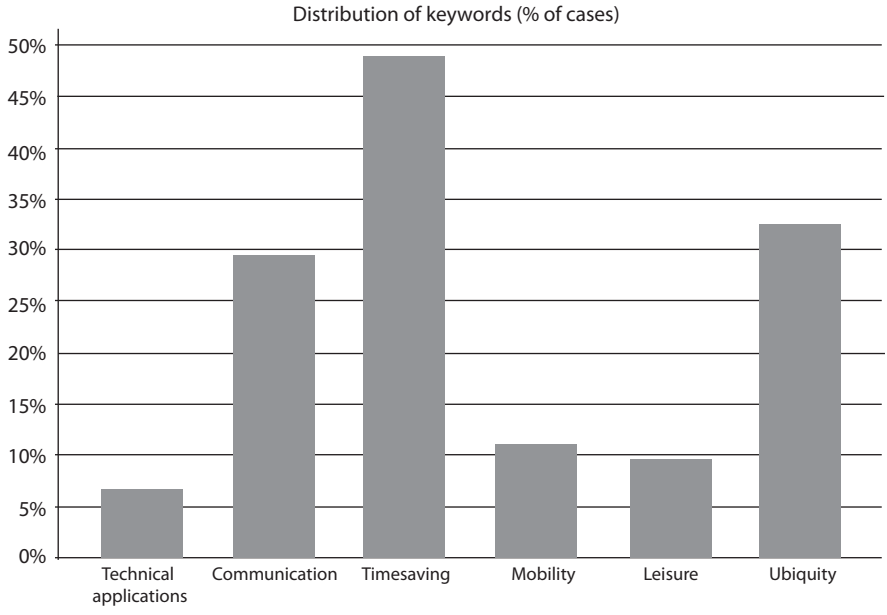
The sample studied highlighted the advantages of using mobile phones for academic purposes. Graphs 3 and 4 show the advantages and percentage assigned to each advantage.

Graph 3. Advantages of using non-smartphones for academic purposes



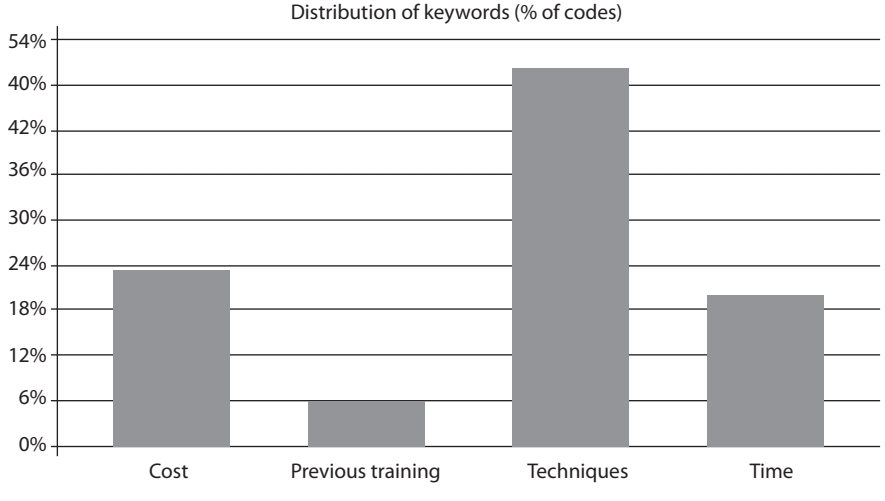
Contrary to what might be expected, there were no significant differences between the advantages of using non-smartphones and smartphones. In both cases, the following were described as advantages (in the same order, but with different percentages): timesaving, ubiquity, permanent communication, mobility and leisure options.

Graph 4. Advantages of using smartphones for academic purposes

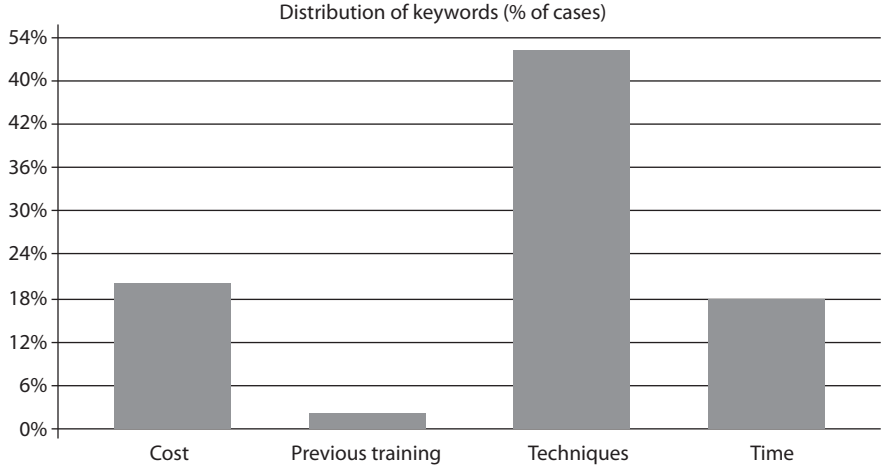


Using mobile phones for educational purposes also involves overcoming a series of problems. These are described in graphs 5 and 6.

Graph 5. Problems with using non-smartphones



Graph 6. Problems with using smartphones



Technical problems when using software were the most cited for both types of mobile phone (34.1% for non-smartphones compared to 51.9% for smartphones). This was followed, with no significant difference, by handset cost (18.5% compared to 20%), the time needed to use them correctly (17% compared to 17.8%) and previous training required (5.2% compared to 2.2% for smartphones).

Using a mobile phone equips users with a series of skills. Table 7 shows the skills gained through the academic uses of non-smartphones and smartphones in descending order.

Table 7. Skills gained through the academic uses of mobile phones

SKILLS GAINED THROUGH ACADEMIC USES OF MOBILE PHONES (% cases)		
ORDER	**NON-SMARTPHONES**	**SMARTPHONES**
1	Mechanical (10.4%)	Information handling (28.9%)
2	Analysing, summarising, information handling (8.9%)	Mechanical (20%)
3	Communicating (8.1%)	Communicating (17.8%)
4	Digital (7.4%)	Digital (9.6%)
5	Foreign language (3%)	Analysing and summarising (6.7%)
6		Foreign language (3%)

4. Conclusions and discussion

The results obtained demonstrate that Spanish universities are moving towards a new collaborative learning paradigm. Mobile phones are one of the new types of hardware enabling this kind of learning to take place. However, mobile phones do not provide students with new knowledge. The academic use of mobile phones equips users with new skills with which they can increase their opportunities to acquire knowledge if they have a handset that makes this possible to happen. Non-smartphones reproduce the paradigm of analogue learning. They are a not very effective complementary learning tool. They do not enable ubiquitous learning because of their lack of access to the Internet. Smartphones are the immediate present and future of ubiquitous learning. Their definition, academically speaking, needs to be revisited. A smartphone is not only a telephone that functions like a portable computer. On the contrary, a smartphone used for educational purposes has become a portable computer that can be used as a telephone. Perhaps the use of smartphones as telephones is now secondary to their functionality.

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