

# Knowledge about Mobile Learning and Integration of Mobile Devices by Faculty of Universidad Nacional de Costa Rica

*Conocimientos sobre aprendizaje móvil e integración de dispositivos móviles en docentes de la Universidad Nacional de Costa Rica*

*Conhecimento de aprendizagem móvel e integração de dispositivos móveis em professores da Universidade Nacional da Costa Rica*

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**ABSTRACT.** There is a debate about the concept of mobile learning and the emergence of mobile devices in higher education. This research was developed from a qualitative approach, with the participation of eight university faculty members through a discussion group. The objective was to understand the following aspects: (a) the faculty's concept of mobile learning; (b) their perspective on using smartphones and tablets in the classroom; and, (c) the implications in the teacher-student relationship upon the incorporation of these devices in higher education. From the data obtained, we can confirm that there is a construction of the concept of mobile learning that comes from everyday praxis. The incursion of tablets and smartphones in the classrooms has been natural. Concerns regarding the management and control of these devices in class were identified, in addition to the concern about their educational benefits or harms. It is concluded that there is an interest and agreement about mobile learning and the use of mobile technology in higher education.

**Key words:**  
teaching,  
higher  
education,  
mobile  
learning,  
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technology

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**RESUMEN.** El debate sobre el concepto de aprendizaje móvil y la irrupción de los dispositivos móviles está presente en la educación superior. Esta investigación se desarrolló desde un enfoque cualitativo, con la participación de ocho docentes universitarios a través de un grupo de discusión. El objetivo fue comprender los siguientes aspectos: (a) el concepto de aprendizaje móvil de los docentes; (b) su perspectiva del uso de smartphones o teléfonos inteligentes y tabletas en las aulas; y, (c) las implicaciones en la relación docente-estudiante ante la incorporación de estos dispositivos en la educación superior. A partir de los datos obtenidos se confirma que hay una construcción del concepto de aprendizaje móvil que deviene de la praxis cotidiana. El ingreso de tabletas y *smartphones* se ha dado en una forma natural en las aulas. Se identificaron inquietudes sobre el manejo y control de estos dispositivos en clase, a lo que se suma la incertidumbre sobre los beneficios o perjuicios pedagógicos de estos en la educación. Se concluye que existe interés y anuencia tanto al aprendizaje móvil como al uso de tecnologías móviles en educación superior.

**Palabras clave:**  
Docencia,  
Educación  
Superior,  
Aprendizaje  
móvil,  
Tecnología  
educacional

**RESUMO.** O debate sobre o conceito de aprendizagem móvel e o surgimento de dispositivos móveis está presente no ensino superior. Esta pesquisa foi desenvolvida a partir de uma abordagem qualitativa, envolvendo oito professores universitários através de um grupo de discussão. O objetivo foi entender os seguintes aspectos: (a) o conceito que os professores têm da aprendizagem móvel; (b) a sua perspectiva de usar smartphones ou telefones inteligentes e tablets nas salas de aula; e, (c) as implicações para a relação professor-aluno para a incorporação destes dispositivos no ensino superior. A partir dos dados obtidos, confirma-se que existe uma construção do conceito de aprendizagem móvel que vem da prática cotidiana. A entrada de tablets e smartphones aconteceu de uma forma natural na sala de aula. Foram identificadas inquietudes sobre a gestão e controle desses dispositivos na sala de aula, e adiciona-se a incerteza sobre os benefícios ou danos pedagógicos deles no ensino. Conclui-se que há interesse e consentimento tanto para a aprendizagem móvel e o uso de tecnologias móveis no ensino superior.

**Palavras-chave:**  
Ensino, Ensino  
Superior,  
Aprendizagem  
Móvel,  
Tecnologia  
Educacional

In our society, people are constantly acquiring information and communication technologies, commonly referred to as ICTs. The way technological innovations transform how people relate to each other is evident. More than ten years ago students were considered as “self-managing”; in other words, they had with them their own information, which they shared, created and recreated, everywhere and at all times (Alexander, 2004; Clarke, Flaherty & Mottner, 2001; Ćukušić, Alfirević, Granić & Garača, 2010; Shepherd & Vardiman, 2014). One of the main questions at that time was how would a “sedentary” campus respond to changes in behavioral patterns of current generations. A question not posed at the time—and still not done so today—is how teachers react, adopt, and adapt to technological innovations.

UNESCO (Mark, 2012) recognizes the impact that mobile technologies are having as a resource for offering new teaching materials in a customized way, expanding the scope of education, which can be an efficient way to keep educational progress from stopping in times of crisis, and highlighting its many uses without losing sight of the teacher's fundamental role.

Since 2010, Costa Rica has experienced an accelerated trade opening process in the field of telecommunications and mobile telephony. According to the Estadísticas del Sector de Telecomunicaciones (Statistics on the Telecommunications Sector) report (Arguello, Arias, Rodríguez, & Segura, 2013), by the end of 2012, a country with a population of 4.5 million people had 5.4 million cell lines. Prepaid service lines grew the most, with 179%. In 2010, mobile internet subscriptions accounted for 37% of total Internet subscriptions nationwide; while by the end of 2012, they already accounted for 67% of the total, with a cumulative growth rate of 282% compared to land line internet, which accounted for 33%. In Costa Rica, mobile cellular devices and smartphones have become the main tool for accessing the Internet.

Since the nineties, there have been discussions about mobile learning as a specialized area of education. According to Pachler, Bachmair, and Cook (2010b), these mobile devices have varied over time. For example, at the beginning they were associated with the use of portable DVD players, PDAs, and laptops (Fallahkhair, Pemberton, & Griffiths, 2007). Recently, the use of mobile learning has been associated with new devices, such as mp3 players, tablets or iPads, cell phones and smartphones (Smith & Kukulska-Hulme, 2012). The difference between the first stages of mobile learning and the present time is the number of functions that phones, smartphones, and tablets have been able to accommodate in just one device, at an accessible price, and portability thanks to its weight and dimension: taking pictures, playing music, audio recording, video recording and playback, GPS, Bluetooth, accessing the internet, accessing documents, among many others. And, they also have applications called apps, some of them free and others available generally at a low price, that help to perform many tasks and activities.

In this sense, it is considered that mobile learning technologies can improve the delivery of content inside and outside the classroom. The classroom is now everywhere, anywhere, and at any given time, as long as there is an Internet connection. The thematic contents are presented in a way that generates much more commitment, which leads to students being better prepared and to the development of new technological capabilities as they are exposed to the constant use of these technologies. Finally, they provide resources for all learning styles, allowing students to select a delivery method/resource that works for them (Ćukušić et al., 2010; Shepherd & Vardiman, 2014).

In the last two decades, research on the use of mobile devices and their integration in education has shown that there is a growing integration of laptops, tablets and cell phones in the educational field. Different published works have primarily found that the main benefit of educational practices with mobile devices has been to share, collaborate, give feedback and develop activities in real time, which is the result of a variety of formats in which it is possible to produce educational material (Baran, 2014). A study with 1,048 teachers identified that there is distrust about the educational use that a cell phone can have compared to a laptop (Şad & Göktaş, 2014), which is mainly associated with ignorance about mobile learning and its current range of educational possibilities. However, the reality is that mobile devices have been present for years in classrooms and university campuses. A multi-year study with

1,181 students from different universities showed that cell phones, laptops and tablets are widely used, and its main conclusion emphasizes the need for students and teachers to have technical, logistical and pedagogical support in order to integrate mobile devices and applications in the education field (Chen, Seilhamer, Bennett, & Bauer, 2014).

Mobile learning is understood as an educational practice that can be developed ubiquitously, synchronously or asynchronously, and establishes new pedagogical competences for teachers, such as the instructional design that allows the incorporation of specific applications as part of learning activities. In addition to competences linked to technological capabilities, such as the creation of digital teaching materials, content organization in platforms, among others, that are mainly executed through portable and multifunctional mobile devices (Pachler, Bachmair, & Cook, 2010a ).

The main characteristic of mobile learning is customization: just in time, just what is needed, and just for me (Traxler, 2007).

The irruption of mobile devices in education is not accidental; it is a product of the world and the social context in which these technologies are highly used on a daily basis. Pachler, Bachmair, and Cook (2010c) point out three factors that determine these practices, (a) the agency, or the means understood as the possibility that facilitates the social and economic context for using these devices; (b) the culture, that blends with socialization in everyday life activities and that in the same way breaks into educational spaces; and finally, (c) the structures, understood as changes in the way of we think because of these conditions.

The teaching and learning process is associated with institutional, individual and educational factors. This work focuses on the relationship between the acceptance and adoption of technologies in these processes by the teacher. As Coll and Sánchez (2008) point out, teachers and students are not disconnected from the learning process. The class environment and the teacher-student relationship are fundamental elements that determine the learning processes (Brekelmans, Wubbels, & Brok, 2002). The teacher's vision is a way for getting to know the student's behavior, which also allows identifying how it coincides with institutional practices. A good teacher-student relationship is required for harnessing the benefits of ICTs or technology (O'Sullivan & Samarawickrema, 2008). In this sense, this work aims to (a) examine the teaching conceptualization of mobile learning, (b) identify the debate about the use of technological tools through portable electronic devices, cell phones and tablets, and (c) explore, from a teaching standpoint, the educational implications produced by daily irruption of these technologies in the university context.

## METHOD

### Design

This research is based on a qualitative approach, with an interpretive discourse analysis design (Vaughan, 2012) of the participants. Based on the information collected, a phenomenological interpretation of the concepts proposed in the study problem was made, with the intention of understanding mobile learning and the use of mobile devices from the participants' perspective, using discussion as the main way for obtaining information (Holstein & Gubrium, 2013). This was achieved through focus groups.

## Context

Universidad Nacional is a higher education public institution, created under the motto of “university education for everyone,” and its purpose is to assist the country’s low socio-economic sectors that do not have the means to access university education (Universidad Nacional, 2016). It has a technology management center for ensuring that all sectors, teachers, administrative staff and students have the necessary infrastructure for an adequate academic development on a continuous basis (Universidad Nacional, n.d.). One of the objectives of the center is “to incorporate advanced technologies as a way of promoting the use of ICTs in the student and the academic and administrative sectors of the institution” (Universidad Nacional, n.d., p.4). The institution has eight campuses distributed in different geographical areas of the country, eight professional schools, 32 programs, 13 research institutes that offer undergraduate and graduate training at a master’s and doctoral level, with an estimated enrollment of around twenty thousand students (Universidad Nacional, 2016).

## Participants

The selection of study participants was made openly through communications from the directors of the different schools of the institution. Likewise, the directors of regional campuses were sent an invitation so that teachers that were not in the urban area were able to participate. Table 1 shows the profile of the people that agreed to participate in the study. The teachers were selected participated voluntarily and were eligible as long as they were active teachers at any of the institution’s professional schools.

## Data collection techniques

The information was collected through focus groups. This tool allows for the qualitative collection of information aimed at learning about, analyzing, and expanding knowledge of a research topic (Hernández, Fernández, & Baptista, 2010). The instrument was designed based on the theoretical construction of five concepts related to technology and education. For the purposes of this work, only the concept of mobile learning and aspects associated with mediation of mobile learning in educational contexts were used. The guide comprises eleven open-ended questions, with the intention of motivating a broad discussion guided by a researcher. The instrument was validated by the research group and with academic peers from Universidad Nacional de Costa Rica and the Master’s Program in Educational Technology from the Tecnológico de Monterrey. During application, the researcher moderated the discussion, and each participant had time to answer the respective questions. The inclusion of the topics proposed proved to be appropriate, though some of the topics were brought up spontaneously during debate.

## Procedure

The focus groups were conducted via two modalities: on-site and online. Four teachers participated in each group. For the online groups (Stewart & Williams, 2005), the Gaiser (2008) synchronous mechanism was used; a chat script was installed on a web page, and the participating teachers were invited to log in to the chat on a given date. The chat recorded the teacher’s interventions that were later used in the analysis. Professors of campuses outside the metropolitan area, whose geographical location would have made it difficult for them to attend an on-site session, participated in this group. Each one of them agreed via e-mail to their confidential participation.

**Table 1**  
*Characteristics of the teachers who participated in the focus groups*

Professor	Profile
Professor 1	Male, professor at the Systems Engineering area. In addition to working in this university, he works at other higher education institutions, including a distance education university. In the current institution, he works at the South-Pacific south area campus.
Professor 2	Male, systems engineer and professor at the Central-Pacific south area campus. He is in charge of the systems and technologies department in this campus.
Professor 3	Female, from the field of social sciences; she works as an editor for several journals and at one of the Education schools of the central campus.
Professor 4	Male, professor at the Systems Engineering School in the central campus. In addition, he is one of the individuals in charge of the information system of the university's Technology Management Center.
Professor 5	Male, professor at the Library Science School. He has a professional background in languages and graduate studies in education, as well as communication and technologies. He also works for the institutional program that promotes incorporation of ICTs in the university's academic field. He works at the central campus.
Professor 6	Male, professor of the Human Sciences area. He has a master's degree in communications and film. He works at the central campus.
Professor 7	Male, professor of the Education area with a PhD in Education. He works for the Basic Education Department at the central campus.
Professor 8	Female, professor of the Education area with a master's degree in Education. She works for the Basic Education Department at the central campus.

The on-site session was held at the university's central campus. The same questions of the online modality were used. An invitation was sent to the teachers, and the focus group started with the oral reading of the study's objective, followed by them agreeing to participate confidentially.

The on-site group had two forms of participation: one included discussion of the subject and concepts on mobile learning, and another presenting the results of another research instrument with patterns and statement regarding the use of mobile devices by students of this university (these have not been included in this work). For the purposes of this discussion, conventional cell phones, smartphones, tablets or iPad, and mp3 players were considered mobile devices. In order to focus the discussion on tablets and cell phones, which have different technical features given their high portability, connectivity, and low cost, and deemed technological resources that have experienced an accelerated growth, laptops and netbooks were explicitly excluded.

### **Data analysis**

The discussion from on-site group was transcribed. The material for both groups was worked on the Atlas Ti program. The categories of analysis were prepared based on the theoretical construction and the participants' responses. The revision of the materials and their categorization allowed us to establish validity criteria, understood as the study authors' estimation that "the conclusions represent the empirical reality" (Pérez-Serrano, 2011, p.80) through the selection of quotes and materials that significantly represent the topics addressed.

## **RESULTS**

The information collected was analyzed from two categories: the intervention of the professor, named mobile learning and teacher mediation, which includes subcategories associated with its development; and a second category that revolves around the teacher-student relationship and the factors associated with mobile learning.

### **Mobile learning and professor mediation**

It was found that, among teachers, mobile learning is understood as a pedagogical practice where knowledge can be facilitated through spaces other than the classroom, and through technological tools. This discussion addresses issues that coincide with the theoretical perspectives of discipline, technology, autonomy, ubiquity, and customization. It highlights the role of self-learning and independent knowledge management. Most participants in the group mentioned mobile devices such as tablets, cell phones, and smartphones as technological resources for this purpose. However, they also agreed that laptops are mobile devices widely used at the university. Their perceptions can be assessed in Table 2.

One of the professors' main concerns was related to how the use of mobile devices in classrooms and in educational spaces is changing the way we think and build knowledge. It is believed that this will be decisive in the future. There is uncertainty about the impact that these technologies will have on education, or whether their consequences on skills such as the reading capability are positive or negative.

In characterizing mobile learning, technology is considered a tool, in other words, a means by which knowledge is managed, not a way of learning in itself. This idea leads to an element that was discussed, perhaps not deep enough, which is to understand mobile learning not necessarily mediated through a certain technology. Learning is mobile not only because of the technologies that are used, but because it can also be dynamic, which means that the role of technologies could or could not be the central element.

The widespread use of Wi-Fi is one of the peculiarities stated by the instructors. Professors believe that investing in this technology can increase the use of cell phones and tablets. In addition, they mentioned on several occasions expanding the reach of mobile technology by implementing open connection spaces to meet and collaborate. The creation of open infrastructure in one of the schools of the central campus was mentioned, where electrical outlets and common areas were implemented at a cafeteria, and students were observed making constant use of this space. According to the teachers, other campuses in the country have the same infrastructure.

Table 2  
*Perceptions about the concept of mobile learning*

<b>CATEGORY: THE CONCEPT OF MOBILE LEARNING</b>	
It describes the ubiquitous learning—mediated by portable technological devices—that is custom-ized to each individual.	
Subcategories	Original text
<b>Mobile learning</b>	<p>“The use of ICTs through mobile devices for educational purposes” (Professor 1)</p> <p>“It is a way of learning that attempts to overcome coordinates, such as time and space, that allows to be at any moment in the presence of” (Professor 7)</p> <p>“It is about minimizing the role of the teacher and giving the learner a more significant role, which allows for self-managed learning processes” (Professor 7)</p> <p>“It is the construction of knowledge through the help of smartphones or tablets” (Professor 3)</p> <p>“It is going to change the way we think, and I believe that somehow it can have a negative effect” (Professor 8)</p> <p>“Perhaps the possibility of reading a book more carefully, the possibility of not being so stuck to an image are some things that we have also lost. So yes, I believe that there are certain structures that technology has now conditioned in students” (Professor 4)</p> <p>“Some want to just put the device and link it with pedagogy, teaching and methodology; and this can be a bit difficult. To me it is to try and miss; that is why I say it is a tool, because it is just a part that can be useful to some of us” (Professor 5)</p> <p>“Learning with the support of mobile devices; I think learning can be mobile in the sense that it moves around” (Professor 8)</p>
<b>Mobile technology and learning</b>	<p>“The number of users of the wireless network, mostly students, is more than one thousand, twelve hundred, thirteen hundred, on average per day that are authenticated by the university” (Professor 4)</p> <p>“As more free Wi-Fi antennas are installed, mobile devices will be used more” (Professor 1)</p> <p>“The infrastructure of the university here is the same we have in Liberia, in Nicoya, in Pérez Zeledón, in Neily, in Sarapiquí, in Puntarenas center, and in Punta Morales” (Professor 4)</p> <p>“There are less barriers; four years ago, we did not have good coverage on campus; now we do” (Professor 1)</p>

Based on the findings presented in Table 3, some factors that influence the use of mobile devices and the development of mobile learning are assessed. With regard to institutional aspects, one of the questions is how to expand the use of these technologies in the classroom. There are several criteria; most agree that not all teachers and not all schools are able to incorporate mobile learning, and that these opportunities, or limitations, could be associated with two aspects: the subject-matter being taught and the age of some teachers. With this scenario, a professor and his or her academic unit must be accompanied by technically qualified people to be able to implement these processes. Professors say that this support has been lacking, and that without institutional support, it will be difficult and impractical to develop innovative mobile learning processes.

The issue of social networks as a distracting element is recurrent; it is a trend that is observed in all areas and a permanent concern of the group. According to the teachers, students do not use mobile devices during class for educational purposes. This issue should be emphasized, as it is a constant concern whether mobile devices are an aid or a distractor. This raises new questions, such as whether they should, in extreme cases, completely limit the use of mobile devices during classes. There is a conflict then in the group that divides the criteria: prohibiting the use of mobile devices is denying that they can have an educational use. Among these possible uses, consulting the dictionary, reviewing a reading, or consulting about a topic; however, there is also the possibility of getting distracted while being in class: getting distracted and not paying attention to the class activities in the device.

The teaching use of mobile technologies was also addressed. The possible bias of these responses is that the participating group, by volunteering, probably tends to be more technological than the average professors. However, the use of mobile devices through tools such as calendar alerts, synchronization of calendars for submission of papers and assessments was also observed. Other experiences have to do with the handling of data and materials in digital format. One of the points in favor is that certain activities measured by technologies are highlighted as environmentally-friendly and time-optimizing.

Other uses mentioned by the teachers coincide with those of the students, such as taking notes and looking for information, which are seen as main advantages. This shows that self-learning and the technological context have caused teachers to learn, acquire, and use devices according to their individual needs.

However, questions as to why differences or barriers persist in the teaching use and how these can be overcome were also raised. One of these barriers is the lack of institutional motivation to learn about new technologies. Professors are recognized as people with skills, a solid academic training, but lacking the technological literacy that would allow them to learn continuously. Some of the statements showed that there is fear; other teachers have already clearly determined which applications to use, and which ones not to use, without closing the door to the immense possibility of new options that can emerge in the years to come. While it is true that some teachers use or have used some of these technologies, they indicated that they do not master them completely. The use of mobile devices and their possible applications is important; the more there is to learn about them, the greater their potential.

**Table 3**  
*Factors affecting the use of mobile devices and the development of mobile learning*

<b>CONCEPT: Different factors that enable or hinder incorporating mobile devices in the university</b>	
<b>Subcategories</b>	<b>Original text</b>
<b>Institutional</b>	<p>“A Philosophy teacher, a colleague, comes and sees a computer and shouts in distress. Even if the computer is next to him or her, he or she will not be able to understand how it works, why? Because they don’t have the skills” (Professor 6)</p> <p>“Within an academic unit, tech support should be available, but then you have to be very careful with that because the authorities want to save money in everything” (Professor 6)</p>
<b>Social networks</b>	<p>“It bothers me that students are heavily focusing on social networks and that this, while it may also be important, does not necessarily contribute to the class and can be a distraction” (Professor 4)</p> <p>“Mobile devices, except for laptops, are being used for strictly educational purposes but can also be distractors because of social networks, which have come to stay” (Professor 4)</p> <p>“I have not banned the use of devices; I leave it to every student’s responsibility. Obviously if you are watching a movie, that is not something that you should be doing. If we are in class, one could consult a dictionary or something else, but I cannot know what they are consulting, and obviously it is not academic” (Professor 6)</p>
<b>Teaching use of technologies</b>	<p>“I have already begun to use such devices, the course’s schedule is linked to my students’ e-mail addresses, and they receive notifications and messages on their devices” (Professor 1)</p> <p>“In my experience, the construction of TFG with free software, such as Drive and Dropbox, saves time; since participants of the process have access to all the same documents, there are no contradictions among us, and we save time” (Professor 3).</p> <p>“If I am in a lecture, I take notes with the tablet; and when I am in the classroom, it is very useful, for example, if I want to revise some concepts, then it is very easy for me to consult immediately. It is me who always has the tablet there to revise something about the class” (Professor 6)</p>
<b>Limitations</b>	<p>“The system favors it; it is considered ‘comfortable.’ Most teachers want to continue doing the same things that they have been doing for many years now” (Professor 1)</p> <p>“Professors in general have received basic technological training, ‘basic’ as you say, they are not experts. What do they require? In my opinion, ongoing technological training” (Professor 4)</p> <p>“Many teachers see virtuality as a threat, because they may become less important” (Professor 1).</p> <p>“I quit social networks, I do not look into any of that, I limit myself to emails and basically to make searches” (Professor 6)</p> <p>“I do not know a lot about technology even though I like it and I have used the virtual classroom and it has been very useful for organizing classes, not using paper and all those sort of things” (Professor 8)</p> <p>“If there were initiatives from the faculty, the devices would be used more” (Professor 1)</p>
<b>Mobile learning possibilities</b>	<p>“Designing a method based on a mobile application that gives students part of a course grade if they carry out an assignment, which implies that the application proposes the assignment, and the students have to research and give an answer, in exchange for an incentive” (Professor 2)</p> <p>“A study of territorial dispersion within an analysis of supply and demand, that requires the use of GPS, can be done with mobile devices” (Professor 1)</p>

In regard to how to use them, the discussion shows ideas ranging from basic recommendations to more complex applications; this is likely related to the prior technical knowledge of these technologies. Specific advice was obtained on how to incorporate the use of tools such as GPS, Dropbox, text messaging, and e-mail in the teaching practice.

The financial factor worries teachers. According to them, even though it is a public higher education institution, where many students have limited resources, access to mobile devices is increasing every day, and they think that more students will acquire these technologies over time. With regard to campuses outside the urban area (or in rural areas of the country), the perception is that any possible access gap has been shortened. However, the type of device and technical features are some of the elements that worry the teachers. This greater access perception foresees that the various university campuses, sites, and facilities will, over the next years, have students using smartphones and tablets more and more.

### **The professor-student relationship in the educational space**

This segment, like the previous one, uses material from the focus groups. Below is a discussion of some of the elements of the mobile device-mediated professor-student relationship at the university (see Table 4).

As for the professor-student relationship, there are explanations about how this dynamic has been breaking into the university. The trend of mobile device use in the classrooms originated with students themselves. They used them discreetly or even clandestinely, as if they were trying to go unnoticed. This observation, made by a teacher who constantly projects audiovisual material in a space with low light conditions also emphasizes the idea that those who use them are physically in the classroom, but distracted and not paying attention to the lesson.

It emphasizes the mobility and ubiquity as an important element of this technology. The professors watch the students move around and navigate the different areas with some kind of mobile device. Emphasis is also placed on the aspect of personal safety. Because of the conditions of vulnerability, students and professors teachers may consider the use of their mobile devices in some public spaces inappropriate. Personal safety against possible robberies or muggings would be, both inside and outside the campus, one of the main limitations of being able to carry out educational practices through mobile technologies. Mobile technology allows working in different spaces; changes derived from widespread installation of wireless networks were mentioned as an example. This ubiquitous relationship is considered as a technological resource with the potential for reading documents, producing or taking notes at any given time or place.

The debate expanded and entered into a dilemma, about the permissiveness or restriction of devices in the university context. The use of the cell phones causes distrust; most participants from the group think it is associated with distraction. Some see the need for carrying out activities that take students away from mobile devices. Several believe that there is a loss in cognitive and learning abilities. They claim that students go into the university with a poor education from schools; they attribute the ease of accessing information that makes students lazy and uninterested in the academic activities to the

Table 4  
The professor-student relationship in the educational space

<b>CATEGORY: Professor-student relationship in the educational space and factors between both subjects that foster or hinder the use of devices in class</b>	
Subcategories	Original text
Institutional context	<p>“The Tecnológico de Monterrey, for example, has some applications based on their own platform through which the teacher sends directly some type of message or some type of communication, using the messaging system” (Professor 5)</p> <p>“One sees them when the light is turned on and as we are in the dark, one sees who is present and who is not” (Professor 6)</p>
Mobility	<p>“You can see students everywhere walking with the devices” (Professor 4)</p> <p>“There are cultural determinants. One could be at Parque de los Ángeles and get mugged, so there are no spaces where one could feel safe” (Professor 8)</p>
Ubiquity	<p>“Students sitting in corridors do not have comfortable chairs and so forth, but they are sitting in the corridors of new buildings at that time, with computers” (Professor 4)</p> <p>“Even the term ‘class’ is limiting; it refers to a physical space, the classroom; ‘session’ is more appropriate” (Professor 1)</p>
Incorporation of mobile devices in teaching	<p>“I understood that by sending them to search in the dictionary, they do not understand what a dictionary is for; they do not know how a dictionary can help them” (Professor 6)</p> <p>“The gap that worries me is the professor/student gap, where students are digital natives and are not seeing in their education an element that is part of their life” (Professor 2)</p> <p>“They see that the functions grow exponentially; they see that the world moves fast and that it will be very necessary for them to be able to use them” (Professor 7)</p> <p>“I recently went to a dermatologist, and they had an application to identify moles, so for a professional, it is very useful, but as a professional, one does not use all the functions” (Professor 8)</p> <p>“It depends on what you have. You first learn to use what you have, the type of device you have. It will also depend on the service provider” (Professor 5)</p> <p>“In an open-ended questions exam, a screen could be useful, another could not, another could be too big. It seems to me that there are exceptions” (Professor 4)</p> <p>“The audiovisual does not have the same status as the book, but it really does have it, why? Because it is a medium, an autonomous resource that has processes. What happens is that a book, like everything that is old, has a range of authority that is losing today, and people are pulling their hair, that is, if we do not get students to go to buy some books, they are not prepared for that” (Professor 6)</p> <p>“When they are on the cell phone, I know they will not be using it for the purposes we talked about here. So it depends, some will allow them, and others will not” (Professor 4)</p> <p>“The class referent they have is the on-site class; they do not know of another” (Professor 1)</p> <p>““Not everything can be mobile, just as not everything has to be on-site” (Professor 1)</p> <p>“Sometimes I think about the solutions that teamwork can give you in order to improve the process; I think that we sometimes do not use work between interdisciplinary teams as much as we should, which is something that, in my opinion, would be more useful” (Professor 8)</p>

new technologies. Whether the educational potential of some digital devices is currently overestimated was debated; and whether at the academic level the debate should be aimed at the concern about the quality of education beyond technology. It is concluded that the student is perceived as an agent that does not use technology for other purposes than to socialize, and that has not necessarily acquired other learning abilities.

At the end of the discussion, participants were consulted on the ways to integrate these devices into their academic activities; for example, identifying applications for their disciplines. They were consulted on the possibility of giving a test or examination through a mobile device, which would be conditioned by technical factors and by the very application of this strategy, including economic and cultural factors. Only one of the teachers participating in the groups considered the use of mobile devices as a tool outside the classroom. This particular fact is clear, especially when discussing the instrument's statement that mentions the possibility of giving a class through one of these devices. Learning mediation with the use of mobile technology, i.e. tablets and cell phones, is a task that requires planning, a foundation, and institutional support. Short implementations, experiments, and innovations are possible and take place; however, expanding and introducing mobile technologies into the discipline on an institutional scale requires special resources and conditions.

Mobile devices can facilitate certain teaching-learning processes, but they are not indispensable the way an instrument can be for a topographer or a physician.

## DISCUSSION

This research showed that participants have a concept of mobile learning that has evolved mainly empirically, through academic experiences and the introduction of these devices as a naturalized element in the daily practices of students and professors at the university. Likewise, it found that mobile learning does not necessarily require the use of technological devices, although it is more related to them day after day. One of the main findings is the lack of institutional guidance regarding the use of cell phones or smartphones and tablets in classrooms. However, it is clear that these have become a piece of technology always present in the classroom, that is useful but that, at the same time, causes uncertainty about its limits and scope at educational and psycho-pedagogical level. Likewise, the participants agreed on the use of this technology as teaching and learning tools, and some potential pedagogical uses are not ruled out; however, new questions have arisen about institutional guidance, the digital gap in terms of access, personal safety, and even the intellectual capacities for developing certain academic activities. Access to information is essential, as well as the professors' ability to learn about and promote the use of these technologies (Sánchez Asín, Boix Peinado, & Jurado de los Santos, 2009). The discussion shows that there is no clear policy or institutional project that contemplates the use of mobile devices in curricular or teaching aspects.

### **Educational implications in higher education**

According to the State of Education report (Programa Estado de la Nación en Desarrollo Humano Sostenible, 2013), one of the challenges of higher education is to incorporate ICTs for the development of competencies, as well as their incorporation into professional development. The discussion identifies

some issues that should be explored and expanded in higher education: wide access to information and production of informational and multimedia content through mobile devices; the use of mobile devices in different teaching and learning disciplines, as well as their respective limitations and scope; the incorporation of professional competences of mobile devices, and the pedagogical mediation brought by these devices into different disciplines.

According to Alden (2013), some of the ways in which these technologies can be incorporated into higher education are to select accessible tools such as the use of SMS text messages, and strategies such as those identified in the discussion, e.g., coordination of calendars and alerts. In more planned stages, digitalization of reading materials, podcasts or audios, i.e., study materials that can be used in different spaces.

Other issues that must be considered are the institutional policies on their use or restriction; in addition to the development of courses or classes through mobile devices, and of assessments or tests according to each discipline. To provide technical support and guidance to both professors and students and to promote interdisciplinary and collaborative work is no less important. As UNESCO has pointed out, information societies require people with lifelong learning skills; professors must integrate mobile technologies into their daily lives, researching, creating and inventing ways of innovation; no technological imposition is effective (Kukulka-Hulme, 2012).

### **Social, psychosocial, and information management implications**

Skepticism is noticeable; there is a widespread concern associated with the use of ICTs that should be researched by other studies. It has been shown that students can perceive themselves as living in two realities: a technological one and an educational one (Kolikant, 2010). It cannot be ascertained that skills are lost, but it can be understood that by introducing mobile devices skills change or new ones are acquired. Professors and institutions should consider students in their pedagogical dimension. There are many psycho-educational skills that must be established when implementing processes that involve mobile learning: memory, cognitive skills, development of digital literacy, and customization according to individual differences (Terras & Ramsay, 2012). These factors should be analyzed from the perspective of specific disciplines. Regarding social networks, there is literature that mentions ways of integrating them into education. Technology itself does not generate well-being or learning (Ahn, 2011); studies of social networks are oriented to specific cases and uses, where there are multiple factors for success or failure.

### **Implications for educational systems in general, and for society as a whole**

Finally, higher education, especially university professors that train professionals, must consider the impact that mobile technologies are having on education as a whole. According to UNESCO (Lugo & Schurmann, 2012), some of the main challenges in the region continue to be the high percentage of dropouts in vulnerable areas, mainly rural areas. This poses the need to articulate the use of ICTs and mobile learning as a resource that can contribute to address and overcome these inequality conditions.

### **Limitations and projections of the study**

This qualitative study opens new questions about the technological repercussions of mobile devices in

teaching and higher education. Generalizations on the subject cannot be drawn from the views of the study participants. Likewise, it is important to highlight the methodological difficulties in conducting focus groups or online discussions, so it is important to explore new research methodologies, ways of collecting information, and the representations that scholars have about these strategies. Future studies should expand and detail qualitatively and quantitatively what is happening in the classroom, at the universities and in their academic disciplines.

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