



To take or not to take the laptop or tablet to classes, that is the question



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ABSTRACT

In recent decades, so-called *mobile learning* or *m-learning* has become a new paradigm in education as a consequence of technological advances and the widespread use of mobile devices to access information and for communication. In this context, this paper analyzes different profiles depending on students' preferences for taking mobile devices (specifically tablets and/or laptops) to economics classes at the University of Seville (Spain). A survey-based field study of a sample of 412 students and the application of bivariate probit models show a low level of mobile device integration in teaching (devices taken to class by only 29.8% of respondents) with a slight predominance of laptops. The results also show differences between users of the two types of devices. Students who take their laptops to class usually live at home with their family, have already used them in pre-university levels, and are concerned about recharging their devices in class. However, although users who take their tablets to class also live with their parents, they are much more active on social network sites and more concerned about the quality of the internet connection. These findings enable the design of strategies to encourage students to attend class with their own mobile devices.

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1. Introduction

Meeting the needs of today's always-on-the-move society has led to the rapid development of information and communication technologies and the widespread use of technological advances, such as laptops, tablets and smartphones, connected with each other through networks and software (Alhassan, 2016; Zidney & Warner, 2016). As a result, a new social and educational paradigm has been shaped, with learning based on these types of mobile devices (so-called *mobile learning* or *m-learning*) becoming an indispensable educational tool at both pre-university (Kim, Jeong, Lu, Debnath, & Ming, 2016; Popović, Marković, & Popović, 2016)

and university level (Henríquez-Ritchie & Organista-Sandoval, 2012; Lin & Lin, 2016). Compared to the traditional concept of teaching, *m-learning* provides a more flexible, collaborative and spontaneous learning model, as proven by the numerous studies found in the scientific literature: both systematic reviews, such as Baran (2014), Cochrane (2014), Crompton, Burke, Gregory, and Gräbe (2016), Peña-Ayala and Cárdenas (2016), Shuib, Shamshirband, and Ismail (2015), and Zidney and Warner (2016), and meta-analyses, such as Wu et al. (2012).

Online or electronic learning (*e-learning*) provides new opportunities for direct learning and improving student performance (see Wu, Tennyson, & Hsia, 2010 for a broader examination). *M-learning* can be regarded as a subset of the e-learning framework (Peters, 2007) or the progression or extension of e-learning (Althunibat, 2015), as it combines advances in information and communication technology by way of widely-used devices. *M-learning* can also be considered a step forward, as a greater number

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of potential users are involved (Jones, Edwards, & Reid, 2009; Gan & Balakrishnan, 2014) and, as Wu et al. (2012) state, learning with mobile devices can be done anywhere where there is a wifi connection. In general terms, following Jacob and Isaac (2008), this educational scenario can be defined as the point where the use of mobile computing/communication devices on the one hand, and e-learning on the other, intersect with each other.

In general, Information and Communication Technology-based (ICT) technological infrastructure not only drives innovation in learning, but, according to Wu, Tennyson, Hsia, and Liao (2008) and Landers and Armstrong (2015), could also integrate everyone involved in e-learning processes or training and instructional contexts. For authors such as Alhassan (2016), using mobile technologies in learning can be regarded as the next great revolution in teaching, as there are more pros than cons. Their advantages can be grouped in three blocks. First, they have the potential to improve learning systems, as they encourage student participation (Castillo-Manzano, Castro-Nuño, López-Valpuesta, Sanz-Díaz, & Yñiguez, 2016) and make it easier to take notes (Mosleh, Baba, Malek, & Alhussein, 2016; Norman & Furnes, 2016); enhance direct student involvement (Cheung, 2008; Green, 2016; Jemni, Khribi, Othman, Elghoul, & Jaballah, 2016; Wong & Mak, 2016); enable the use of apps adapted to different subject matter (Domingo & Gargante, 2016; Jordano de la Torre, de Larreta-Azelain, Dolores, & Pareja Lora, 2016); make it easy to instantly find information (Hassan, Khan, & Lalitha, 2016; Holderied, 2016); and boost so-called *mobile collaborative learning* (Reychav & Wu, 2015), i.e., integration between students and instructors (Alhassan, 2016). Second, among the technical advantages are their immediacy and portability (Peters, 2007; Zayim & Ozel, 2015), enabling the greater integration of Information Technologies (IT) in the classroom (Cook & Santos, 2016; Lin, Wang, & Li, 2016). Finally, *m-learning* has the advantage of improving personal and social involvement and integration by raising social interactivity (Peters, 2007) and enabling peer interaction and cooperation (Fisher & Baird, 2006).

Possible disadvantages to integrating these devices into teaching include: first, from the educational point of view, they can become a source of distraction in the classroom (Alhassan, 2016; Chen & Yan, 2016; Wilkinson & Barter, 2016) and it can even be a disadvantage for students to have access to too much information that they do not know how to handle (Alhassan, 2016); second, technical disadvantages, such as mobile devices' battery life, different operating systems that occasionally require different software, connection speed (Alhassan, 2016) and screen size and resolution (Viberg & Grönlund, 2013); and from the financial point of view, the cost has to be mentioned, as each individual student has to have a device to be able to participate (Popović et al., 2016).

Education centers are taking a variety of business-type initiatives to mitigate economic disadvantages and boost the growing implementation of *m-learning*. One well-known initiative is *Bring Your Own Device* (BYOD), which consists of encouraging students to attend class with self-owned mobile devices with which they are familiar (Kong & Song, 2015; Song, 2016). Although until only a few years ago a student taking a cell phone or a laptop to class was regarded as a sign of a lack of attention or a source of external distraction, today BYOD is encouraged by a number of universities (Imazeki, 2014; Wang, 2015) and schools (Song, 2014; 2016), as it enables students to access learning content.

This strategy has broad advantages in terms of cost reductions for its advocates (Zahadat, Blessner, Blackburn, & Olson, 2015), in this case universities, which no longer need IT rooms and computer labs (Kobus, Rietveld, & Ommeren, 2013); however, the advantage could also become a disadvantage, as it evidences an income gap between students (see Kobus et al., 2013).

This possible disadvantage of the BYOD strategy has led to the

implementation of the well-known One-to-One Laptop Programs (Nielsen, Miller, & Hoban, 2015). These consist of the educational establishments themselves providing an internet-connected laptop to each of their students. Programs of this type are usually directed at pre-university education, both Primary (as indicated in studies by Nielsen et al., 2015 for Australia; and Pereira & Pereira, 2015 for Portugal, among others); and Secondary (as analyzed in Howard, Chan, Mozejko, & Caputi, 2015; for example). Authors such as James (2015) have drawn attention to these programs' high cost when they are publicly financed, which makes them unsustainable in the long term, particularly in the case of developing countries.

The topic's complexity means that the impact of integrating mobile devices into the classroom can be evaluated from many different angles. Following Hwang and Wu (2014), more than half of the analyzed studies do not focus on the impact on student performance and learning, but assess other aspects, such as the various facets of student engagement (Witecki & Nonnecke, 2015); student perceptions of *m-learning* (Althunibat, 2015); students' opinions of being forced to take a device to class (Cutshall, Changchit, & Elwood, 2006); and even student profiles with respect to the implementation of a BYOD strategy on university campuses (Kobus et al., 2013).

Building on this last line, the objective of the present paper is to establish differentiated student profiles according to the type of electronic device that they are willing to take to class. The ultimate objective is for the findings to enable the optimized design and application of a BYOD strategy without the university having to bear the high costs of its implementation. The chosen case study is composed of a broad sample of students enrolled in the first cycle of the Business Management undergraduate degree course at the University of Seville (Spain). The study is also justified by the fact that the University of Seville cancelled a One-to-One Laptop program called "One student, One laptop" during the 2011–2012 academic year. Students were each loaned a laptop (to keep until the conclusion of their studies) in return for a deposit of 150 Euros. After the program was cancelled, a significant fall was seen in the number of laptops being used by students in the classroom.

The present study seeks to respond to questions about the real causes that explain this falling use of laptops from the perspective of an assessment given by the students themselves. The motives could include: the lack of financing for the purchase of a laptop (although free loan programs still exist for borrowing university-owned laptops by the hour); recent advances in technology that have broadened the range of possibilities of *m-learning* implementation in teaching (Valtonen, Havu-Nuutinen, Dillon, & Vesisenaho, 2011); and using devices such as smartphones (O'Bannon and Bolton, 2014) and tablets (Kearney & Maher, 2013), whose purchase cost is generally lower than that of laptops. The present case study considers two devices for comparison, the laptop and the tablet, as these are the two pieces of electronic equipment most used for academic activities at the current time (Zayim & Ozel, 2015). The smartphone was excluded; as this is a device that the vast majority of students always carry around with them, generally for nonacademic reasons, analyzing any differences between the profiles of students who take smartphones to class and those who do not, would not be likely to contribute any relevant conclusions.

Based on a wide-ranging review of the prior literature on the BYOD strategy, four groups of determining factors are considered that affect the likelihood that a student might decide to take a tablet or a laptop to class (in the latter case, no distinction is made between a private device and one loaned by the university):

- (1) The existence of any possible barriers to access, both to the ownership of mobile devices and to their usage, or to knowledge of the technology required for their usage

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