



Use of mobile devices in the classroom to stimulate and encourage learning. Study case: undergraduate students

Uso de dispositivos móviles en el aula para dinamizar e incentivar el aprendizaje. Estudio de caso con alumnado de pregrado

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Abstract

This text is developed because it looks to understand how new pedagogies based on the use of mobile devices can be incorporated in the classroom by teachers and professors as well. The objective of this research is to show that the use of smartphones, tablets and laptops during class sessions is something necessary and that it should be incorporated as a practice in classrooms. The methodological approach is qualitative; There are 63 people as study subjects, who are divided into fourteen focus groups. There are three essential results: 1) it is inevitable to incorporate mobile devices as work tools in classes; 2) devices are allies of learning if they are used properly; 3) technology must be integrated into current educational contexts. The main discussion focuses on understanding that mobile devices are an essential component and those are part of the students. As a conclusion, the prohibition of mobile devices isn't a viable option, on the contrary, the teacher must have the ability to include them within the sessions and make them a tool that promotes the learning process. teaching and learning, that is, education needs to be updated and accompany this renewal from a point of view that integrates technology with innovative education.

Keywords: mobile devices, learning, teaching, students, teachers, innovative education.

Resumen

Este texto se desarrolla porque busca comprender cómo se pueden incorporar en el aula nuevas pedagogías basadas en el uso de dispositivos móviles. El objetivo de esta investigación es sustentar que el uso de smartphones, tabletas y laptops en el salón de clases es algo necesario y debe incorporarse como una práctica lúdica en los salones de clases. El enfoque metodológico es cualitativo; se tienen 63 personas como sujetos de estudio, las cuales se dividen en catorce grupos focales. Hay tres resultados esenciales: 1) es inevitable incorporar dispositivos móviles como herramientas de trabajo en las clases; 2) los dispositivos son aliados del aprendizaje si se utilizan de forma adecuada; 3) se debe integrar la tecnología en los contextos educativos actuales. La principal discusión se enfoca en entender que los dispositivos móviles son un componente esencial que forma parte del estudiantado y del ser humano y que su uso es cada vez mayor. La conclusión es que prohibir su uso no es una opción viable, al contrario; el docente debe tener la capacidad de incluirlo en las sesiones y hacer que se convierta en una herramienta que fomenta el proceso de enseñanza y aprendizaje, es decir, la educación necesita actualizarse y esa renovación debe abordarse desde un punto de vista que integre la tecnología con la innovación educativa.

Palabras clave: dispositivos móviles, aprendizaje, enseñanza, alumnado, profesorado, innovación educativa.

1. Introduction and state-of-the-art

Increasingly, the incorporation of Information and Communication Technologies-ICT has had more importance as tools to support university life, specially at the undergraduate level (García *et al.*, 2018). In this sense, currently, it is unlikely to think of an academic training process 100% without digital advances and interconnection, because talking about a disruptive education involves the use of mobile devices and other electronic and pedagogical resources that strengthen learning and teaching (Peñalosa, 2020).

On the other hand, educational innovations undergo changes that move from traditional models -based on professors - towards a treatment focused on active learning, which is linked to real experiences and close to practice and that demand skills according to the new roles of both students and the teaching staff (Bailey and Ford, 2023); so the promotion and encouragement of educational disruption and innovation is a relevant strategy for Higher Education Institutions -IES- (Quintero, 2017).

Thus, education changes and both professors and students must adapt to the new schemes demanded by IES; these roles have been transformed because of educational processes and should be perceived as something positive that can generate positive changes (Navarrete and Mendieta, 2018). On the one hand, professors must adapt to the use that young people give to devices, and on the other, it must be understood that today's young people are born with a range of available ICTs; therefore, there must be a balance in the classroom for their use. For students, what is normal is to be *online* and having the devices at hand, which makes them more comfortable, which further validates the incorporation of technology in the classroom (McMullan, 2016).

As for the interaction of students in the classroom, this can be enhanced if devices are used intelligently to dynamize the role it plays in the class, i.e., to create an environment in which students are able to interact immediately and be an active part of the educational process; the above, potentializes the retention of knowledge and dynamizes the relationship between student and professor.

Regarding ICTs, it should be mentioned that they are used for virtually everything from work to leisure; with a significantly high percentage of users

who are permanently connected to the services offered by the devices, so the educational system must take advantage of the multiple advantages that ICTs offer in different academic fields. In fact, the *smartphone* is the most used tool by students, for this reason its use in the classroom cannot go unnoticed (Fernández, 2019).

Smartphones have become the common within the classrooms; however, formal and institutional agreements have not yet been established regarding their use; and the guidelines depend on each educational institute, professor, subject, educational plan, etc. Finally, and to have a more appropriate delimitation of what is considered as a digital mobile device, the term of Ramírez (2012), is used who defines it as a processor with memory with various forms of input, understand keyboard, screen, buttons and output forms (text, graphics, screen, vibration, audio, cable).

Once contextualized what happens in relation to the use of digital devices in the classroom, educational innovation, the roles of students and professors, it is possible to mention that the purpose of this study is to sustain that mobile devices are necessary to strengthen and promote teaching and learning processes at higher level, in addition to ratifying their importance to strengthen educational innovation and new pedagogical techniques.

Innovation is essential to create proposals that formulate new training styles that boost the quality and functions of teaching and learning. Therefore, it is necessary to understand its components, the roles of those involved and the possibilities of use (Cueva, 2020). Precisely, within the educational level, innovation can be represented at different levels ranging from pedagogical, to administration and professionalization and updating (Valenzuela, 2017). Therefore, it is said that education -at any of its levels- cannot do without innovation, as this is one of the elements that best adapts to the characteristics of students. In short, educational innovation can be defined as any evolution - in any of its ways - that strengthens the teaching and learning process; in addition, it is considered as an intervention where the object of innovation is pedagogical techniques or teaching methodologies (Vieluf *et al.*, 2012).

In this way, innovation is associated with three basic aspects: novelty, creativity and improvement, i.e., innovating involves the creation of something unconventional that results in an improvement in

a context, for problem solving, in strategic analysis or processes, among other areas (Valencia and Valenzuela, 2017). Therefore, innovations in educational institutes take place in the classroom, outside it, in teaching practices, in pedagogies, in the curriculum, in academic programs and in different fields that enable transformation. Finally, it should be noted that currently there is not enough literature to complement the use of mobile devices in the classroom, hence this text aims to contribute to knowledge on these topics.

1.2 Pupils / professors in education

IES are faced with approaches that seek to modify their perception, where student-centered learning is the prevailing approach. Therefore, the professor must build a new role where he/she guides the student towards the development and acquisition of diverse competences that help him/her to develop in personal and professional situations. Directly, the work of professors is not limited to the present and provide knowledge, it involves assuming leadership before the group to design schemes that allow transmitting and advising students in the discipline that corresponds (Lomelí, 2016).

Thus, one of the challenges facing the teaching staff is to attend to the educational needs of students (Cardona and Barrionuevo, 2020). Individual differences in learning and the implications they have for effective education are the subject of both research and innovation programs aimed at improving educational quality, which, on the other hand, in each time and social moment have had different connotations (Perez, 2019).

For all of the above, professors must have an adequate use of ICT and thus create different teaching resources, which must be based on the characteristics and needs of the group/student to which he/she teaches to generate self-learning and achieve the set objectives (Ausín *et al.*, 2016). This entails a change in pedagogical models and teaching style (Basantes *et al.*, 2017).

Thus, the challenge for professors is to benefit from using digital devices to trigger learning and encourage continuous participation through a didactic use that allows seeing these devices not as a distractor, but as a tool to promote innovative education

and eliminate the concept of traditional teaching (Abreu *et al.*, 2016).

On the other hand, there is the new role of the students, they leave passivity and become active people (Rugel *et al.*, 2015); from a student who only listened to the professor to people able to lead their own learning, i.e., has more participation in all roles of the academy, from researching, to taking arguments and comparing them (Prieto *et al.*, 2014).

There is a concept within the educational field called ubiquitous learning/*U-learning*, which refers to the fact that learning can occur at any time and place thanks to the different portable devices (Burbules, 2012). Specifically, it relies on mobile devices such as *smartphones*, electronic tablets or laptops. This has a direct impact on the type of materials that professors can share, ranging from texts in PDF format, to videos, images, presentations, etc. (Zhao *et al.*, 2010).

It should be noted this topic has been under discussion that since 2010 (Ozuorcun and Savaroglu, 2012). Currently, everyone attending an IES has a *smartphone*. Between 2010 and 2020, this device has become the indispensable electronic device because it facilitates and serves to access information such as a personal computer (Cervantes and Hernández, 2020). Therefore, smartphones can provide tools for students to develop mathematical equations, make projections, communicate immediately, download apps depending on the discipline in which they prepare and thus give a smarter use to these devices.

Thus, the use of mobile devices in an appropriate way can be an innovative contribution in motivating learning during university life (Avendaño *et al.*, 2017). In this sense, it should be noted that the design of virtual educational environments seeks that teaching and learning focuses on developing critical thinking and that is able to adapt from different contexts under a collaborative environment (Flavin, 2017). Using the devices to strengthen learning involves designing suitable activities that contribute to facilitate the work of the student (Fiad and Galarza, 2015). Mobile devices, in one way or another, transform education, as they are a powerful instrument, which are at the service of education and student learning (Shan, 2013).

Some of the benefits for students who must use ICT in the classroom, and particularly mobile devices, is that they help them develop competen-

cies, promote teaching and learning processes and maintain an open, continuous and flexible learning (Garcés and Alcívar, 2016). In addition, it motivates development, group collaboration, critical thinking and reflection.

On the other hand, there has been discussions about the use of these devices in the classroom, and whether they should be approved or not; or, whether it is necessary to have regulated programs, either by the educational institution itself or by the professors who are the authority in the classroom (Suárez, 2018). The reality is that these devices are here and their prohibition is not a solution, especially because the information society includes them (Fragoso *et al.*, 2020).

Ramírez and García (2017) mention that mobile devices modify educational practices by offering personalized independence elements that other technologies have; for example, *smartphones* can collect and modify data immediately that go hand in hand with the appropriate use of the internet, photographs, file transfer, real-time video communication, file editing, etc.

2. Methodology

Scientific research is like any other, only more rigorous; it is systematic, controlled, empirical and critical of hypothetical propositions on the relationships between natural phenomena (Hernández *et al.*, 2020). The research uses qualitative approach because it seeks to answer questions that highlight how the social experience is produced and its meanings. Its contribution is related to the study of complex phenomena difficult to address with quantitative tools, since the proposed instruments do not usually cover the topics presented. This approach is used because of the credibility of its results. Likewise, the quality of anthropological data and their interpretations are assessed from the adequacy of narratives and interpretations with the reality of the perspectives raised by their participants (Duque, 2019).

The study was conducted with the *focus group* tool. This technique consists of sessions with small groups of people where a specific topic is addressed and where knowledge, opinions, beliefs, feelings of what is discussed are investigated (Conejero, 2020).

Now, regarding the scope of this project, the subjects of study were students studying various

academic programs at the undergraduate level of a private university in Puebla, Mexico. The population sample was 63 people, of which 37 were women and 26 were men. The age ranges from 18 to 23 years and belong to different undergraduate academic programs that include the areas of Business, Social, Humanities, Engineering and Science. The sample is for convenience and includes all students enrolled in the courses that the researcher taught during the academic period Fall 2022, which represents four courses with the aforementioned total.

Fourteen focus groups, each lasting approximately 20 minutes, were recorded and then analyzed. This process took place during October and November 2022. The groups were as follows: (1) six people (five men and one woman); (2) five people (one man and four women); (3) four people (one man and three women); (4) five people (one man and four women); (5) four people (two men and two women); (6) four people (one man and three women); (7) four people (four women); (8) six people (one man and five women); (9) five people (two men and three women); (10) four people (three men and two women); (11) four people (one man and three women); (12) two people (two men); and, (14) five people (four men and one woman).

The questions asked were:

- Why do you use the phone in class?
- How would you encourage learning and teaching in the classroom using the telephone?
- Do you think the phone is here to stay as a learning instrument inside the classroom?
- Does banning the use of the phone encourage you to use it more?
- What apps do you use most during classes?
- Is there any relationship between cell phone use and interest in class?

It should be noted that prior to the final conduction of the focus groups, two pilot tests were carried out with undergraduate students of other courses to check the effectiveness of the questions and the clarity of the answers; in this sense some changes were made both to the wording of the questions, as well as the number of questions, since at the beginning there were ten questions, and this changed

after performing the validation; from this, the aforementioned questions were obtained.

3. Results

Once focus groups are made and each of the student's participations is analyzed, it is possible to summarize the main abstractions generated in these conversations. Thus, and in order to have a clearer idea of the results, the following paragraphs include the comments —paraphrased—, assertions, points and ideas of students regarding the questions raised. It should be noted that the following paragraphs summarize most of the statements made by the student; note that the comments are related to the order of the questions asked.

As a first point, it is important to mention that students resort to the concept in English: *Fear Of Missing Out* - FOMO-; this acronym refers to the fear that users have to miss something that is happening in their social networks, notifications on WhatsApp, or any vehicle of communication and / or contact with their outside. The student comments that this phenomenon is typical of the digital age in which they live; in fact, when carrying out this study, it is found that 90% of the study subjects suffer from this symptom and although not all participants know the term, claim to have this type of suffering.

In this sense, the student affirms that the prohibition of the devices is not the answer to achieve more attention in the classroom, since although they can be removed or saved a withdrawal syndrome can be created which would make them have no interest in the session and only think about what happens in social networks, chats, pages they visit, etc. The participants define that the use of these devices “has become a habit, sometimes we use them unconsciously”; it is one of the phrases that is repeated by the student during the *focus groups*; and it is the subjects of study who indicate that the above is related to the characteristics of the devices themselves, so notifications, according to her words: “force us to see what is happening, especially on the phone, you cannot miss it,” the participants say.

However, among the comments obtained by the students, the idea of using mobile devices as part of an inherent custom of the public being studied stands out; especially because it is an instrument that is at hand and easy to use, and its use is immediate,

in fact, it is considered as something instinctive to use them because it is the digital content itself that attracts them. It should not be forgotten that the members of the focus groups mention that digital devices serve as a distraction to break the monotony of the classes, and they perceive it as a *gadget* that helps the sessions to be more dynamic, especially when the classes are very extensive.

However, among the comments repeated in this analysis is that the students admit having little attention to the different topics that are studied in class and therefore resort to the use of the tablet, phone, or laptop, and therefore propose that the classes should implement the use of devices in a playful way and not prohibit them. It is even proposed the inclusion of these as learning tools as long as they have very clear guidelines for their use, otherwise they can become distracting. It should be noted that the focus groups were composed by students who are in different semesters, there are those who are between 2nd and 4th and other groups were constituted by the student who during this academic period ends their undergraduate studies. Therefore, there is a fundamental difference, those who are already finishing the undergraduate program since they work and use the device for work issues and not so much for distraction, and even admit that their own working life has led them to perform tasks from other subjects while attending another course.

On the other hand, the use that is given to the devices is very wide, although they are almost used to check social networks, such as Facebook, Twitter, TikTok, Instagram, WhatsApp and Twitter; another type of use lies in different styles of games or streaming platforms; and to a lesser extent, it is used for educational issues such as Google Drive, or apps that allow to create presentations, texts and spreadsheets and even some platforms of the institution itself. It should be noted that it is difficult for students to approach their devices to consult any of the academic or official platforms of the IES. But there were also respondents who mentioned that any device can be used to corroborate the activities or exercises that should be performed during the class, it also serves as a notebook because they take notes, and even take some photos of formulas, slides or material that professors share.

Likewise, the students affirm that when the content of the course is complex, the device is used

less; in this sense, it can be said that the subject taught in the classroom is a factor that directly influences the use of this type of digital device. However, most respondents mention that the different devices are used by the association of topics that are discussed in the classroom, i.e., the student hears a word or concept and uses the device to know more about that subject; however, sometimes they are inclined to have an academic reason to use it, the distraction itself leads to see other pages and the dissociation is presented by forgetting the real intention and once again social networks come into play.

Many participants point out that when using the device in class it does not mean that they are not paying attention to what the professor says or explains; rather, as strange as it may seem, it helps them to have more concentration on the topics analyzed and this allows them to extract more content. Faced with these aspects, the students also share that sometimes there is no empathy on the part of professors and far from understanding the new learning processes of young people, there is an immediate ban on the use of devices; and in this sense, they point out that sometimes the class schedule directly influences the use of the devices because when they have classes at 7:00am, they need something that keeps them awake and sometimes paying attention in class is not enough.

Therefore, participants propose that agreements be established between both parties regarding the use of these devices to be used for recreational purposes and not only as distractors. It should be noted that regardless of the academic subject, there are personal situations, or possible emergencies, to which participants emphatically indicate it is a sufficient reason to keep the devices close, especially the telephone.

As for the proposals regarding the playful use that can be given to electronic devices in the classroom, the students think that the activities derived from apps like Kahoot or Menti promote healthy competition and help develop a better environment in the classroom, i.e., the use of these tools strengthens the links between students and professors. It should be noted that thanks to this type of tools, communication is also strengthened, and the learning process is perceived as something more dynamic. Focus groups mention that having a device with them encourages research, because students can

search for specific data or topics, which increases knowledge as they complement what is studied in the classes, and as they point out in the conversations “all the platforms we use have access from the phone, so it makes no sense that they tell us not use it, since all the activities are on a platform that you can see from the phone”.

In addition to the above, focus groups mention that some of the tools needed for classes are on the phone, i.e. the apps, can solve some of the problems that are asked to be solved during the sessions. In this sense they say that you can edit videos, solve mathematical equations, photograph, scan QR codes, record testimonies among many other actions that can be done with the *smartphone*, and that limiting their use would be contradictory, especially because “we are in an era where everyone is connected to everything, and many answers are in apps or on the internet”; something mentioned in some sessions.

One point that the students point out is that professors must be trained to know what kind of applications they can use, because nowadays many things can be solved with an app. The comments of the participants of the focus groups focus on the fact that if professors are prepared and understand that with mobile devices they can create more innovative learning processes, these tools do not become a distraction tool, but a powerful working tool that can help them in many of their school activities. They even mention that there are assessments and exams that can be solved from *smartphones* and that they can easily qualify and/or know the result.

Finally, the students indicate that there may be a directly proportional relationship between the use of the device and the attention that one has in class or in the complexity of it, for this reason they propose that the sessions be more dynamic and challenging, since professors cannot expect that during the 90 minutes of the class, they will have 100% attention to what the professor explains. Thus, the problem is not mobile devices, but the use that students give to it inside the classroom, so there must be a balance between applying the appropriate strategies to have a positive impact on the educational process.

Thus, once the results are obtained, it is possible to admit that mobile devices are tools that offer new spaces for educational processes. From the intelligent use by the students, but propitiated by

professors, it is possible to draw a correlation with educational innovation, especially in a time of digital mobility characterized by a student who constantly resorts to this kind of tools. Therefore, it is necessary to rethink not only the process that refers to the teaching of classes, and of the pedagogy itself, but to understand that the current generations are immersed in ICT —not always in an ideal way—; but it is the professors who must instruct the students to use them efficiently.

Hence, it is essential to understand that for using digital devices in the classroom it is necessary to have strategies that involve the curriculum, the role of professors, through dynamic sessions in which both professors and students are involved in the teaching and learning process and mobile devices are not perceived as a distraction element, but as a tool to foster better learning and seek spaces in which skills related to technology can be enhanced.

4. Discussion and conclusions

As a result of the analysis carried out, it is observed that the use of ICTs -particularly mobile digital devices- has a fundamental and innovative role in the educational field since it allows the development of knowledge, bonding, teamwork and communication in many of its aspects. Consequently, the objective of this study is fully met, since from the analysis of the results and comparing them with what the theory says, it is verified the importance of mobile devices in higher education and it is achieved to know that the students need to be close to these tools to have a more dynamic learning; removing them from the classroom is not the solution, since in the end, they have become an extension of youth. In this sense, it should be noted that the purpose of this study is to know how it is possible to integrate *smartphones*, tablets, or laptops to the sessions, and this can be established not only in the theoretical framework, but in the results presented from the methodology.

Although there are previous research that discusses the use of devices in the classroom, they do so from an empirical point of view and as a reinforcement of the importance that ICT have today; however, there are few analyzes that are drawn on the usability that devices can have and the emphasis that the students give to these tools themselves, so that

the literature is scarce or null; therefore, the information resources referred to may not be as “current” - more than five years old -, since it seems that there is a stagnation in this class of studies.

There are some interesting relationships that are worth noting. The main is that the educational system faces a somewhat complex reality due to the constant change and progress that are presented in the academic plans, without forgetting, of course, that the IES usually have more responsibility due to the specialization degree provided to the students (Doyle, 2015). As a result, professors are expected to perform various functions effectively and, of course, bring innovation to their teaching practices.

As a primary contribution, this study demonstrates -through a field study- that the students must have the ability to acquire skills that allow them to achieve meaningful learning and critical thinking; furthermore, the prohibition of mobile devices in the classroom is not the solution, but the idea is to find a pedagogical way to use them as a tool of knowledge.

The main limitation of this project is that it is somewhat complex to study the entire university population that makes up the institute in which the analysis is performed; and, in this case, only one sample is studied. In this case, only the positive characteristics of the use of mobile devices are emphasized; however, it is considered interesting to know the negative aspects and consequences in the classroom.

Future studies could include a project in which professors discuss and argue the reasons for prohibiting devices in class, or, where appropriate, make a comparative analysis of the students who use the devices in class, and those who do not use them; another analysis could be more psychological to observe the isolation or socialization behaviors of students as a result of the use of these devices.

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