

The Impact of m-Learning in School Contexts: An “Inclusive” Perspective

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Abstract. M-learning takes advantage of the use of mobile technologies (i.e. mobile phones, personal digital assistants, handheld computers) and allows students to carry out activities in a variety of settings and according to different paces. The paper discusses the main changes and challenges brought about by the use of m-technologies in school contexts with a special attention on one hand to the limitations posed, and on the other to the possibilities for enhancing students' inclusion.

Keywords: mobile, learning, impact, school, inclusion, technologies.

1 Introduction

Even if the use of ICT in school settings has become quite common, in most cases technology is something that is not really integrated in the learning activity, but rather it is a supplemental resource that is occasionally exploited.

This is due to a series of reasons, including the fact that the technological devices are often placed within laboratories and, in order to carry out ICT-based activities, students and teachers have to move from their classroom to the lab, thus causing organizational problems, as well as an overall disruption in the learning activity itself.

Taking advantage of the use of mobile technologies, m-learning should in principle allow students to carry out ICT-based learning activities in a variety of settings, ranging from the traditional places where learning usually occurs (classroom, lab, home, etc.), to places that are even far away from the “typical” ones. Furthermore, m-technologies should support the possibility for students to learn at their own pace. From this perspective, m-learning should offer a lot of advantages and allow the learning event to become really “time and space independent” [1]. In addition, mobile technologies support collaboration and information sharing, thus allowing group working, both face-to-face and at a distance.

All these features make mobile learning a very flexible approach that seems to be appropriate for addressing different needs and achieving different learning objectives.

Nonetheless, it is evident that the availability of m-devices in schools does not guarantee per se the learning experience to become a “m-learning” event; on the opposite: in order to effectively integrate m-devices in the pedagogical plan, the overall activity needs to be redesigned, taking into account that the very nature of m-devices affect several aspects of the teaching and learning process.

The paper provides an overview of the main changes and challenges brought about by the use of m-devices in school contexts and focuses on one hand on their ability to “include” students in the learning activity, and on the other on the limitations they pose.

2 Defining m-Learning

The very nature of “learning” is in itself “mobile”. Vavoula and Sharples [2] state that: “learning is mobile in terms of space, i.e. it happens at the workplace, at home, and at places of leisure; it is mobile between different areas of life, i.e. it may relate to work demands, self-improvement, or leisure; and it is mobile with respect to time, i.e. it happens at different times during the day, on working days or on weekends”.

From this perspective, one could argue that mobile technologies simply provide an “extension” to the “natural mobility of learning”.

When looking at the literature for a definition of “m-learning”, it is possible to find “technology oriented” definitions, as for example the one provided by Hoppe et al. [3] who state that “m-learning is e-learning using mobile device and wireless transmission”. In such definitions the focus is on the kind of technology used which, from time to time, may include: palmtops (or handhelds), Personal Digital Assistants (PDAs), tablet PCs, mobile or smart phones, special handhelds (e.g. e-books, dictionaries, graphical calculators, spellcheckers). It is to be noted that, generally speaking, laptops – which in principle are “mobile devices” – are not included in such definitions, in that their portability is limited and their size and weight do not allow an *everywhere* use.

Other definitions of m-learning are more “learner-centered”: O’Malley et al. [4] define m-learning as: “any sort of learning that happens when the learner is not at a fixed, predetermined location, or learning that happens when the learner takes advantage of the learning opportunities offered by mobile technologies.”

Some other definitions stress the relationship between e-learning and m-learning. Petrova [5] defines mobile learning as “a form of e-learning” to be distinguished from “online learning”. Petrova states that while the “mobile learner” is typically one who has got his/ her private device and who consequently can access the device whenever and wherever s/ he wants, the “online learner” is one who typically shares a desktop computer with others, having access to it only at fixed and pre-determined periods of time.

In the present paper we refer to “m-learning” as the *social, contextualized* and *individualized* learning process that takes advantage of the use of mobile devices in school settings.

3 M-Learning and Students’ Inclusion

A lot of studies agree that m-learning can contribute to really integrate technology in the classroom, as opposed to the present occasional, supplemental use of technology.

Klopfer et al [6] argue that five characteristics of mobile devices allow them to produce unique educational affordances; such characteristics are: *portability*, that

allows to take the devices everywhere; *social interactivity*, that supports data sharing and collaboration among face-to-face students; *context sensitivity*, that is the possibility to gather and respond to real or simulated data in a specific context; *connectivity*, i.e. the availability of the network; *individuality*, that is the possibility to personalize activities on the basis of the individual needs.

According to [7], thanks to their ability to “engage students in creative, collaborative, critical and communicative learning activities”, m-technologies “offer new solutions to traditionally problematic contexts of information delivery... The number of learners whose needs may be met by m-learning includes mature-aged, gifted, international and remote learners, as well as those with cognitive, behavioral, or social problems, or with physical or mental difficulties [8; 9; 10]. Mobile devices can help improve literacy and numeracy skills; encourage independent and collaborative learning experiences; identify areas where learners need assistance and support; mitigate resistance using ICTs; engage reluctant learners; enable learners to remain more focused for longer periods and promote self-esteem and self-confidence [11]” [7].

The impact of mobile technology on education could potentially be even stronger, because the constant exposure of students to digital technologies makes them “native” digital literates and thus the adoption of mobile learning should turn out to be particularly motivating and “natural” for them [7].

Despite this widespread enthusiasm, it is a fact that m-learning has not yet seriously impacted on educational contexts and the projects addressing the adoption of m-technology in school settings can still be regarded as spearheads [12]. This is perhaps due to a series of reasons of different nature (organizational, economical, technological, methodological) and it is beyond the scope of the present paper to analyze them. Certainly, it is worthwhile to further explore the field, since it seems that the spectrum of possibilities offered by this new generation of technologies is in some way even wider than that “announced” by the introduction of ICT in schools. As it will be illustrated in the following, such range of possibilities seems to open new horizons as far as students’ inclusion is concerned. Despite the limitations they pose, it seems that today mobile devices can really open the school to a process of innovation, “finally allowing the impact of technology to match its promise” [13].

3.1 M-Learning and Inclusion: Main Challenges

Assuming that a teacher may dispose of mobile devices for all the students, s/he should wonder why to use them, for which educational purposes.

Starting from the definition we have provided of mobile learning, we could infer that the use of handhelds is worthwhile when the teacher aims at stressing:

- the *social dimension* of learning, by enhancing communication and collaboration among peers
- the *contextualization* of learning, by providing possibilities to “work on the field”
- the *individual dimension* of learning, by personalizing the activities according to the individual needs.

Gay et al. [14] provide an interesting categorization of the learning objectives that may motivate the use of mobile technology, which is shown in the following table:

Table 1. Objectives of m-technology in education [14]

<i>Level 1</i>	<i>Level 2</i>	<i>Level 3</i>	<i>Level 4</i>
Productivity	Flexible physical access	Capturing and integrating data	Communication and collaboration
<i>Sample applications</i>			
Calendars	Local database	Network database	Real-time chat
Schedule	Interactive prompting	Data collection	Annotations
Contact	Just-in-time instructions	Data synthesis	Data sharing
Grading		Mobile library	Wireless e-mail
Content-intensive Users: individual Mostly asynchronous Information storage Hardware-centered Isolation			Communication-intensive Users: group Mostly synchronous Knowledge construction Network-centered Interconnection

The table enlightens that mobile technologies may address a certain number of objectives, ranging from “individual-centered” (left side of the table) to “group-centered” (right side) ones. Both the ends of the continuum may be regarded as promoting students’ inclusion.

Inclusion is seen as a process of addressing and responding to the diversity of needs of all learners, comprising those with “special needs”, i.e. those with intellectual or physical disabilities and learning impairments, those who are disaffected, “hard to reach” or even those who cannot attend school for personal or family/cultural reasons.

As we have already stated, one of the most interesting aspect of m-learning is the possibility to “personalize” the activities according to the individual needs of students. This may imply for example using functionalities, such as the calendar or an the automatic reminder, to support those students who have difficulties in scheduling their work.

Mobile devices may also provide the possibility to a student who cannot attend the class with regularity, to participate to the lessons and/or classroom events by using his/her personal handheld.

In other cases, the personalization may imply allowing students with cognitive difficulties to learn and work at their own pace, by providing them with specific activities or supplemental materials to be used according to their needs.

Or personalization may simply refer to the involvement in collaborative activities of students who usually work in isolation, so that they can use their palmtop for communicating, discussing and sharing materials with others.

Thus, mobile learning can in principle reach a variety of learners and may help the teacher in the difficult task of involving as many of them as possible.

Unfortunately, nowadays there are still limitations to face when adopting such technologies in educational contexts. Such limitations are first of all technical problems still to be effectively solved.

For example, one of the most important limitations related to the use of mobile devices in classroom, is the shortage of materials available for “mobile use”: the contents very often need to be designed *ad hoc* or re-adapted from the existing ones in order to make them readable from the small screen displays and both these processes seem to require a certain effort. At the moment the teacher is usually forced to either produce the material by him/herself, or select the appropriate sources to provide to students.

Besides, if the teacher wants to adopt mobile technologies for inclusion purposes, the full accessibility and high-quality interaction of devices, applications and services should be guaranteed.

On the contrary, there are “objective” barriers created above all by the small size of PDAs in particular and portable devices in general, that make them not fully accessible.

First of all, the small size of the body may prevent the use to people with manual dexterity problems, who may find it difficult to hold the PDA while working on it, or to use the stylus.

But the small size may represent a problem for blind and visual impaired as well, who may suffer from the size of the screen, its low resolution and poor lightning and from the low tactile and visual quality of both screens and buttons.

Furthermore, people with speech and language difficulties and those with learning and /or cognitive difficulties may find it difficult to understand the graphical interfaces, the technical language that is often used in the manuals and technical documentation in general, and may suffer from a lack of visual representations (e.g. icons) of actions or commands.

Even if designers of mobile devices are always looking for better and more usable solutions, it is a fact that, at the moment, before considering the possibility to adopt such technologies, the teacher should take into account such constraints.

3.2 M-Learning and Inclusion: Main Changes

A mobile learning activity may be carried out in the classroom or outside the school and the teacher may choose to let the whole class work on the same task or divide it into groups, according to the needs.

Such a scenario is not new at all in the educational panorama and could happen independently from the use of technologies, being them mobile or not.

But let's suppose each student being equipped with an handheld of his/ her own, which is on his/ her desk together with books, pencils and paper. In this new scenario, it is possible for the teacher to launch any ICT-based activity directly in the classroom and whenever this is necessary, because this won't cause any disruption in the activity itself. The class won't need to transfer into the computer laboratory and each student (and/or each group) will be able to use ICT if and when she needs it.

Besides, another innovative advantage brought about by the integration of mobile devices in the school practice, consists of the possibility to adopt a variety of learning approaches.

Naismith et al. [15] have elaborated an activity-based categorization of mobile technologies and learning, where “mobile” activities are associated with their underpinning learning theories. According to their conceptualization, one may adopt

behaviorist approaches for example by setting up drill and practice exercises to be delivered through mobile devices; as a matter of fact instant messaging (e.g. SMS) can be fruitfully used for delivering tests and questionnaires.

On the other hand, more constructivist and situated approaches can be supported by handheld computer, for example by making students gather and elaborate data on the field during experiments.

Furthermore, socio-constructivist approaches may be enhanced by exploiting the ability of mobile devices to provide communication and collaboration services, to be used both during face-to-face sessions and at a distance.

Even if one could argue that such activities and approaches were already possible using stable workstations, the real, new potentiality afforded by mobile technology is the possibility to easily switch from one approach to another without disrupting the activity, i.e. shifting from an individual activity to a collaborative one, from a frontal presentation to a working session, on the basis of the learning objectives and on the students' needs. The frequent and easy switch between the virtual and the real space is also important from a cognitive point of view, above all in an age where acquiring knowledge means above all thinking critically and solving complex problems by retrieving information in context and using multiple sets of facts [16].

From an “inclusive” perspective, this means that during the learning activity, each student (or group of students) may indifferently be “virtually” or “physically” present, working on a personal or on a group assignment, and above all s/he may change this status softly and dynamically.

From this perspective, mobile devices are not at all a *surrogate* of desktop or laptop PCs, i.e. they can not be viewed as simply providing more portable versions of the learning activities that are currently supported on more static machines [15]. Thanks to mobile devices, the technology may become an integrated resource in the learning environment being “transparent” to the student and allowing the teacher to fully exploit its potentiality.

The teacher should be aware that the ownership of mobile devices by students provide them with a great potentiality, because in principle this allows them to become active constructors of their learning process. As a matter of fact, the introduction of mobile learning in the school practice should enhance a more autonomous learner's role [17], where students are allowed to make suggestions and have a certain degree of freedom in choosing when and how they use their device.

While the teacher is in charge of providing the general outline of the activity, it would be up to the single student to “shape” the activity, according to his/her needs, pace and interests. In this scenario, the teacher becomes a mentor, able to support the learning process by catching the stimuli provided by the students and directing them towards the learning objectives.

This implies changes in the competences required by the teacher, who is not any more the “knowledge repository” who “pours” the contents into the students' minds, but rather a facilitator of learning processes, the one who orchestrates all the resources and manages the dynamics towards the achievement of the learning objectives.

Besides, at a deeper analysis of the new panorama we have sketched, it soon becomes evident that great changes are required not only to the single teacher, but rather to the overall school system as well.

As a matter of fact, the school should guarantee a flexible organization, so to allow the teacher to fully exploit mobile learning potentialities.

Moreover, the school should provide support to the teacher who adopts mobile devices in his/her practice, not only in terms of proving the suitable equipment and infrastructure, but also affording a constant technical support.

The new teacher's role and students' attitude should also find a counterpart in the curriculum and the evaluation model, that should demonstrate a certain flexibility, so to allow the teacher to take into the due consideration the stimuli provided by the learners.

If in principle mobile learning presents characteristics that indicate it as a possible solution for tackling students' inclusion in class, on the other hand, great changes are required to the school system in order to integrate mobile devices as effective learning resources.

4 Conclusions

The present paper focuses on the use of mobile technology in school settings.

When looking at the literature and analyzing the experience in the field, it is easy to realize that - despite the great enthusiasm and the optimism arisen by such technology - the impact on the educational system is still quite low and the experiences carried out are still to be considered as spearheads.

The case studies are even less, if we consider those addressing people with special needs and this is because of the several limitations, mainly technical, that still mobile devices provide to the end user.

Still, there is accordance among the authors on the idea that mobile learning can help in engaging all the students and even more, those with difficulties.

Certainly, mobile technologies have features and characteristics of their own, which make them different from ICT in general, and thus a particular attention has to be devoted to them and *ad hoc* reflections are to be carried out. In particular, inclusion could be effectively addressed with a massive adoption of mobile learning, due to the fact that such technologies may allow a more individualized learning process.

In our view, there is still a lot of work to do in the field and new, challenging research questions are raising. As it has been up to now for the introduction of ICT in education, even the use of mobile technologies in school contexts may act as a propulsive agent of innovation, thus enhancing the school to face the new needs of the society and finally move it towards inclusion.

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