How Mobile Learning Can Change Education

Mario Dumančić, Milan Matijević, and Tomislav Topolovčan
Faculty of Teacher Education, University of Zagreb, Croatia

Abstract

Frequent technological changes have started the unstoppable changes in the development of human society. Unlimited access to the information is surely the first and the basic result of these changes. The next change, not less important, happened in the transfer and the presentation of the information and the knowledge. Development of mobile technologies enabled a new step out by making the users fully mobile, resulting in obliterating the time and space limits. These devices enable the unlimited access to the information, knowledge data bases, and multimedia contents and most importantly to the communication beyond time and space. Is today's elementary school ready for the changes influenced by the mobile technologies? How can today's teacher respond to the challenges of mobile technologies in their classroom?

This paper would like to showcase and point out the changes in the educational process influenced by the development of mobile technologies.

KEYWORDS: m-learning, mobile learning, elementary school, educational technology

Introduction

A hundred years ago, as a reaction to the revolutionary discoveries in the fields of communication and transport (telephone, automobiles, airplanes, etc.), educational experts and schools have responded with projects and directions of reform pedagogy. Technological changes in communication and transport at the beginning of the 21st century, are far beyond those of a hundred years ago. Therefore, we have to ask ourselves: Are we in need of new reform pedagogy?

There are many misunderstandings in the search for answers to numerous organizational and didactic questions. Of course, the solutions hide many mistakes. Therefore, we often see students with tablets in the 17th or 18th century prototype classroom. Mighty hypermedia technology is often secondary to didactic solutions from 200 or 300 years ago. Internet and mobile phones are secondary tools within the classroom/lesson system founded 350 years ago.

To date, we have done more to adjust digital technology to the needs of teachers than to the needs of students (PowerPoint presentations, smart boards…). Yet, even today, students are generally requested to sit, listen and observe what the teacher is doing. It is difficult to achieve academic standards that today's society would expect with such didactic models. Over the last ten years we have focused a lot of attention on events in the classroom and in the school with respect to the influences of digital communication technology on the changes of the teaching environment and didactic strategies occurring in the classrooms (Matijević, 2008; Matijević, 2012; Topolovčan & Matijević, 2014). What we need now is the didactics of student's work which scientifically explains learning assisted by digital media, because we can learn *what we want, whenever we want*

it and where we want (Marche, 2006). Of course, what we need, aside to the artificial intelligence built into the latest digital media, is the empowered natural intelligence that manages learning processes with these media (Topolovčan and Matijević, 2014).

To Marche's (2006) statement, we can add that it is possible to learn in *any ways possible*. That proves that students are different; each student learns in their specific ways, but also that the competencies can be taught and developed in many different ways. That was confirmed over the last thirty years through psychology of learning (Bransford, Brown and Cocking, 2000; Preiss and Sternberg, 2010) and by neuroscience (Ischinger, 2007; Herrmann, 2009). Based on these notions, it is obvious that a human is holistic and that learning is an inherent mechanism of survival. A human being learns through cooperation, participation, work, research, play and creation. According to new discoveries on learning, a human being is not only intellectual, but also social, emotional and psychomotor creature. Therefore, a human being needs learning strategies and situations organized in such a way, as well as the classroom. We can say that today's discoveries in psychology, and primarily neuroscience, confirm what over 100 years ago was pledged by educational reform scientists such as Freinet, Steiner, Dewey, Montessori, Keschensteiner and others.

As previously mentioned, owing to new technologies, primarily Web 2.0 technologies and mobile technologies, learning is possible anywhere and anytime, and about any subject imaginable. When we add to it new discoveries of neuroscience and psychology of learning, we reach what we call "digital worlds of learning" (Hugger and Walberg, 2010) announced more than 20 years ago (more by Issing, 1994; Matijević, 1992). Digital worlds of learning include what we call mobile learning (m-learning) (Hug, 2010). In that respect, we talk about a very flexible learning and classroom organization. Such a classroom is individualized and adjusted to the individual capabilities and needs of students. Mobile learning (digital worlds of learning) is characterized by informal organization, cooperation, creativity, redefinition, individuality, small informal groups of students (associates), communication, self-organized learning and research. The listed characteristics of learning and classroom organization, assisted by digital media can be explained by the concept "open classroom and open learning" (Gudjons, 1993). Digital worlds of learning and mobile learning as one of its manifestations are, above all, interest groups of associates (students) which are formed based on individual interests and needs. Afterwards, associates work together on joint problems and this is how they develop individually.

Mobile learning of any subject, anytime, anywhere, and in every way possible, is based on the constructivist theory of learning (Terhart, 1999; Tobias and Duffy, 2009) and *community of practice* (Wenger, McDermott & Snyder, 2002).

Mobile learning is dominated by learning through research and problem solving, cooperative learning, learning by play, project learning and action oriented learning. Together with the emphasized individual approach and focus on self-realization, these learning strategies can be found within the already mentioned didactic directions and movements of the reform pedagogy (see: Skier, 2010). Didactic characteristics of „digital worlds of learning" (as well as mobile learning) significantly correspond to the didactic elements formed by Celestine Freinet, and are related to learning by research, correspondence, agreement, group meetings, free expression, cooperation etc. (see: Matijević, 2001; Skiera, 2010).

Mobile learning described in such a way has characteristics of participating culture of learning which, according to Jenkins (2006) and his renowned report *Confronting the challenges of participatory culture: media and education for the 21st century,* contains special features in net generation students. According to Jenkins, these features, i.e. skills and competencies, important for the participatory (digital) culture, as well as for mobile learning, are as follows:

1) play,

2) performance,

3) simulation,

4) appropriation,

5) multitasking,

6) distributed cognition,

7) collective intelligence,

8) judgment,

9) trans media navigation,

10) networking, and

11) negotiation.

Characteristics of digital worlds of learning, use of mobile technologies and web 2.0 technology, characteristics of m-learning, learning and classroom adjusted to the net-generation students (Hugger and Walberg, 2010), demand significantly different classes. Such classes differ from the traditional teacher-oriented class. However, it is important to mention that within the modern paradigm of learning, classroom and school (in the digital time) teacher has not become obsolete. The teacher continues to be a very important classroom subject, but that role has been changed in relation to the role of the student (and modern discoveries of the learning process). In that sense, the teacher is no longer a „lecturer", and the student is no longer a passive receptor. Students become active constructors of their knowledge, skills and competencies, and the teacher is a co-constructor who organizes learning activities based on specific learning content. Such learning and classes are described by constructivist and media didactics specialists (Issing, 1994; Kerres, 2013; Klimsa and Issing, 2009; Kron and Sofos, 2003; Simons, van der Linden and Duffy, 2002; Terhart, 1999; Tobias and Duffy, 2009). The possibilities of „digital worlds of learning" are especially observed (Arnold and Reinmann, 2010).

This paper focuses on the pedagogical, didactic and organizational solutions that can represent a starting point for the development of new, motivating educational environments and organization of learning and teaching based on e-learning and m-learning, which can meet the developmental needs of today's net-generations in today's schools.

Mobile technologies

Mobile "smart" phones and tablets have significantly altered the approach to technology, but they have also changed the ways in which society communicates and accesses information. The use of mobile technologies enables improvement of our daily activities. Business in motion, non-stop communication, resource sharing and joint work on projects represent ways in which today's society exists and develops. According to the 2011 census in Croatia, more than 60% of the households have personal computer and Internet[1] access, while, we believe, more than 90% of inhabitants of Croatia have mobile devices. Mobile technology enables continuous entertainment as well as participation in social

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1 http://www.dzs.hr/Hrv/censuses/census2011/results/htm/h02_01_20/H02_01_20.html

events aimed towards social groups and individuals based on their preferences. Mobile technology in education is the topic of scientific and expert groups. It is beyond any doubt that the capabilities of mobile technology in education are large, probably the largest so far. ICT technology of the past didn't have the capabilities and characteristics of today's mobile technology, which makes them more interesting to all the participants in the learning process (Ally, 2009.).

Students' interest in use of smart phones and tablets is a chance to create new and exciting educational experience in the classroom and in the school. But, are our schools able to accept and further develop the possibilities already present in the classroom? It is interesting to see that, at the same time, schools are continuously complaining about inadequate ICT equipment. Lack of equipment is very often a good excuse for not using the ICT equipment in the classroom (Leask & Meadows, 2000). Today, students often have brand new mobile phones, and their parents pay for access to the network resources, which, as mentioned before, make those phones a potentially very interesting classroom technology.

Unfortunately, schools generally prohibit the use of mobile phones in the classroom. Schools are actually ignoring the technology available and skills possessed by students, which are indeed necessary for the society of the future. When asking teachers for their opinion on the subject of using mobile phones in the classroom, they are generally skeptical and believe that such use is neither pedagogical nor didactical. It is interesting that they believe that mobile phones can only "interrupt the teaching process". Some teachers accept the possibilities provided by mobile technology, but admit that they lack the training in their use while teaching (Buehl, 2013). Some teachers can be called "traditional teachers", because they generally oppose the new technologies in the preparation, organization and implementation of the teaching process. This paper aims to showcase the possibilities of using mobile devices and mobile learning in primary education.

In order to enhance the learning process, it is important to consider the best characteristics of mobile devices. Today's students differ significantly from students of the past. They are, the so called, *digital natives*, according to Prensky. (Prensky, 2001). Mobile technologies have, through their development and countless possibilities, confirmed the needs and expectations of digital natives, especially when it comes to the form of education and communication. Mobile phones offer students new and flexible access to information, and prepare content in a different, more "personal" way, while at the same time teaching new skills for the future. Therefore, mobile technology has the potential to motivate new generations of students who perceive the world as an open classroom.

Having in mind all of the above, it is reasonable to ask ourselves how can we define mobile learning considering the possibilities of the technology, as well as how to define mobile learning in a way that is not closely tied to a physical device? Maximilian Dictionary defines2 mobile learning as "teaching method and materials including the use of mobile devices or hand held computers". From a technology standpoint, the use of mobile devices assumes the possibility to access information, communication, resource sharing, continuous connection, battery use (use of device), size of the monitor and of the

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[2] http://www.macmillandictionary.com/buzzword/entries/m-learning.html

device. Mobile devices offer students various possibilities in everyday life which should be focused on education (Udell & Woodill, 2014). If we want to define Mobile learning without the connection to the technical device, it is necessary to consider the possibilities, new experiences and opportunities offered by the evolution of educational technologies, which, upon request, create a personal world filled with tools and resources, aiming to develop personal knowledge, fulfilling personal needs and interests, and complete or partial cooperation.

Mobile learning means continuous adjustment to new achievements in mobile technology, continuous redefinition of the roles of students and teachers, as well as interlacing formal and informal learning. Mobile learning encourages development of life-long learning, necessary in today's society (Rosenstein, 2014).

Techno-Pedagogical Models

The first model is TPACK authored by Punya Mishra and Matt Koehler (Koehler, Mishra, & Cain, 2013) which presents the knowledge necessary for teachers so that they can efficiently use ICT in education. The TPACK framework is a complex play between three basic forms of knowledge: content (CK), pedagogy (PK) and technologies (TK). TPACK access overcomes individual elements. TPACK also highlights new forms of knowledge which are found at the crossroads in between those forms, and that represents four higher levels of teachers' knowledge applied to technology based teaching: knowledge from pedagogical content (PCK), knowledge from technological content (TCK), knowledge from techno-pedagogical content (TPK), as well as the crossing point of all three circles, knowledge from technological and pedagogical contents (TPACK) (Koehler et al., 2013). The second model is SAMR (Substitution, Augmentation, Modification and Redefinition), by Puentedura who points out the way the learning applications were selected with the help of mobile technologies. The author forecasts four phases. The first phase is substitution which directs you how to do something in a different way or with the help of something different (substitution phase), how to further enrich that way (augmentation phase or building up), how to change the task (modification or redesign phase), and redefining what is being done in a way that was not possible earlier (redefinition phase) (Puentedura, 2014.).

Organizational and Didactic Models

In order to analyze the possibilities applying mobile technology in the teaching process, it is necessary to know other available models based on the availability of mobile technology and the possibilities they offer for preparation, implementation and evaluation of the teaching process. A very important element is also the support of further professional development of teachers.

It is possible to establish several models of use of tablet devices and organization of mobile learning based on the availability of mobile devices and mobile technology, all of which can be didactically implemented within the educational environment:

- model 1 on 1 (one teacher, one device),
- model 1 on 1 (one student, one device),
- model 1 on more (one device on several students of 1 tablet classroom in a school)

One Teacher, One Device

A tablet or smartphone can be a very important teaching mean and assistance to the

teacher when showing multimedia content in a classroom, for management of educational process, access to students' work, interaction with students, designing educational content and personal development. It is important to highlight the possibility of communication and liaison with parents as well. The majority of schools in Croatia today are equipped by high-speed network connections.[3] Almost all schools have equipped their classrooms with at least one laptop or personal computer connected to a projector. When talking to teachers, it is obvious that they only use that equipment to show various content. Since 2012, CARNet has been conducting a project called e-Log, which should enable the management of the educational process[4] aimed at closely following students' notes, grades, and absences. So far, 380[5] elementary and high schools in Croatia have joined the project. The project provided tablet devices with access to web application e-Log for teachers. It is interesting to mention that access to the e-Log system is provided to parents as well. Parents can use this system to access updated information about their children.

When analyzing this model from the teaching and didactical point of view, we notice that teachers are offered various possibilities for using mobile devices and personal computers in the classroom (Quinn, 2011). A teacher can create simple educational materials (presentations, photo-albums), or use applications to supplement specific educational content, such as GeoGebre[6] for Mathematics, or Google Earth[7] for Geography, science etc.

One Student, One Device

The most motivating and the most functional concept would surely be «one student, one device» where each student would use a tablet computer or a smart phone during and after the educational process. This model can be implemented in two ways: by equipping students and classrooms with the same type of device or through the BYOD model (Bring your own device) which has been implemented in numerous schools in USA (Udell & Woodill, 2014), (Enders, 2013). Equipping schools and classrooms with the same type of device in which every student has their own device is the most motivating and the most advanced way of using tablets in teaching. Unfortunately, this is also very rare due to the very high expenses, especially for state schools that lack sufficient resources. This model would be mostly found in private schools, such as Steve Jobs Schools.[8] Private schools in various countries of the world are providing iPads to students and teachers, as well as additional educational technology. This model is specific because all the devices are of equal performances and characteristics, such as the operational system, monitor size, autonomous batteries etc. So far, there is only one school in Croatia (Elementary school Vežice[9], Rijeka) that is conducting such a project. In the Elementary school Vežice, currently 1/3 of the students are equipped with iPads and use the above-described model in their classrooms. It is important to say that the parents and the school are the project leaders because parents are financing the purchase of tablets for their children. A different

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3 It is expected that within the next two years, 75% of elementary schools, high schools and student dormitories will have a high-speed network connections (100Mbit)

4 e-Dnevnik for students is a web application which enables writing and monitoring of student's marks, absence and notes entered into the system by teachers (http://www.carnet.hr)

5 Recorded on November 11, 2015 (http://www.carnet.hr)

6 https://www.geogebra.org

7 https://www.google.com/earth/

8 http://stevejobsschool.nl

9 http://os-vezica-ri.skole.hr

form of the BYOD model is interesting because it enables the students to bring their own device to the classroom, the device that they use at home with the family, or their personal device (Harsha & Kataria, 2012., Caldwell & Bird, 2015). Schools that choose this model should first develop the network infrastructure in order to create an environment capable of accepting various devices.

This model truly provides a fully technologically supported school where devices provide great capabilities for the preparation and design of educational material, communication and implementation of the educational process. In order to fully implement this model, it is necessary to integrate it completely into the curriculum. (Udell & Woodill, 2014). Unlike the previous model that focused on the presentation of multimedia educational content, this model provides possibilities for interactive design and use of multimedia audio and video materials, active use of problem solving learning, blended learning, Flip method (reverse classroom). In addition to classroom learning, this method promotes learning of new content and communication outside the school through projects, online access to the learning materials etc. (Bergmann & Sams, 2012).

The use of gamification is also interesting, providing the students with the opportunity to learn new contents and acquire new competencies through games. This method will ensure greater participation of students, elicit exchange of ideas, cooperation, expression of opinions, empowering of communication, etc. (Kapp, 2012).

One device, several students or 1 classroom equipped with tablets per school

This model would be financially accessible to most schools. This particular model is used to equip those schools in Croatia that joined the e-schools project[10]. By equipping one tablet classroom as «Tablet lab» the goal is to enable schools to use mobile technology. It is beyond doubt that the use of mobile technologies can enhance the level of motivation and enthusiasm for learning, and increase students' performance. It is the same with the personal computers. However, if we want to make significant steps towards the improvement of learning, we need to develop a systematic approach to the use of tablet labs and to the education and training of all teachers. We should have in mind that, unlike computer classrooms, used mainly by the computer science teachers, tablet labs should be used in all subjects and classes. Tablet labs should not be reserved for one subject, because we believe that its concept and abilities could provide identical results for almost all subjects in elementary school (Beauchamp, 2012). Therefore, we can conclude that tablets have great potential for the integration into the elementary school's curriculum. An additional argument for integrating tablets into the curriculum is the need of today's digital natives who sit in the classrooms. The use of specific tablet classrooms should not satisfy today's learning process as it does not provide the same opportunities for all students (Bidarian, Bidarian, & Davoudi, 2011).

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10 e-*Schools - Overall digitalisation of the school management and learning process in order to create digitally mature schools for the 21st century. Digitally mature schools are schools connected to high-speed network, highly equipped with ICT technologies, with digital management, learning and teaching processes. Digitally competent teachers and students in e-Schools use computers and mobile equipment as well as educational applications and digital learning materials in everyday work (CARNet, http://www.carnet.hr/e-skole)*

Conclusion

The capabilities of tablets and mobile learning and teaching provide first and foremost depend on the pedagogical approaches and readiness of teachers, experts in teaching and didactics, to integrate tablets into the learning process. It is necessary to highlight that "traditional" didactics cannot stand up to the challenges of mobile technologies and possibilities of their use in the preparation, implementation and evaluation of the learning process. We have to be ready to accept new educational possibilities offered by information and communication technologies, in order to conduct necessary changes. Instead of frontal classroom didactics, we need to develop didactics of student oriented learning, constructivist didactics and constructivist teaching methodology. Finally, it should be noted that the possibilities offered by mobile learning are not the solution for all the problems of educational systems around the world, however, they do represent a powerful and revolutionary solution.

Acknowledgment:

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