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STUDENTS' PERCEPTION ON MOBILE LEARNING OF ENGINEERING GRAPHICS

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ABSTRACT
It is almost twenty years since management of the Faculty of mechanical engineering at the University of Montenegro decided that our students would be introduced to computer aided drafting and would use computers throughout the course in Engineering graphics (formerly Technical drawing). All those years our students were trained to use drafting software face to face with their lecturer. In september of 2010 american company Autodesk released a Flash-based version for the iOS version of AutoCAD for the iPhone, iPod Touch and iPad, following with the version for Android phones and tablets on april 2011. The program is available via download at no cost from App Store (iOS), Google Play (Android) and Amazon Appstore (Android). This event was the trigger for the author, appointed to the post of lecturer in Enginering graphics, to investigate the students' perception on mobile learning of Engineering graphics. This paper introduce the results of this investigation.
Keywords: mobile learning, smarthphone, engineering graphics, AutoCAD

1. INTRODUCTION
The aspect of having all pertinent information accessible at a given important moment in real time has lead to the rapid development of the wireless communication and the demands for a low-cost mobile wireless device, especially mobile phones. Mobile phone ownership and usage is now almost ubiquitous among student communities. More and more people are mobile-literate. Almost all young people today possess mobile phones. The increasingly powerful networks and current smarthphones (Apple iPhone 6, Samsung Galaxy S6, HTC One), overcoming key restriction aspects of previous generaton of mobile phones such as the limited size of the screen, limited processing power and memory, are making mobile learning a potential reality. Conventional teaching methods limit students learning outcome and disable educators to provide students better quality of learning experience [1]. Since engineering students usually have good ability in 'learning by doing' [2], which means that engineering students have a greater potential in skill, technology advancement could be use as a catalyst of innovative methods in teaching and learning process, such as mobile learning. The use of mobile devices in learning is referred to as mobile learning, this is the delivery of electronic learning materials on mobile devices such as mobile phones, personal digital assistants PDAs, tablet PCs, pocket PCs, palmtop computers, etc. Mobile learning materials can provide many advantages in teaching and learning process [3]. Good mobile learning materials, which consider the learning environment and is compatible with the current situation and needs of students to the use of mobile learning materials [4], can attract students to use it.
In september of 2010 american company Autodesk released a Flash-based version for the iOS version of AutoCAD WS for the iPhone, iPod Touch and iPad, following with the version for Android phones and tablets on april 2011. The program is available via download at no cost from App Store (iOS), Google Play (Android) and Amazon Appstore (Android). In addition to capabilities of current mobile devices this event was the trigger for the author, appointed to the post of lecturer in Enginering graphics, to investigate the students' perception on mobile learning of Engineering graphics.

2. TRENDS IN THE ADOPTION AND USE OF MOBILE TECHNOLOGIES IN MONTENEGRO

The first step in the realization of this idea was to collect and analyze the information on a current state of the telecommunication market in Montenegro. According to the information of Ministry of Information Society and Telecommunications of Montengro, which are shown in Fig.1, for the time interval 2009 to 2012, the mobile phone penetration in Montenegro is significantelly above the average mobile phone penetration in EU countries. Recent technological developments of the mobile network in Montenegro are typical for modern telecommunications sector and involve emergence of broadbend and 3G or 4G technologies. These technological developments, allowed for integrated high speed transfer of all forms of data, are followed by extensive integration of internet and web applications, which resulted in strong growth in number of mobile broadband internet users from 1.4% in 2008 to almost 20% in 2012 as shown in Figure 2. After Karen Hilsen, executive director of Telenor, by the end of 2012 almost 20% of all montenegrin users of the mobile networks owe smarthphone. At the same time smarthphone's share in mobile phone sale is more than 50%. Growing number of smathphone users obviously cause growth in use of mobile broadband services and trends shown in Figure 2.

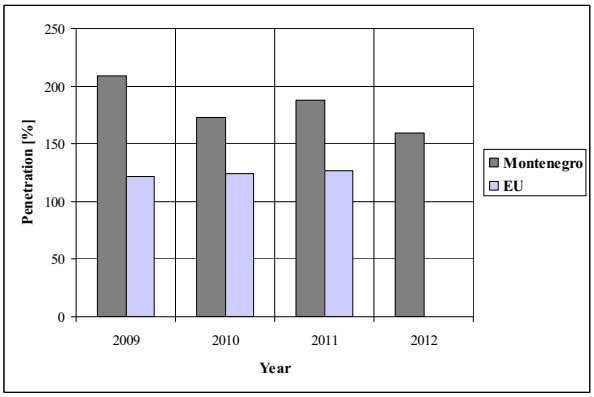

Fig. 1. Mobile phone penetration in Montenegro and EU countries from 2009 to 2012 year [5]

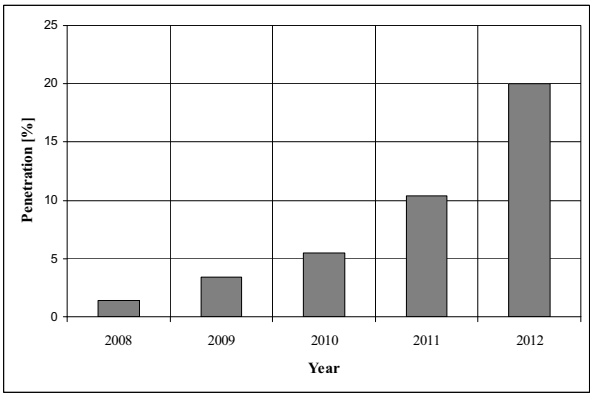

Fig. 2. Mobile broadbend internet penetration in Montenegro from 2008 to 2012 year [6,7]

The previous analysis of the collected information on a current state of the telecommunication market in Montenegro from year 2008 to 2012 highlights widespread mobile telecommunications, as well as, a considerable growth in the number of smarthphones and mobile broadband internet users. Therefore, a survey of students of Faculty of mechanical enginering, attending classes of Engineering graphics, was conducted, in order to collect information such as the answer wheter they own a mobile phone or some other kind of mobile devices, if they own some mobile devices which is type and model of their mobile devices, wheter and how frequently they use mobile broadband internet, as well as, to investigate students' perceptions on mobile learning. Such survey is conducted for two generations of students during the school year 2010/11 and 2011/12. The results of this survey revealed that all student attending classes of Engineering graphics during the mentioned school years own a mobile phone and only a few of them own some other kind of mobile devices. Even 42% of the sudents from the first generation and 48% of the students of the second generation own a smarthphone. This survey also revealed that all students owning smartphones are users of some tariff package including a broadband internet. Therefore, this survey revealed an exceptional interest of montenegrin students in the use of a mobile technology resulting in a considerably higher level of smarthphone and mobile broadbend internet penetration within student population compared to other users of mobile telecommunications in Montenegro. Survay results are expected becuase of many of the students entering university now are younger than the mobile devices. These students have grown up with mobile devices, and technology has continued to evolve and enhance their lives.

3. METHODOLOGY AND RESULTS OF SURVAY ON STUDENTS' PERCEPTION ON MOBILE LEARNING OF ENGINEERING GRAPHICS

Students of the Faculty of mechanical enginering are introduced to computer aided drafting at the start of the course in Engineering graphics (formerly Technical drawing) and they use computers throughout the course. AutoCAD is software, which they use to produce engineering drawings and three-dimensional models. Released iOS version of AutoCAD WS for the iPhone, iPod Touch and iPad, following with the version for Android phones and tablets enable using AutoCAD as a new drafting tool for mobile learning, which has the ability to provide rich mobile internet experiences that are accessible, rich in content, efficient, flexible, secure, reliable, and interactive.

Since, the concept of mobile learning is unknown to the most of students of Faculty of mechanical engineering of Univerity of Montenegro, attending the classes of Engineering graphics, a presentation on mobile learning was organized in order to introduce possibilities of implementation of AutoCAD WS as a new drafting tool for mobile learning of Engineering graphics After presentation, a survay was conducted in order to reveil students' perception on mobile learning of Engineering graphics. Presentation and survay were conducted during the school year 2011/12.

The population of this survay consisted of all students of the Faculty of mechanical engineering at the University of Montenegro attending Engineering graphics. There were 45 students in the school year 2011/12. A survay questionnaire was developed to collect data in order to investigate students' perception on mobile learning for Engineering graphics. The most important aim of the study was to reveal whether or not there is an orientation toward this concept, regarding its usefulness, simplicity and availability. The questionnaire was consisted of 10 positively and negatively statements in order to prevent any response set. Several statements from other studies were used for this study to meet its purpose [8]. A five point Likert scale (1=Strongly disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly agree) was used to express students' perception on each statement [9]. Cronbach's alpha coefficient, used to test the internal consistency of the questionnaire, is mathematically defined as follows:

$$\alpha = \frac{k}{k-1} \cdot \left(1 - \frac{1}{s_T^2} \cdot \sum_{i=1}^{k} s_i^2 \right) \tag{1}$$

where k is number of statements, s_i is standard deviation of i-th statement and s_T is standard deviation of the total of all k statements scores [10]. The major findings for the students' opinion measures, found in the questionnaire, are reported in Table 1.

Table 1. Results of survay on students' perceptions on mobile learning for Engineering graphics

No	Statement	2011/12	
		Mean	St.Dev.
1.	Mobile learning is useful for this course	3.80	0.60
2.	Using mobile learning it is easy for me to access course content	3.90	0.70
3.	Course learning objectives can be met by mobile learning	3.50	0.81
4.	Mobile learning enables me to spend my time more efficientlly	3.50	0.67
5.	Mobile learning is covenient for communication with other course students	4.00	0.77
6.	I like learning with mobile devices	3.80	0.75
7.	Mobile learning is easy to use	3.90	0.83
8.	Mobile learning makes the course more interesting	3.60	0.80
	Mobile learning can not be used for learning due to:		
9.	expenses involved in mobile learning	2.40	0.80
10.	poor networking	2.80	0.75
	The total of all 10 statements:	35.2	4.64
	Cronbach's alpha:	0.82	

A rule of thumb that has been advocated in the literature is to require Cronbach's alpha of an internally consistent questionnaire to be equal 0.70 or exceed it [11]. In this study Cronbach's alpha, calculated to be 0.82, showed a good internal consistency of the questionnaire.

4. CONCLUSION

The results of the study show that the highest means are on statements 5, 2 and 7 and the lowest means are on statements 9 and 10 that measure the students' perceptions on mobile learning. This result reveals the fact that students of the Faculty of mechanical engineering at the University of Montenegro have got positive perceptions on mobile learning considering it to be easy to use, convenient for communication with other students and access to course content. Expenses involved in mobile learning and possibility of poor networking are not meant to be obstacle to use mobile learning. The students also like to learn with mobile devices and consider mobile learning useful for course in Engineering graphics. This positive perceptions might be based on the fact that all students use mobile devices on a daily basis. Therefore, a majority of students show positive perceptions towards mobile learning. This result is in accordance with the findings of other researchers that students using technology in everyday life also become willing to use technology in their education [12].

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