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Preservice teachers' perceptions about using mobile phones and laptops in education as mobile learning tools

Süleyman Nihat Şad and Özlem Göktaş

Dr Süleyman Nihat Şad is an assistant professor at the Department of Curriculum and Instruction in İnönü University, Malatya, Turkey. His main research interests include instructional technologies, teaching methods, parental involvement and teacher training. Özlem Göktaş is a mathematics teacher and doctoral student at the Department of Curriculum and Instruction in İnönü University, Malatya, Turkey. She is interested in mathematics teaching, measurement and evaluation. Address for correspondence: Dr S. Nihat Şad/Miss Özlem Göktas, Department of Curriculum and Instruction, School of Education, İnönü University, Main Campus, 44800, Malatya, Turkey. Email: nihat.sad@inonu.edu.tr; ozlemgoktas44@hotmail.com.tr

Abstract
The purpose of this research was to investigate preservice teachers' perceptions about using m-phones and laptops in education as mobile learning tools. A total of 1087 preservice teachers participated in the study. The results indicated that preservice teachers perceived laptops potentially stronger than m-phones as m-learning tools. In terms of limitations the situation was balanced for laptops and m-phones. Generally, the attitudes towards using laptops in education were not exceedingly positive but significantly more positive than m-phones. It was also found that such variables as program/department, grade, gender and possessing a laptop are neutral in causing a practically significant difference in preservice teachers' views. The results imply an urgent need to grow awareness among participating student teachers towards the concept of m-learning, especially m-learning through m-phones.

Introduction

The world is becoming a *mobigital virtual space* where people can learn and teach digitally anywhere and anytime. Today, when timely access to information is vital, mobile devices such as cellular phones, smartphones, mp3 and mp4 players, iPods, digital cameras, data-travelers, personal digital assistance devices (PDAs), netbooks, laptops, tablets, iPads, e-readers such as the Kindle, Nook, etc have spread very rapidly and become common (El-Hussein & Cronje, 2010; Franklin, 2011; Kalinic, Arsovski, Stefanovic, Arsovski & Rankovic, 2011). Mobile devices are especially very popular among young population (Kalinic *et al*, 2011), particularly among university students (Cheon, Lee, Crooks & Song, 2012; Park, Nam & Cha, 2012). Thus, the idea of learning through mobile devices has gradually become a trend in the field of digital learning (Jeng, Wu, Huang, Tan & Yang, 2010). This is because learning with mobile devices promises "new opportunities and could improve the learning process" (Kalinic *et al*, 2011, p. 1345) and learning with mobile devices can help achieving educational goals if used through appropriate learning strategies (Jeng *et al*, 2010). As a matter of fact, from a technological point of view, mobile devices are getting more capable of performing all of the functions necessary in learning design (El-Hussein & Cronje, 2010). This and similar ideas have brought about the concept of mobile learning or m-learning.

Practitioner Notes

What is already known about this topic

- Mobile devices are very popular among young population, especially among university students.
- Though it has a recent history, m-learning (ie, learning through mobile devices) has gradually become a trend.
- M-learning brings new opportunities and can improve the learning process. Previous research on m-learning mostly presents positive outcomes in general besides some drawbacks.
- The success of integrating m-learning in teaching practice requires some degree of awareness and positive attitudes by students towards m-learning.

What this paper adds

- Since teachers' attitudes are decisive in successful integration of m-learning in teaching, the present paper attempts to understand whether preservice teachers have favorable perceptions and attitudes regarding m-learning.
- Unlike much of the previous research on m-learning that handle perceptions about m-learning in a general sense, the present paper takes a more specific approach to distinguish and compare the perceptions about two most common m-learning tools: m-phones and laptops.
- It also attempts to find out the variables that cause differences in preservice teachers' perceptions about using these m-learning devices.

Implications for practice and/or policy

- Results imply an urgent need to grow awareness and further positive attitudes among participating student teachers towards m-learning, especially through m-phones.
- Some action should be taken by the faculty and administration to pedagogically inform and raise awareness about m-learning among preservice teachers.

Although mobile learning applications are at their early days, there inevitably emerges a natural pressure by students on educators to integrate m-learning (Franklin, 2011) and so a great deal of attention has been drawn in these applications in the USA, Europe and Asia (Wang & Shen, 2012). Several universities including University of Glasgow, University of Sussex and University of Regensburg have been trying to explore and include the concept of m-learning in their learning systems (Kalinic *et al*, 2011). Yet, the success of m-learning integration requires some degree of awareness and positive attitudes by students towards m-learning. In this respect, in-service or preservice teachers' perceptions about m-learning become more of an issue, since their attitudes are decisive in successful integration of m-learning (Cheon *et al*, 2012). Then it becomes critical whether the teachers, in-service or preservice, have favorable perceptions and attitudinal representations regarding m-learning.

Theoretical framework

M-learning

M-learning has a recent history. When developed as the next phase of e-learning in early 2000s (Peng, Su, Chou & Tsai, 2009), its potential for education could not be envisaged (Attewell, 2005). However, recent developments in mobile and wireless technologies facilitated the departure from traditional learning models with time and space constraints, replacing them with

models embedded into our everyday environment, and the paradigm of mobile learning emerged (Vavoula & Karagiannidis, 2005). Today it spreads rapidly and promises to be one of the efficient ways of education (El-Hussein & Cronje, 2010).

Partly because it is a new concept, there is no common definition of m-learning in the literature yet (Peng *et al*, 2009). A good deal of literature defines m-learning as a derivation or extension of e-learning, which is performed using mobile devices such as PDA, mobile phones, laptops, etc (Jeng *et al*, 2010; Kalinic *et al*, 2011; Motiwalla, 2007; Riad & El-Ghareeb, 2008).

Other definitions highlight certain characteristics of m-learning including *portability through mobile devices*, *wireless Internet connection* and *ubiquity*. For example, a common definition of m-learning in scholarly literature is "the use of portable devices with Internet connection capability in education contexts" (Kinash, Brand & Mathew, 2012, p. 639). In a similar vein, Park *et al* (2012, p. 592) defines m-learning as "any educational provision where the sole or dominant technologies are handheld or palmtop devices." On the other hand, m-learning is likely to be simply defined stressing its property of *ubiquity*, referring to its *ability to happen whenever and wherever needed* (Peng *et al*, 2009). For example, Franklin (2011, p. 261) defines mobile learning as "learning that happens anywhere, anytime."

Though it is rather a new research topic and the effectiveness of m-learning in terms of learning achievements has not been fully investigated (Park *et al*, 2012), there is already an agreement that m-learning brings new opportunities and can improve the learning process (Kalinic *et al*, 2011). Moreover, the literature review by Wu *et al* (2012) notes that 86% of the 164 mobile learning studies present positive outcomes in general. Several perspectives of m-learning are attributed in the literature in association with these positive outcomes. The most outstanding among them is the feature of *mobility*. M-learning makes sense as an educational activity because the technology and its users are mobile (El-Hussein & Cronje, 2010). Hence, learning outside the classroom walls is possible (Nordin, Embi & Yunus, 2010; Şad, 2008; Saran, Seferoğlu & Çağıltay, 2009), enabling students to become an active participant, rather than a passive receiver of knowledge (Looi *et al*, 2010). This unique feature of m-learning brings about not only the possibility of learning anywhere without limits of classroom or library but also anytime (Çavuş & İbrahim, 2009; Hwang & Chang, 2011; Jeng *et al*, 2010; Kalinic *et al*, 2011; Motiwalla, 2007; Sha, Looi, Chen & Zhang, 2012; Sølvberg & Rismark, 2012). This especially offers learners a certain amount of "freedom and independence" (El-Hussein & Cronje, 2010, p. 19), as well as motivation and ability to "self-regulate their own learning" (Sha *et al*, 2012, p. 366). This idea of learning coincides with the principles of and meet the requirements of other popular paradigms in education including lifelong learning (Nordin *et al*, 2010), student-centeredness (Sha *et al*, 2012) and constructivism (Motiwalla, 2007).

Beside the favorable properties referred in the m-learning literature, some drawbacks of m-learning are frequently criticized. The most pronounced one is the small screen sizes of the m-learning tools that makes learning activity difficult (El-Hussein & Cronje, 2010; Kalinic *et al*, 2011; Riad & El-Ghareeb, 2008; Suki & Suki, 2011). Another problem is the weight and limited battery lives of m-tools, particularly the laptops (Riad & El-Ghareeb, 2008). Lack of understanding or expertise with the technology also hinders nontechnical students' active use of m-learning (Corbeil & Valdes-Corbeil, 2007; Franklin, 2011). Using mobile devices in classroom can cause distractions and interruptions (Cheon *et al*, 2012; Fried, 2008; Suki & Suki, 2011). Another concern seems to be about the challenged role of the teacher as the most learning activities take place outside the classroom (Sølvberg & Rismark, 2012).

M-learning in higher education

Mobile learning is becoming an increasingly promising way of delivering instruction in higher education (El-Hussein & Cronje, 2010). This is justified by the current statistics about the

prevalence of mobile devices among university students around the world (Çavuş & İbrahim, 2009; Cheon *et al*, 2012; Corbeil & Valdes-Corbeil, 2007; Park *et al*, 2012), as well as the emerging mobile learning applications in several universities (Kalinic *et al*, 2011).

Though the attempts towards using information and communication technology (ICT) in higher education institutions progress slowly (Lai, 2011), students are regarded as pioneers in forcing the faculty to change and adapt m-learning (Franklin, 2011). As a matter of fact, current findings in m-learning literature in higher education context signal positive outcomes. For example, Yılmaz (2011) found high level of theoretical awareness among master's students and faculty about m-learning. Motiwalla (2007, p. 591) found university students think mobile learning systems are "effective learning tool[s] or aid," they provide "flexible access from anywhere" and "convenient to use application." On the other hand, Avenoğlu (2005) reported that though they liked using mobile technologies, students did not think m-tools (rather referring to m-phone technologies) increased their level of learning and motivation or communication between students and between students and teachers. This and such controversial results necessitate more detailed research on the issue. As a matter of fact, we are still in the early stages of mobile learning and its application (Franklin, 2011; Wang & Shen, 2012). In the USA, for example, "student readiness for mobile learning "is not yet a fully explored field (Cheon *et al*, 2012). Also the factors affecting university students' adoption and use of m-learning need to be investigated more (Park *et al*, 2012).

Purpose and limitations

Our main purpose was to investigate the preservice teachers' perceptions about mobile learning regarding two of the mobile tools: *m-phones* and *laptops*. Unlike much of the previous research on m-learning (Cheon *et al*, 2012; Corbeil & Valdes-Corbeil, 2007; Park *et al*, 2012; Uzunboylu & Özdamlı, 2011), which seemed to handle teacher or student perceptions of m-learning in a general sense, we preferred to take a more specific approach in order to distinguish and compare the perceptions about these two m-learning tools. As a limitation, however, we decided not to categorize laptops or m-phones further into more specific devices such as tablet PCs, notebooks, smartphones, cellular phones, etc because not every participant might really know what exactly these products are and how they differ from each other.

It was also aimed to find out whether preservice teachers' perceptions differ significantly by such variables as program/department, grade, gender and the state of possessing the relevant mobile tools.

Research design and methodology

This study was designed based on a baseline descriptive survey methodology followed with a casual-comparative one in order to first determine specific characteristics of the relevant population and then to determine the possible causes for differences (Fraenkel, Wallen & Hyun, 2012). Accordingly, we attempted first to describe preservice teachers' perceptions and attitudes about using laptops and m-phones as mobile learning tools in formal education. Then as per causal-comparative approach, we compared the participants' views on using laptops and m-phones as m-learning tools, and investigated the noted differences across groups according to variables including program/department, grade, gender and the state of possessing the relevant mobile tools.

Sampling

A total of 1087 preservice teachers participated in this study from two universities in two cities. Sampling was done using a stratified random strategy, where different programs/departments and grade levels were taken as subgroups. Thus the number of students from each department and grade level in the sample was determined representing approximately the proportion as they

exist in the population (Fraenkel *et al*, 2012). Accordingly, the sample consisted of 119 (10.9%) preservice science teachers, 105 (9.7%) preservice social studies teachers, 104 (9.6%) preservice primary mathematics teachers, 98 (9%) preservice classroom teachers, 96 (8.8%) preservice counseling and guidance teachers, 95 (8.7%) preservice music teachers, 94 (8.6%) preservice Turkish language teachers, 76 (7%) preservice preschool teachers, 74 (6.8%) preservice secondary mathematics teachers, 67 (6.2%) preservice religion and moral teachers, 54 (5%) preservice art teachers, 34 (3.1%) preservice physical education and sport teachers, 27 (2.5%) preservice English language teachers, 24 (2.2%) preservice computer and technology teachers, and 20 (1.8%) preservice special education teachers. Furthermore, 294 (27.05%) of the participants were freshmen, 277 (25.48%) were second grader, 261 (24.01%) were third graders and 255 (23.46%) were seniors. Female preservice teachers ($n = 701$) represented 64.48% of the sample, while males ($n = 386$) represented 35.51% of the sample. Lastly, almost all of the participants ($n = 1081$, 99.44%) owned at least one mobile phone, and a good number of them possessed a laptop ($n = 650$, 59.8%), while 437 (40.2%) had no personal laptops.

Data collection and analysis

A 5-point (ranging from *strongly agree* to *strongly disagree*) Likert-type instrument was developed to collect data about preservice teachers perceptions and attitudes about using laptops and m-phones in education. The content of the instrument was validated through literature review and expert panel opinion. To this end, a qualitative document analysis was conducted using NVivo software (QSR International Pty Ltd., Victoria, Australia) for systematic literature review. As a result of this review, 29 items were produced and centered around two major categories: 17 statements about the strengths and 12 statements about the limitations of m-learning. In addition, we produced three items to understand whether participants think laptops and m-phones should be used as m-learning tools and whether participants actually intend to use them.

In total, 32 items were produced with two sets of responses in two columns, one for laptops and second for m-phones. In other words, each participant answered the same item both for *laptops* and *m-phones*. Next the trial form was consulted to views of an expert panel involving academicians specialized in computer and technology education and test development. In line with their views, contextual and linguistic revisions were done.

Next, in order to analyze the construct validity of the instrument, the initial form was administered on a pilot group of 368 preservice teachers selected randomly from among different departments/programs and grade levels of the study population. First attempts failed to produce the same constructs for *laptop* and *m-phone*, which would allow us to analyze participants' views for both mobile tools comparatively. Thus we decided not to produce factors or total scores, but to analyze and compare the data item-by-item. While presenting the results the items were categorized in line with the results of content validity study, and items 1–17 were categorized as *strengths* of m-phones and laptops as m-learning tools, items 18–29 were categorized as *limitations* of m-phones and laptops as m-learning tools, and finally, items 30–32 were categorized as *attitudes* towards using m-phones and laptops in education as m-learning tools.

Preservice teachers' perceptions about strengths and limitations of laptops and m-phones, and their attitudes towards their use in education were compared using paired-samples *t*-test, and results were presented in graphics. The differences across groups according to variables including gender and the state of possessing mobile tools were tested using independent-samples *t* test, while possible differences stemming from program/department and grade variables were tested through one-way ANOVA test. The significance level in inferential analysis was considered 0.05.

Results

Results about strengths

The results (see Figure 1) showed that preservice teachers favored the strengths of *laptops* (L) as m-learning tools significantly more than *m-phones* (MP), except for the feature of *portability* (item 6), where the situation was vice versa, but with a difference of small effect size ($r_{(6)} = 0.01$). Other differences were proven to be practically significant with large effect sizes for most of the items ($r_{(14)} = 0.71$, $r_{(9)} = 0.68$, $r_{(13)} = 0.66$, $r_{(12)} = 0.63$, $r_{(2)} = 0.62$, $r_{(16)} = 0.57$, $r_{(17)} = 0.56$, $r_{(15)} = 0.56$, $r_{(8)} = 0.55$, $r_{(7)} = 0.54$, $r_{(1)} = 0.52$, $r_{(10)} = 0.52$, $r_{(5)} = 0.50$), and with medium effect sizes for a few items ($r_{(4)} = 0.47$, $r_{(3)} = 0.45$, $r_{(11)} = 0.37$). That means preservice teachers believe that laptops are more feasible tools for m-learning than m-phones.

The analysis of mean scores revealed that preservice teachers mostly agreed that laptops *enable fast and easy access to information* ($\bar{x}_{L1} = 4.36$), *promote individualized learning opportunities* ($\bar{x}_{L2} = 4.16$) and *motivate learners if used for learning* ($\bar{x}_{L14} = 4.15$); and *m-phones' portability offers comfort and ease to learners* ($\bar{x}_{MP6} = 4.02$). Following these items is a group of strengths attributed to the ability of laptops to *promote lifelong learning opportunities* ($\bar{x}_{L5} = 3.97$), to *make learning interesting and enjoyable* ($\bar{x}_{L15} = 3.96$), to *enable learners to learn anywhere* ($\bar{x}_{L3} = 3.95$), to *encourage learners to become inquisitive* ($\bar{x}_{L12} = 3.87$), to *enable learners to learn more efficiently* ($\bar{x}_{L9} = 3.86$), *to be transported comfortably and easily by learners* ($\bar{x}_{L6} = 3.85$), to *improve student achievement* ($\bar{x}_{L13} = 3.80$), to *facilitate learning new things in spare time* ($\bar{x}_{L7} = 3.75$), to *enable learners to learn anytime* ($\bar{x}_{L4} = 3.73$) and to *make learners more active in learning* ($\bar{x}_{L8} = 3.73$). The items with relatively lowest scores for laptops were about their ability to *provide equal learning opportunities for learners* ($\bar{x}_{L17} = 3.49$), to *support learning by enhancing learner–learner* ($\bar{x}_{L11} = 3.47$) and *teacher–learner* ($\bar{x}_{L10} = 3.33$) interaction and lastly to *help learners concentrate on lessons better* ($\bar{x}_{L16} = 3.25$).

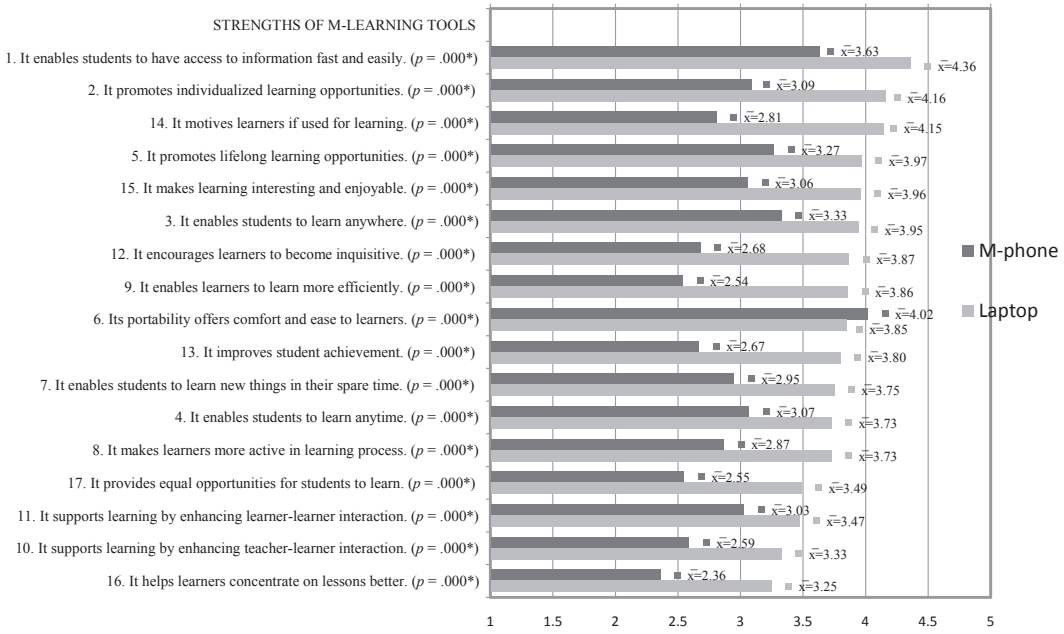

Figure 1: Paired-samples t*-test results on the comparison of student views on strengths of m-phones and laptops as m-learning tools* (n = *1087,* *p < *0.05)*

On the other hand, as mentioned earlier, participants were found to believe that mobile phones are not strong m-learning tools compared with laptops. While participants mostly agreed that mobile phones' *portability feature offers comfort and ease* ($\bar{x}_{MP6} = 4.02$), degree of agreement decreased gradually for items about mobile phones' ability to *enable students to have access to information fast and easily* ($\bar{x}_{MP1} = 3.63$), to *enable learners to learn anywhere* ($\bar{x}_{MP3} = 3.33$), to *promote lifelong learning opportunities* ($\bar{x}_{MP5} = 3.27$), to *promote individualized learning opportunities* ($\bar{x}_{MP2} = 3.09$), to *enable learners to learn anytime* ($\bar{x}_{MP4} = 3.07$), to *make learning interesting and enjoyable* ($\bar{x}_{MP15} = 3.06$), and to *support learning by enhancing learner–learner* interaction ($\bar{x}_{MP11} = 3.03$). Preservice teachers' perceptions about strengths of m-phones as m-learning tools can be said to be poor in terms of their abilities to *facilitate learning new things in spare time* ($\bar{x}_{MP7} = 2.95$), to *make learners more active in learning* ($\bar{x}_{MP8} = 2.87$), to *motivate learners if used for learning* ($\bar{x}_{MP14} = 2.81$), to *encourage learners to become inquisitive* ($\bar{x}_{MP12} = 2.68$), to *improve student achievement* ($\bar{x}_{MP13} = 2.67$), to *support learning by enhancing teacher–learner interaction* ($\bar{x}_{MP10} = 2.59$), to *provide equal learning opportunities for learners* ($\bar{x}_{MP17} = 2.55$), to *enable learners to learn more efficiently* ($\bar{x}_{MP9} = 2.54$) and finally—like in the case of laptops—to *help learners concentrate on lessons better* ($\bar{x}_{MP16} = 2.36$).

Results about limitations

The results regarding the limitations (see Figure 2) showed that preservice teachers found *laptops* (L) significantly more limited as m-learning tools than *m-phones* (MP) in some aspects, whereas in other aspects it was vice versa, and for two items there were no significant differences. To start with, the difference with the largest effect size ($r_{(18)} = 0.47$) was found between preservice teachers' views about *the cost of using m-tools in education*. Accordingly, participants thought that using *laptops* in education ($\bar{x}_{L18} = 3.54$) requires moderate level of and significantly higher costs than using *m-phones* ($\bar{x}_{MP18} = 2.83$). Though their degree of agreement was not so high for both m-tools, participants thought *laptops*' ($\bar{x}_{L22} = 2.97$) weight and size pose more trouble in education than *m-phones* ($\bar{x}_{MP22} = 2.45$), with a statistical difference of medium effect size ($r_{(22)} = 0.34$).

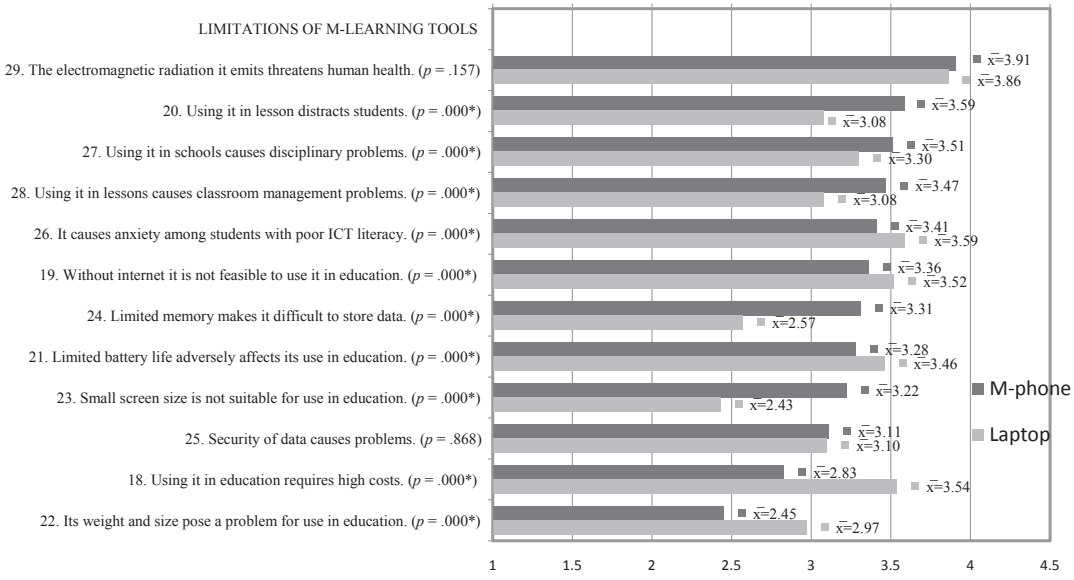

Figure 2: Paired samples t*-test results on the comparison of student views on limitations of m-phones and laptops as m-learning tools (*n = *1087,* *p < *0.05)*

Participants found both laptops ($\bar{x}_{L26} = 3.59$) and m-phones ($\bar{x}_{MP26} = 3.41$) causing moderate level of *anxiety among students with poor ICT literacy*, with a significant difference of small effect size ($r_{(26)} = 0.17$) in favor of laptops. Similarly participants moderately agreed that laptops ($\bar{x}_{L19} = 3.52$) and m-phones ($\bar{x}_{MP19} = 3.36$) are *not feasible to be used in education without Internet*, with a significant difference of small effect size ($r_{(19)} = 0.14$) in favor of the former. Finally, both laptops' ($\bar{x}_{L21} = 3.46$) and m-phones' ($\bar{x}_{MP21} = 3.28$) limited battery lives were regarded rather adversely affecting their use in education, with a significant difference of small effect size ($r_{(21)} = 0.17$) in favor of laptops again.

M-phones were perceived more limited in terms of some technical capabilities including *memory to store data* ($\bar{x}_{MP24} = 3.28$) and *suitability of screen size* ($\bar{x}_{MP23} = 3.22$) than laptops, for which participants' degree of agreement was significantly less, $\bar{x}_{L24} = 2.57$ and $\bar{x}_{L23} = 2.43$ respectively. The effect sizes for these differences were estimated medium, $r_{(24)} = 0.42$ and $r_{(23)} = 0.41$ respectively. Another difference with medium effect size ($r_{(20)} = 0.32$) was found about *distracting students during lessons.* Accordingly, participants perceived m-phones ($\bar{x}_{MP20} = 3.59$) moderately and significantly more distracting than laptops ($\bar{x}_{L20} = 3.08$) during lessons. Finally, significant differences in favor of m-phones (though with small effect sizes) were observed in *causing disciplinary problems in school* and *causing classroom management problems in the class.* So participants can be said to perceive both m-phones ($\bar{x}_{MP27} = 3.51$) and laptops ($\bar{x}_{L27} = 3.30$) moderately as a cause of *disciplinary problems at school*, and *classroom management problems in the class,* $\bar{x}_{MP28} = 3.47$ and $\bar{x}_{L28} = 3.08$ respectively.

It was also noted that participants agreed relatively the most with the item about *the risk of electromagnetic radiation emitted* by laptops ($\bar{x}_{L29} = 3.91$) and m-phones ($\bar{x}_{MP29} = 3.86$) alike without any statistically significant difference ($P > 0.05$). On the other hand participants were almost neutral about *problems regarding security of data* in laptops ($\bar{x}_{L25} = 3.11$) and m-phones ($\bar{x}_{MP25} = 3.10$) alike without any statistically significant difference ($P > 0.05$).

Results about attitudes

The results regarding the attitudes (see Figure 3) showed that preservice teachers had significantly more favorable attitudes towards using *laptops* (L) as m-learning tools than *m-phones* (MP). These differences were also proven to be practically significant with large effect sizes for all three items, $r_{(30)} = 0.67$, $r_{(32)} = 0.66$ and $r_{(31)} = 0.51$. The analysis of mean scores revealed that preservice teachers were rather positive about *using a laptop as an m-learning tool in their lessons when they become teachers in the future* ($\bar{x}_{L32} = 3.94$) and they rather support the *common use of laptops in education* ($\bar{x}_{L30} = 3.89$). They, however, found laptops relatively less suitable for every lesson at every stage ($\bar{x}_{L31} = 3.21$). On the contrary, they were in disagreement about *using m-phones*

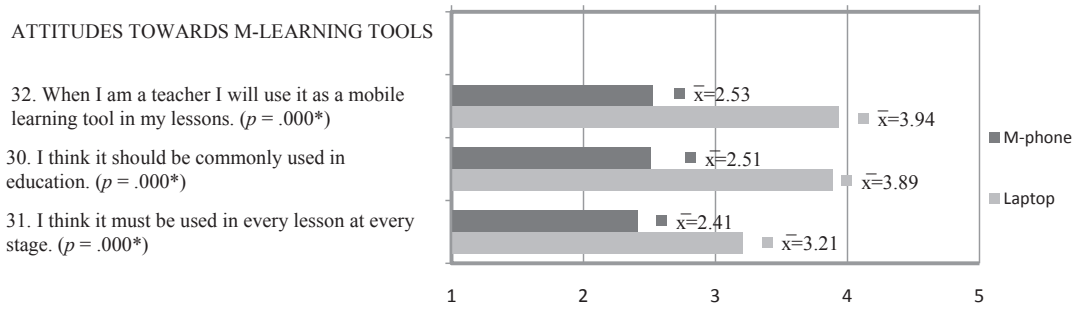

*Figure 3: Comparison of student attitudes towards m-phone and laptop as m-learning tools (*n = *1087, paired-samples* t*-test,* *p < *0.05)*

in their own lessons in the future ($\bar{x}_{MP32} = 2.53$), the *common use of m-phones in education* ($\bar{x}_{MP30} = 2.51$) and the *suitability of them for every lesson at every stage* ($\bar{x}_{MP31} = 2.41$).

Results about department/program

Following the comparative analysis of student teachers' views about using m-phones and laptops in education, it was also investigated whether the views of those studying at different departments/programs about using m-tools in education differed significantly. The one way ANOVA revealed that preservice teachers' views on using *laptops* and *m-phones* as m-learning tools regarding strengths, limitations and attitudes did not differ statistically significantly, except for attitude item 32 for *laptops* ($F_{(14, 1086)} = 2.302$, $P = 0.004$*). The Scheffe post hoc test revealed that preservice computer and technology teachers were more willing to *use laptops as an m-learning tool in their lessons when they become teachers* ($\bar{x} = 4.50$) than preservice primary mathematics ($\bar{x} = 3.60$) and secondary mathematics ($\bar{x} = 3.78$) teachers. However, the estimated small effect size ($\eta^2 = 0.03$) for this difference indicated small practical significance.

Results about grade

The comparative analysis of preservice teachers' perceptions about using m-phones and laptops in education by grade revealed no significant differences for any of the items both in terms of m-phones and laptops. That implies preservice teachers from all grades (1st to 4th) had similar views on strengths and limitations of, and attitudes towards using m-phones and laptops in education as m-learning tools.

Results about gender

Female ($n = 701$) and male ($n = 386$) preservice teachers' views about using m-phones and laptops in education were compared using independent samples *t*-test. The analysis for each item revealed that preservice teachers' views on using *m-phones* in education differed statistically significantly for items "*27. Using it in schools causes disciplinary problems*" in favor of women ($\bar{x} = 3.60$) compared with men ($\bar{x} = 3.32$) ($t_{(1085)} = 3.708$, $P = 0.000$*; Cohen $d = 0.24$, $\eta^2 = 0.01$ and $r = 0.10$), "*29. The electromagnetic radiation it emits threatens human health*" in favor of women ($\bar{x} = 4.05$) compared with men ($\bar{x} = 3.65$) ($t_{(758,62)} = 5181$, $P = 0.000$*; Cohen $d = 0.33$, $\eta^2 = 0.02$ and $r = 0.17$) and "*9. It enables learners to learn more efficiently*" in favor of men ($\bar{x} = 2.74$) compared with women ($\bar{x} = 2.43$) ($t_{(1085)} = 3.954$, $P = 0.000$*; Cohen $d = 0.25$, $\eta^2 = 0.01$ and $r = 0.10$). For preservice teachers' views on using *laptops* in education, the only statistically significant difference was established in the item "*29. The electromagnetic radiation it emits threatens human health*" in favor of women ($\bar{x} = 3.98$) compared with men ($\bar{x} = 3.64$) ($t_{(766,94)} = 4.534$, $P = 0.000$*; Cohen $d = 0.29$, $\eta^2 = 0.02$ and $r = 0.14$). Although statistically significant differences were found for these items, the estimated small effect sizes indicated poor practical significance.

Results about possessing the M-learning tool

Another question was whether possessing these tools created any significant differences in preservice teachers' views. Since almost all participants owned a mobile phone ($n = 1081$), the analysis was solely done between laptop owners ($n = 650$) and those with none ($n = 437$). The independent *t*-test analysis for each item revealed that preservice teachers' views on using *laptops* in education only differed significantly for the item "*12. It encourages learners to become inquisitive*" in favor of those having a laptop ($\bar{x} = 3.96$) compared with those having none ($\bar{x} = 3.74$) ($t_{(886,76)} = 3.266$, $P = 0.001$*). However, the estimated small effect size (Cohen $d = 0.21$, $\eta^2 = 0.01$ and $r = 0.10$) for this difference again indicated small practical significance.

Discussion

The results in general proved that participating preservice teachers found laptops potentially stronger than m-phones as m-learning tools. Though participants' views about limitations of

laptops and m-phones were found more balanced, their attitudes towards using them in education again favored laptops. These findings also suggest that when making research on m-learning, the kind of mobile tool does matter.

The premature perceptions of the participants about the potentials of m-learning (especially regarding m-phones) are inconsistent with the findings in the literature where mobile tools' contribution to effective learning has been a major focus. To illustrate, the review by Wu *et al* (2012) suggests that most mobile learning studies (86% of 164) present positive outcomes. Not only studies based on the views of teachers (Uzunboylu & Özdamlı, 2011) or students (Chen, Chang & Yen, 2012; Cheon *et al*, 2012; Gedik, Hancı-Karademirci, Kurşun & Çağıltay, 2012; Menkhoff & Bengtsson, 2012) but also experimental works (Geist, 2011; Shih, Chuang & Hwang, 2010) have found that m-tools including m-phones improve learning. Exceptionally, Kinash *et al* (2012) reported that undergraduate students were mostly neutral when asked about learning improvement via mobile learning (using iPads).

Participants' attitudes towards m-learning (relatively favorable for laptops and poor for m-phones) also seem to be controversial with a substantial literature. Several studies suggest positive student or teacher views regarding mobile learning systems or tools in general (Corbeil & Valdes-Corbeil, 2007; Motiwalla, 2007; Uzunboylu & Özdamlı, 2011), and m-phones in particular (Gromik, 2012; Saran *et al*, 2009). Exceptionally, some research found negative attitudes by university students against suitability of using m-phones in learning because of such reasons as inappropriate mobile device features, cost and its usability (Suki & Suki, 2011). Gedik *et al* (2012) also stressed the limited functions of using learners' regular cellular phones particularly with respect to the application of a constructivist approach. This implies the need to distinguish the state of art phones like smart ones from mobile phone category. Although the term mobile phone is used as a comprehensive category (Wu *et al*, 2012), there is a tendency in the literature to distinguish smartphones from other mobile phones as a distinct category (Avenoğlu, 2005; Corbeil & Valdes-Corbeil, 2007; Cui & Wang, 2008; Franklin, 2011; Kalinic *et al*, 2011; Wang & Shen, 2012; Wang, Wu & Wang, 2009; Yang, 2012). Smartphones are combinations of phone and computer technology (Çavuş & İbrahim, 2009; Yılmaz, 2011). Like PDAs, they are so advanced and versatile that smartphones are also categorized as handheld computers (Cui & Wang, 2008). That means they can do what most laptops can do or more than what an average laptop can do. So a smartphone can be said to be inferior to a laptop only in terms of screen size. However, this also seems to be a temporary problem, as smartphone producers offer larger screen sizes (Chen *et al*, 2012) and better resolutions (Nordin *et al*, 2010), or LED projectors and touch screen facilities (Wang & Shen, 2012). Thanks to all these features, smartphones are regarded as one of the most appropriate devices for m-learning (Yılmaz, 2011) and possibly increase interest in mobile learning systems (Wu *et al*, 2012). Thus, they are becoming a category of their own. Probably in very near future, most of the people might only use one device and most likely that will be the smartphone. Thus, the participants' perceptions about limitations (eg, memory size and cost) and poor m-learning potentials (eg, access to info, individualized learning, lifelong learning, learning everyday and anytime, etc) of m-phones should be interpreted carefully. It is understood that participating preservice teachers have formed their perceptions on the m-learning potentials of m-phones based on regular/traditional ones with limited features, ie, cellular phones. That means they need to be better informed about technical capabilities of state of art mobile phones (eg, smart ones) with implications on mobile learning. This is also true for laptops because participants' perceptions about the m-learning potential of laptops were not convincingly positive either. This necessitates integrating m-learning across the teacher training curricula.

A transformation towards the integration of m-learning, on the other hand, requires not only possessing the mobile devices but an awareness and intention for change on the part of students

and faculty (Franklin, 2011). To start with some communication (information, announcements, etc) can be done by the faculty or dean's office through mobile phones or laptops to increase their awareness of the m-learning function of these devices. The infrastructure can be improved to provide students with free wireless Internet connection in the campus. Providing the students with mobile friendly course information on the other hand is a major step to implement m-learning (Cheon *et al*, 2012). That means mobile tools must be aligned with the course objectives in order to make pedagogical sense (Menkhoff & Bengtsson, 2012).This requires the faculty to align themselves with m-learning requirements. However, this may pose a challenge at first because instructors may not be so ready (Cheon *et al*, 2012; Corbeil & Valdes-Corbeil, 2007) or may even be resistant (Franklin, 2011) to integrate m-learning as they may lack the required technical know-how (Menkhoff & Bengtsson, 2012). However, it should be borne in mind that the faculty or the teacher is an essential part of m-learning. Jeng *et al* (2010, pp. 6–7) refers to this role as "mobile coacher," which involve scaffolding the learning in line with learner's needs and abilities. Thus, to fully engage with mobile technologies, faculty needs to acknowledge that they are professional role models to their students. As a need for future research, the perceptions and readiness of faculty and administration towards integrating m-learning into teacher training programs can be investigated.

Conclusions

This research aimed to understand the preservice teachers' perceptions of using two most common m-learning tools, eg, laptops and m-phones, in education. It was concluded that in general participating preservice teachers' perceptions about the potentials of laptops as m-learning tools are rather positive but still need to be improved. On the contrary, it is the opposite way round for m-phones: preservice teachers mostly had less positive perceptions about the potentials of m-phones as m-learning tools. In terms of limitations participants' views on laptops and m-phones were found more balanced. The attitudes towards using laptops in education were not exceedingly positive but significantly more positive than m-phones. Also, it was found that such variables as program/department, grade, gender and possessing a laptop are neutral in causing practically significant differences in preservice teachers' views.

The results of this study imply an urgent need to grow awareness and further positive attitudes among participating student teachers towards the concept of m-learning, especially m-learning through m-phones, which get smarter day by day. As a matter of fact attitudes towards m-learning have a major influence on the intention to adopt and use m-learning (Cheon *et al*, 2012; Park *et al*, 2012). Thus, if these preservice teachers are expected to adopt and use m-learning in their future classes, some action should be taken by the faculty and administration to pedagogically inform and raise awareness about m-learning among students. Actually, this is a matter of having a competitive edge among contemporary universities where a good amount of investment is done in ICT and e-learning (Lai, 2011), and using mobile devices for learning become popular and common (Cheon *et al*, 2012; Corbeil & Valdes-Corbeil, 2007; Park *et al*, 2012).

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