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ORIGINAL RESEARCH

Teachers' Readiness to Adopt Mobile Learning in Classrooms: A Study in Greece

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Abstract
Mobile devices have become a learning tool with great potential in both formal and informal learning; however, mobile learning readiness research in school education is relatively limited. This study investigated teachers' readiness to adopt mobile learning in K-12 classrooms. A questionnaire was administered to 920 teachers in Greece and four factors were extracted, *Possibilities, Benefits, Preferences* and *External influences*. Teachers, in general, expressed positive perceptions on mobile learning readiness. The highest percentage of agreement regarded the possibilities of mobile learning (over 60%). ICT training and attendance of ICT conferences, both affected positively teachers' perceptions on mobile learning benefits and preferences. Teachers who use mobile devices in class reported significantly more positive perceptions on all factors, while gender or age had no impact on perceptions. There was a higher probability of mobile devices' usage in class among teachers working in elementary schools (in comparison with those working in high schools or general/vocational lyceums). Stronger perceptions on mobile learning benefits, preferences and external influences were associated with an increased likelihood of using mobile devices in the classroom. Teachers' readiness perceptions can be explored from a multidimensional perspective, and also be associated with mobile technology use in classrooms. Implications for teacher professional development, methodology and pedagogical practice are discussed.

Keywords Mobile learning readiness · K-12 classroom · Teachers' perceptions · Mobile devices' usage · Greece

1 Introduction and Background

Mobile devices such as smart/mobile phones and tablets have become a learning tool with great potential in both classrooms and outdoor learning (Fu and Hwang 2018; Chang and Hwang 2019). Researchers have called the learning mode that employs mobile technology/devices to facilitate or support learning, mobile learning (m-learning). Mobile

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learning is a recent technology that has been developed rapidly to deliver e-learning using personal mobile devices without posing any restrictions on time and location (UNESCO 2012); mobile learning has become an umbrella term for the integration of mobile computing devices within teaching and learning (Grant 2019). For the purpose of this paper, it is adopted that mobile learning can be defined as facilitating and enhancing the learning process via mobile devices anytime and anywhere, while the use of mobile devices in education is considered along with its potential pedagogical benefits such as enhancement of students' motivation, achievement and communication (Baydas and Yilmaz 2018). M-learning has many benefits: continuous, ongoing, flexible learning; it enables time for reflection; it facilitates informal and formal learning; it supports personalization; it is readily available; ubiquitous; contextual and relevant; it provides ubiquitous access and supports user-generated media (Zhang 2015; Sullivan et al. 2019).

Mobile learning readiness, as a new aspect of technology integration, is interpreted as the level of mobile learning acceptance and/or willingness to incorporate mobile technologies in the classroom (Christensen and Knezek 2018). Teachers' pedagogical beliefs influence teachers' adoption and use of technology in classrooms (Ertmer 2005), while the successful and satisfactory use of technology at school depends to a large extent on teachers' readiness, level of comfort, attitudes, beliefs, as well as their previous experience of information technology (Ditzler et al. 2016; Kim and Kim 2017). The purpose of this paper was to investigate Greek teachers' perceptions regarding mobile learning readiness to adopt-implement mobile technologies in classrooms. Investigating teachers' perceptions is important, because teachers' attitudes towards the value of technology to aid students' learning have a strong effect on actual technology use in the classroom (Blackwell et al. 2014; Khlaif 2017).

The context of mobile learning in Greece is briefly mentioned here (it is described in more detail in Nikolopoulou 2018). The official legislative framework (June 2018), from the Ministry of Education, states that within the school environment, primary and secondary school students may not own mobile phones or any other electronic device/game that has a system of processing image and sound. Although, mobile phone use is officially banned, during the school intervals (despite the ban), several students *switch on* their mobile phones in order to take photos/videos, send messages or enter social networking sites, while within semi-formal settings (such as school projects, museums and field trips) students are allowed/encouraged to use their mobile devices (Nikolopoulou and Gialamas 2017). Although the integration of mobile devices/phones in Greek schools is negatively affected by the current regulations, some teachers make their own decisions about the extent of mobile technology use in classrooms, in different subjects (Nikolopoulou and Kousloglou 2019; Fokides et al. 2020); also, 83% of 12–18 year old students go online via a mobile device several times per day (Nikolopoulou 2018). Within the Greek context there is insufficient empirical evidence regarding teachers' mobile learning readiness perceptions (or mobile learning classroom practices).

The rationale for this study considered as starting points the Greek context and the limited empirical evidence in K-12 education settings (e.g., in comparison to higher/tertiary education). The readiness of teachers to introduce and adopt mobile learning in classrooms is necessary to be investigated from a multi-dimensional perspective (Christensen and Knezek 2018). Teachers' perceptions of mobile learning possibilities, benefits, preferences and external influences constitute dimensions/aspects of their readiness to teach in a mobile learning environment (described in Sect. 4.2). Teachers' perceived mobile learning possibilities regard their beliefs on future possibilities arising from mobile learning implementation in the classroom (classroom potential). Mobile learning perceived educational benefits

relate to practices that benefit/improve classroom instruction (perceived beliefs and concerns about the affordances of technology use). Mobile learning preferences concern teachers' preferences in using mobile devices, while external influences relate to the context of mobile learning implementation (school, curriculum etc.). In this paper, the terms *beliefs*, *perceptions* and *views* are used as synonymous. Also, the term *ICT* (Information and Communication Technology) is treated as synonymous to *digital technology*, to indicate any forms of technology used to store, display, process, transmit, share or exchange information by electronic means.

2 Literature Review

2.1 Teachers' Perceptions on Readiness to Adopt-Implement Mobile Learning in Classrooms

Previous studies revealed that the attitude towards a new technology plays an important role in its acceptance and usage (Peng et al. 2006). In view of its educational potential, teachers' mobile learning attitudes/perceptions are important since they affect the actual use-integration of mobile technology in the classroom (Kim and Kim 2017; Khlaif 2018). Prior studies (e.g., Lenhart et al. 2010; Thomas et al. 2014; Ozdamli and Uzunboylu 2015; Christensen and Knezek 2018) highlighted teachers' perceptions towards mobile learning, as well as the factors that influence/affect their perceptions (Ifenthaler and Schweinbenz 2013; Christensen and Knezek 2018; Khlaif 2017, 2018; Al-Furaih and Al-Awidi 2020). It is noted that since some mobile learning issues relate to those studied in the broad ICT literature, we took into account relevant widely reported ICT studies (e.g., Hennessy et al. 2007; Somekh 2008; Ertmer 1999, 2005; Ertmer and Ottenbreit-Leftwich 2010), which are by no means exhaustive. Even though the potential of mobile technologies (and learning) is now recognised (Grant 2019), different barriers that inhibit their use in K-12 classrooms can be the same as ICT barriers: e.g., teachers' pedagogic beliefs, knowledge, skills, confidence (Ertmer 2005), school context and limited pedagogic and technical support (Somekh 2008).

Some teachers reported that mobile devices constitute a distraction in classroom (Lenhart et al. 2010), while others supported their use in the school due to the teaching advantages they offer (Thomas et al. 2014). Montrieux et al. (2014), in Belgium, found that secondary school teachers' acceptance of tablet computers were, in general, positive. Teachers were intrinsically motivated, while their acceptance seemed related to attaining a positive attitude, social influence and the sense to master the new mobile technology. Al-Furaih and Al-Awidi (2020), in Kuwait, investigated secondary school teachers' readiness to adopt smartphones as instructional tools, with respect to their personal concerns, technological competency and personal characteristics; teachers' perceptions of the adoption of smartphone technology were associated with their stages of concern and smartphone competency level.

In Korea, Leem and Sung (2019) investigated primary and secondary school teachers' technology acceptance of smart mobile devices in their lessons. Their results indicated that teachers' beliefs consistently revealed the factors of immediacy, interest, interactivity, instability and inconvenience; teachers' beliefs could be a major barrier to the use of technology in the classroom. Also, Kim and Kim (2017) explored the perceptions of teachers in Korean rural schools regarding teaching and learning, including technology preparedness,

performance, difficulties, and continuing integration in tablet-based interactive classrooms; teachers reported that their continuing integration of lessons with tablets was correlated with their beliefs about the applicability of tablets for lessons, their personal interests, as well as students' satisfaction with previous lessons and expectations.

Ozdamli and Uzunboylu (2015) reported positive perceptions towards mobile learning among secondary school teachers (and students) in Northern Cyprus; teachers wanted to use m-learning in education, but their adequacy levels were not sufficient. Teachers were better users of devices that they use in their daily routines such as mobile phones, while they wanted to make use of m-learning applications with the aim of supporting their lessons in the classroom. Domingo and Garganté (2016), in Spain, investigated primary school teachers' perceptions of mobile technology learning impacts/benefits and applications' use in the classroom; teachers held strong perceptions regarding encouraging learner interest for learning content, promoting new ways of knowledge building and improving information searching skills (while collaborative learning was the least appreciated learning impact). Kousloglou and Syrpi (2018), in Greece, investigated secondary school teachers' perceptions on the use of mobile phones for educational purposes; around 38% of the sample said they often use mobile phones/tablets for educational purposes, while 75% of respondents expressed willingness to integrate mobile devices in the learning process (they said, it is likely to increase students' interest/motivation), if the law allows it.

Early on, Hennessy et al. (2007) examined pedagogical strategies/approaches for exploring the benefits of ICT-based tools (simulations, datalogging etc.) to support science teaching and learning. They stressed the importance of investigating teachers' perceptions of the relative successes, problems and challenges of working with ICT, change in teachers' approach to incorporating the use of ICT in their practice and how this relates to student learning (they found that teachers exploited the affordances of the ICT tools such as the dynamic visual presentation, interactivity and immediate feedback).

2.2 Factors that Impact on Teachers' Mobile Learning Perceptions

A recent systematic review revealed that different factors (attitude, intention, ease of use, enjoyment, personal characteristics, prior experience etc.) influence/affect mobile learning adoption (Kumar and Chand 2019). Studies have shown that factors such as teachers' gender (Baek et al. 2017), age (O'Bannon and Thomas 2014), teacher experience (Ifenthaler and Schweinbenz 2013; Baek et al. 2017), availability of technical support and educational resources (Ifenthaler and Schweinbenz 2013; Khlaif 2017) and level of technology integration (Christensen and Knezek 2018) have an impact on teachers' perceptions regarding mobile learning.

Christensen and Knezek (2018) identified challenges, preferences and possibilities for integrating mobile learning into the classroom. The Mobile Learning Readiness Survey (MLRS) was used to measure the extent to which teachers indicate a willingness to introduce and teach with mobile devices in their classrooms. Educators who were higher in technology integration reported the greatest benefits from mobile learning and recognized the importance of external influences on implementation. Khlaif (2017) investigated middle school teachers' attitudes towards the adoption and acceptance of tablets into their teaching, and the factors affecting these attitudes. It was found that most teachers reported positive attitudes, and that they used tablets because it facilitates their teaching and provides equality of access to the internet and educational technology for students in rural schools. Several factors were found to influence teachers' attitudes such as prior experience

with ICT and tablets, technical support, instructional assistance and availability of suitable educational resources (Khlaif 2017, 2018); for example, 60% of the sample asserted that their prior experiences with ICT and tablets had a positive impact on their attitudes, while 73% reported that having a wireless internet access was a prerequisite to having a positive attitude toward using tablets in education (Khlaif 2017).

Baek et al. (2017) investigated Korean teachers' attitudes toward mobile devices and whether they differ in terms of teachers' gender, school level, teaching experience and specialization. It was found that female teachers, those with more than 15 years of teaching experience, as well as secondary school teachers had more positive attitudes. O'Bannon and Thomas (2014), in the USA, indicated that age impacts on teachers' perceptions on using mobile phones; those over 50 years old differed significantly in mobile phone ownership and support for mobile phone usage in the classroom, as well as in their perceptions regarding the useful mobile features for school related work (i.e., the older teachers were less likely to own smartphones, were less enthusiastic about the features, and found the barriers to be more problematic).

Somekh (2008) reported that teachers' beliefs and their use of ICT in the classrooms depend on the social and organisational contexts in which they live and work. School-wide innovation occurred when the principal's vision and motivation, and the support were of central importance; supportive infrastructure relates not only to ICT resources, but to pedagogical expertise to facilitate meaningful use of technology (Somekh 2008). Ertmer and Ottenbreit-Leftwich (2010) examined technology integration by placing the teacher as an agent of change: his/her knowledge, self-efficacy, pedagogical beliefs, and subject and school culture are dimensions affecting teacher technology use in the classroom (so as to facilitate increased student learning). These factors are also relevant to the field of mobile learning.

3 Research Objectives of the Study

1. To confirm the factorial structure of the questionnaire administered for the investigation of teachers' perceptions on mobile learning readiness;
2. To investigate the impact of teachers' characteristics (gender, age, years of teaching experience, school level, training in ICT, attendance of ICT conferences) and class conditions (i.e., mobile devices' usage in class) on their perceptions;
3. To investigate a predictive model of mobile devices' usage in class (by using the teachers' characteristics and the mobile learning readiness factors).

4 Method

4.1 Sample

The sample consisted of 920 teachers, who teach in public (state) schools across different regions in Greece. Demographic and individual characteristics of the sample (gender, age, years of teaching experience, school level, specialization, training in ICT, attendance of ICT conferences, postgraduate degree) and class conditions (use of mobile devices in class) are shown in Table 1. The teachers 33.7% males and 66.3% females, ranged in age from ≤ 40 to 56+ years, and in years of teaching experience from 1 to 26+ years. The

Table 1 Demographic, individual characteristics of the sample (920 teachers) and class conditions

Gender	
Male (33.7%) Female (66.3%)	
Age	Years of teaching experience
≤ 40 (19.5%) 41–45 (15.8%) 46–50 (19.3%) 51–55 (31.1%) 56^{+} (14.3%)	1–10 (14.6%) 11–15 (22.7%) 16–20 (24.8%) 21–25 (17.8%) 26^{+} (20.1%)
School level (students' ages)	Specialization (for 61% of high school & lyceum)
Early childhood (< 6) (13.1%) Elementary school (6–12) (25.9%) High school (12–15) (26.0%) General lyceum (16–18) (20.7%) Vocational lyceum (16–18) (14.3%)	Literature teachers (11.8%) Foreign language teachers (10.1%) Science teachers (9.9%) Mathematics teachers (7.7%) Information technology teachers (7.5%) Other (14%)
Teacher training in ICT - B' level (pedagogical)	Attendance of ICT conferences
Yes (65.9%) No (34.1%)	Yes (70.9%) No (29.1%)
Postgraduate degree/studies	Class conditions: use of mobile devices in class
Yes (42.1%) No (57.9%)	Yes (52.8%) No (47.2%)

teachers teach in different school levels, ranging from early childhood to general/vocational lyceum (in parentheses are shown the ages of students who attend the corresponding school level). For high school and lyceum teachers (i.e., for 61% of the sample), the specialization was mainly literature, foreign language, science, mathematics and Information technology teachers. The majority of the sample (65.9%) have attended/completed B' level teacher training in ICT; this is currently the largest in-service programme in Greece dedicated to providing teachers with the pedagogical skills for integrating ICT in the classroom (it follows A' level training which regards technical skills; such as use of Word, Excel and the internet). 52.8% of the sample reported they use mobile devices in class.

4.2 Procedure

The questionnaire was administered during the school year 2018–2019; it was promoted/forwarded online via two of the authors who have written educational material for teachers' training in ICT. The link with the questionnaire was sent to 500 randomly selected schools across Greece (250 primary and 250 secondary schools), using their official email addresses. Ethical issues were considered, and the participation in the survey was voluntary. We initially asked for school principals' consent about the participation of teachers in the survey, according to the new General Data Protection Regulation (GDPR). The teachers were informed that the questionnaire is anonymous and the data collected will be used solely for research purposes. Official permission was obtained from the Greek Ministry of Education and the University ethics committee (this study constituted part of a larger project).

4.3 The Research Instrument

Data were collected by the use of an online questionnaire, which consisted of two sections. Section A aimed to collect information regarding teachers' characteristics/attributes (gender, age, years of teaching experience, school level, specialization, training in ICT, attendance of ICT conferences, postgraduate degree/studies) and class conditions (use of mobile devices in class).

Section B involved 28 statements/items of the Mobile Learning Readiness Survey (MLRS), which was developed and used to measure the extent to which teachers indicate a willingness to introduce and teach with mobile devices in their classrooms (see Christensen and Knezek 2018); as these researchers pointed out this instrument was "used to address many of the areas identified in the literature as concerns to be overcome en route to full acceptance and integration of mobile learning by classroom teachers" (p. 379). The MLRS instrument was selected as most appropriate for this study for two reasons: (i) it explores mobile learning readiness as a new aspect of technology integration, and it was considered suitable for the Greek context where mobile learning is in embryonic stage, and (ii) it has been administered to a large sample of 1430 educators in K-12 classrooms, in the USA, and its internal consistency reliability (Cronbach's alpha) was found to be .92 for all items; the developers of the MLRS suggested this instrument as useful towards the development of a framework for the identification and measurement of attributes relevant to mobile learning. The instrument was considered suitable for Greek teachers (grades K-12), since we wanted to explore their preparedness to introduce and teach with mobile devices in their classrooms. The MLRS assesses perceived levels of mobile learning readiness in four identifiable areas, with reliabilities ranging from acceptable to excellent. The four scales/factors/constructs of the MLRS are as follows (see Appendix A): Factor 1 (F1: Possibilities) is related to future possibilities and involves 8 items (S1-S8); Factor 2 (F2: Benefits) is related to practices for improving classroom instruction and involves 10 items (S9-S18); Factor 3 (F3: Preferences) is related to mobile device preferences and involves 5 items (S19-S23); and Factor 4 (F4: External influences) is related to the environment/context and involves 5 items (S24-S28).

All items were initially translated into the Greek language by the authors-researchers with the help of a linguistic expert. Then, the instrument was piloted with 15 teachers (who did not participate in the main survey) in order to check that there were no difficulties or ambiguities in interpreting the statements. The 28 items were presented in random order and the teachers were asked to rate their views on a 5-point Likert-type scale (1 = strongly disagree, 2 = disagree, 3 = not sure/neutral, 4 = agree, 5 = strongly agree).

4.4 Data Analysis

The statistical software SPSS version 24.0 (2016) was used for managing the data and conducting the statistical analyses (descriptive statistics, correlation analysis and logistic regression). Moreover, during all stages of the factorial analysis, the R (R Core Team 2018) environment was used.

5 Results

5.1 Descriptive Measures for Teachers' Perceptions on Mobile Learning Readiness

To explore teachers' perceptions on mobile learning readiness, a descriptive analysis was initially performed. Table 2 shows teachers' response percentage frequencies on the 28 items of the questionnaire (n = 920 teachers). In this Table, the percentages of those who "agree" and "strongly agree", as well as of those who "disagree" and "strongly disagree" were added together; in order to have a more cohesive presentation of the responses. Also, the 28 items were sorted in descending order according to the last column (i.e., items with the highest percentage of agreement appear at the top). More specifically, over 60% of the sample, "agree and strongly agree" with the items S7, S8, S6, S4, S5, and S2. These six items with the highest percentage of agreement are associated with the possibilities of mobile learning (first factor of the questionnaire). Teachers reported "technology can be used to level the playing field for special needs students" (agreement for S7: 79.9%), "mobile devices can enhance learning if there is adequate support for teachers" (for S8: 79.6%), "mobile technology can be used to improve 21st century skills" (for S6: 76.9%), "mobile learning will increase flexibility of learning" (for S4: 66.3%), "mobile learning can be used to improve traditional literacy programs" (for S5: 65.1%), and "mobile learning will bring new opportunities for learning" (for S2: 62.2%).

5.2 Factorial Structure of the Questionnaire

5.2.1 Final Factorial Structure of the MLRS Questionnaire

In order to validate the factorial structure of Mobile Learning Readiness Survey (MLRS) with the Greek teachers' sample, we randomly split the sample into two identical sized samples (N1 = N2 = 460). The first training sample was used in Exploratory Factor Analysis (EFA) to investigate the structure of MLRS and the second validation sample in Confirmatory Factor Analysis (CFA) to validate the generated factorial structure. The parallel analysis using the "psych" package with the training sample (resampled data with 1000 replications) (Hayton et al. 2004) revealed four factors for the MLRS questionnaire, as suggested by the creators (Christensen and Knezek 2018). Then a series of factorial analyses using the "lavaan" package (Rosseel 2012) and the package "semTools" (Jorgensen et al. 2018) led us to the final factorial structure of the MLRS. Fit indices used to accept the factorial structure were, Chi square, Comparative Fit Index (CFI), Tucker Lewis Index (TLI) and Root Mean Square error of Approximation (RMSA). Values of CFI and TLI over 0.95 and RMSA under 0.08 (Byrne 2010; Hu and Bentler 1999) imply a very satisfactory fit. As an estimator in EFA and CFA, we used robust WLS estimators that do not assume normally distributed variables and can be used for ordered data (Muthén 1993). This choice was based on the fact that there were strong asymmetries in the distributions of the MLRS statements. Mardia's estimate of multivariate skewness and kurtosis (Mardia 1970) with "psych" package, were found very large (at least 47, $p < .001$).

During the EFA with WLSMV estimator, the four factor structure with all statements (see Table 3) revealed an acceptable fit. However, eight statements (S24, S7, S16, S27, S3, S23, S21 and S9) from this factorial structure presented very low loadings ($\lambda < 0.5$) and our decision was to be excluded. Our decision was based on the fact that the

Table 2 Teachers' response percentage frequencies on the 28 items (n = 920 teachers)

	Strongly disagree & disagree	Not sure	Agree	Agree & strongly agree
S7. Technology can be used to level the playing field for special needs students	3.7	16.4	55.2	79.9
S8. Mobile devices can enhance learning if there is adequate support for teachers	3.7	16.7	67.5	79.6
S6. Mobile technology can be used to improve 21st century skills	3.1	19.9	65.4	76.9
S4. Mobile learning will increase flexibility of learning	5	28.7	58.4	66.3
S5. Mobile learning can be used to improve traditional literacy programs	4.8	30.1	61.4	65.1
S2. Mobile learning will bring new opportunities for learning	6	31.7	58	62.2
S11. The use of mobile technology in the classroom increases student engagement	9.1	34.8	50.2	56.2
S25. My school is doing a good job of using technology to enhance learning	18.2	27.3	44.3	54.4
S1. Mobile devices can play an important role in K-12 education	11	35	47.3	54
S9. The use of mobile technology in the classroom makes students more motivated to learn	11.8	36.8	46.2	51.3
S12. The use of mobile technology in the classroom allows students to own their learning	12.2	38.8	44.7	49
S14. The use of mobile technology in the classroom allows students to develop creativity	10.5	42.5	43.7	47.1
S20. Using a mobile device will allow me to be better organized in my teaching	16.2	40.4	39.7	43.4
S19. Using a mobile device will help me be better organized in my daily activities	14.8	42	40.9	43.3
S26. My campus technical infrastructure and wireless network can accommodate students bringing their own technology	38	22.7	36.3	39.2
S13. The use of mobile devices in the classroom allows students to work together more often	13.5	47.6	36.2	38.9
S3. Mobile technology should be used to connect learners to people, content, and resources	17.4	44.8	33.5	37.8
S15. Mobile learning will improve communication between students and teachers	15.9	46.5	34.8	37.6
S24. Students are more knowledgeable than I am when it comes to using mobile technologies	32.2	32.8	29.3	35
S16. Mobile learning devices improve communication between students	32.7	36.8	28.3	30.5
S18. Mobile devices would introduce a significant distraction in my classroom	28.6	41	25.8	30.5
S17. Having a mobile device would improve student organization	17.6	52.8	28.6	29.6
S23. I prefer to use a mobile device rather than a computer for learning	31.7	40.3	24.6	28.1

Table 2 (continued)

	Strongly disagree & disagree	Not sure	Agree	Agree & strongly agree
S10. The use of mobile technology in the classroom increases student participation in classroom discussions	33.9	39.2	24.5	26.9
S27. My curriculum is conducive to students having their own technology	44.1	35.1	19	20.7
S28. My administration is supportive of students having their own device	39.3	40.2	17	20.6
S22. I prefer to use an electronic textbook rather than a traditional textbook	37.5	46.5	14.2	15.9
S21. I prefer to read a book on a mobile device rather than a traditional book	61.9	29.7	7.7	8.5

Table 3 Fit indices of four factor models

	χ^2	df	x^2/df	TLI	CFI	RMSEA	95% CI (RMSEA)
Training Sample (all 28 items)	1368.16	344	3.98	.935	.941	.081	.076–.085
Training Sample (remained 20 items)	582.47	164	3.55	.958	.964	.075	.068–.080
Validation Sample (remained 20 items)	499.94	164	3.04	.971	.975	.067	.060–.074

exclusion of these statements does not affect the MLRS content validity (it is noted that some of these statements are not relevant to the Greek educational context, e.g., S27, because schools ban students from using mobile devices). Additionally, the remaining statements present satisfactory fit, in all fit indices (see Table 3) and loadings (λ close to .7) to all four constructs (see Table 4). Similarly, this factorial structure was confirmed for the validation sample too (see Table 3).

Table 4 Factorial structure for each sample (remaining 20 items)

Factors	Training sample		Validation sample	
	Loadings	Mean (SD)	Loadings	Mean (SD)
F1: Possibilities				
S1	0.762	3.51 (0.78)	0.779	3.47 (0.82)
S2	0.869	3.62 (0.67)	0.899	3.59 (0.68)
S4	0.882	3.69 (0.69)	0.888	3.68 (0.72)
S5	0.658	3.65 (0.64)	0.683	3.62 (0.65)
S6	0.754	3.85 (0.67)	0.781	3.85 (0.64)
S8	0.723	3.89 (0.66)	0.749	3.86 (0.67)
F2: Benefits				
S10	0.759	3.08 (0.89)	0.704	3.06 (0.84)
S11	0.815	3.52 (0.75)	0.807	3.53 (0.77)
S12	0.775	3.42 (0.78)	0.822	3.38 (0.78)
S13	0.744	3.30 (0.74)	0.772	3.25 (0.74)
S14	0.806	3.41 (0.72)	0.854	3.38 (0.76)
S15	0.776	3.26 (0.76)	0.794	3.20 (0.80)
S17	0.789	3.14 (0.74)	0.810	3.09 (0.73)
S18*	0.690	3.00 (0.89)	0.701	2.94 (0.93)
F3: Preferences				
S19	0.841	3.31 (0.79)	0.876	3.28 (0.78)
S20	0.778	3.31 (0.82)	0.780	3.28 (0.81)
S22	0.683	3.27 (0.82)	0.664	3.23 (0.83)
F4: External Influences				
S25	0.737	3.43 (0.99)	0.727	3.44 (0.94)
S26	0.751	2.99 (1.10)	0.661	2.90 (1.04)
S28	0.775	2.78 (0.95)	0.772	2.78 (0.92)

*The negative worded statement was reversed

Table 4 shows the MLRS' factorial structure for the two different samples. The four factor structure with the remaining 20 items presented a more acceptable fit in all fit indices (Byrne 2010; Hu and Bentler 1999), both for training and validation samples.

5.2.2 Psychometric Properties of Factorial Structure of MLRS Questionnaire

Table 5 displays the reliability and validity indices of MLRS' factorial structure with the 20 remaining statements, for the training and validation samples. Moreover, the mean correlations among the remaining 20 items were .352 and .360 for training and validation samples respectively (see Appendix B). In order to establish the construct validity of the derived factorial structure the convergent and discriminant validity were investigated. The index Average Variance Extracted (AVE) of at least .5 (Raykov 2001) and the Heterotrait-Monotrait (HTMT) Ratio up to .9 (Henseler et al. 2014) establish the convergent and discriminant validity respectively. For the reliability of the derived factorial structure Cronbach's alpha and composite reliability were calculated. Indices values of at least .7 are considered satisfactory (Raykov 2001). These indices are similar with the study of Christensen and Knezek (2018); whose factors/constructs "Possibilities" (F1), "Benefits" (F2), "Preferences" (F3) and "External influences" (F4) had Cronbach's alpha .92, .91, .79 and .61, respectively.

5.3 Impact of Teachers' Characteristics and Class Conditions on the Mobile Learning Readiness Factors

Initially, the negatively worded statement S18 was reversed, so that for all items a higher score corresponds to a more positive perception. Following the final formation of our factorial structure, we constructed four new variables based on the scale (of 5 points) of the items. Then, for the whole sample a series of tests were performed; in order to determine any differences in the scores of the factors in the different groups of the aggregate sample, as these were distinguished by the demographic characteristics of the sample. Table 6 shows the impact of teachers' characteristics on the factors with ANOVA analysis; except of the teachers' age and years of teaching experience, for which bivariate correlation analysis was carried out. The more the years of teaching experience the stronger were teachers' perceptions on the external influences of mobile learning ($r = .131$, $p = .001$). Those teachers who hold a postgraduate degree showed significant higher scores on the "Benefits" factor ($F(1, 918) = 9.375$, $p = .001$); i.e., more positive perceptions in comparison to other groups of teachers. The ICT training groups showed significant differences on the

Table 5 Reliability and validity indices for training and validation samples

Factors	Cronbach's Alpha	Composite Reliability (CR)	AVE	HTMT ratios			
				F1	F2	F3	F4
Possibilities	0.895 (0.908)	0.866 (0.880)	0.606 (0.640)		(0.899)	(0.815)	(0.166)
Benefits	0.916 (0.923)	0.889 (0.898)	0.593 (0.615)	0.895		(0.858)	(0.117)
Preferences	0.809 (0.810)	0.776 (0.785)	0.592 (0.605)	0.843	0.851		(0.175)
Ext. influences	0.790 (0.760)	0.708 (0.677)	0.569 (0.520)	0.165	0.192	0.155	

In parentheses the validation sample indices

Table 6 Impact of teachers' characteristics and class conditions on the factors

	Possibilities (F1)	Benefits (F2)	Preferences (F3)	External Influences (F4)
Gender	ns	ns	ns	ns
Age	ns	ns	ns	ns
Years of teaching experience	ns	ns	ns	r = .131, p = .001
Postgraduate studies	ns	Yes: 3.32 No: 3.19	ns	ns
ICT training (B' level)	ns	Yes: 3.30 No: 3.17	Yes: 3.35 No: 3.14	Yes: 3.10 No: 2.98
Attendance of ICT conferences	Yes: 3.73 No: 3.60	Yes: 3.30 No: 3.13	Yes: 3.35 No: 3.11	ns
School level (they teach)	early childhood: 3.68 elementary school: 3.74b high school: 3.59a general lyceum: 3.74b vocational lyceum: 3.70	ns	early childhood: 3.32 elementary school: 3.29 high school: 3.15a general lyceum: 3.32 vocational lyceum: 3.38b	early childhood: 3.23b elementary school: 3.10 high school:3.09 general lyceum:2.94a vocatioanal lyceum: 2.90a
Use of mobile devices in class	Yes: 3.82 No: 3.54	Yes: 3.42 No: 3.05	Yes: 3.45 No: 3.08	Yes: 3.14 No: 2.96

$p < 0.05$, ns: non significant, different subscript letters reveal a statistically significant difference

"Benefits", "Preferences" and "External Influences" factors ($F(1, 918) = 8.088$, $p = .005$, $F(1, 918) = 20.984$, $p = .001$ and $F(1, 918) = 3.890$, $p = .045$, respectively); i.e., teachers who completed training in ICT showed significantly stronger perceptions on these three factors in comparison to other groups of teachers. The attendance of ICT conferences groups showed significant differences on the "Possibilities", "Benefits" and "Preferences" factors ($F(1, 918) = 10.092$, $p = .002$, $F(1, 918) = 15.247$, $p = .001$ and $F(1, 918) = 24.957$, $p = .002$, respectively); i.e., teachers who participated in ICT conferences showed significantly higher scores on these three factors in comparison to other groups of teachers. The school level groups showed significant differences on the "Possibilities", Preferences" and "External Influences" factors ($F(4, 915) = 3.040$, $p = .017$, $F(4, 915) = 3.280$, $p = .011$ and $F(4, 915) = 4.232$, $p = .002$, respectively). Elementary school and general lyceum teachers showed significantly higher scores on the "Possibilities" factor, in comparison to high school teachers. Vocational lyceum teachers showed significantly higher scores on "Preferences" factor in comparison to high school teachers. Early childhood teachers showed significantly higher scores on "External influences" factor in comparison to general and vocational lyceum teachers. The use of mobile devices in class showed significant differences on all four factors ($F(1, 918) = 68.200$, $p = .001$, $F(1, 918) = 95.642$, $p = .001$, $F(1, 918) = 77.079$, $p = .001$ and $F(1, 918) = 11.330$, $p = .001$, respectively); i.e., teachers who use mobile devices in class reported significantly more positive perceptions on all four factors/constructs in comparison to other groups of teachers. Finally, gender or age (<=25: .4%, 26–30: 2.2%, 31–35: 5.7%, 36–40: 11.2%, 41–45: 15.8%, 46–50: 19.3%, 51–55: 31.1%, 56–60: 11.8%, > 60: 2.5%) had no impact on any factor.

5.4 Investigation of a Predictive Model of Mobile Devices' Usage in Class

A logistic regression was performed to ascertain the effects of specific teachers' characteristics and of the four mobile learning readiness factors on the likelihood that teachers use mobile devices in the classroom (yes/no). The independent variables entered in the logistic regression model were "gender", "age", "years of teaching experience", "school level" (early childhood, elementary school, high school, general lyceum and vocational lyceum), "postgraduate studies" (yes/no), "B-level ICT training" (yes/no), "attendance of ICT Conferences" (yes/no) and the four mobile learning readiness factors F1, F2, F3 and F4 (i.e., "Possibilities", "Benefits", "Preferences" and "External influences"). Model selection was done using stepwise forward procedure based on the probability of the Wald statistic (Hosmer et al. 2013). The omnibus test statistic revealed that the logistic regression could be used to model the data, $x^2(9) = 136.26$, $p = .0001$. The model explained 18.40% (Nagelkerke R2) of the variance of actual mobile usage in the classroom and correctly classified 66.2% of cases. Hosmer-Lemeshow goodness-of-fit statistics (Hosmer et al. 2013) were also used to assess the fit of the models revealed that the Chi square values of test and non-significant p-values ($x^2(8) = 14.136$, $p = .078$) were improved after removing insignificant factors.

Table 7 shows significant factors that explain teachers' intention to use mobile devices in class. School level had a significant positive effect on mobile devices' use (Wald = 19.633, $p = .001$). There was a higher probability of mobile devices' usage in class among teachers working in elementary schools in comparison with teachers working in high schools (Wald = 16.611. $p = .0001$, Exp(B) = 1/.443 = 2.26), general lyceums (Wald = 5.197. $p = .023$, Exp(B) = 1/.618 = 1.62) or vocational lyceums (Wald = 4.103. $p = .043$, Exp(B) = 1/.622 = 1.61). With regard to the teaching experience, teachers with

Table 7 Logistic regression model of mobile use in class (yes/no): Variables retained after forward selection method with Wald criterion

	B	SE	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
School level (SL) (elementary school = ref)			19.633	4	.001			
SL: early childhood	− .080	.245	0.106	1	.744	.923	.571	1.493
SL: high school	− .815	.200	16.611	1	.000	.443	.299	.655
SL: general lyceum	− .481	.211	5.197	1	.023	.618	.409	.935
SL: vocational lyceum	− .475	.234	4.103	1	.043	.622	.393	.985
Years of teaching experience	− .159	.050	10.102	1	.001	.853	.773	.941
F2: Benefits	.841	.171	24.290	1	.000	2.318	1.659	3.238
F3: Preferences	.393	.151	6.733	1	.009	1.482	1.101	1.994
F4: External Influences	.246	.094	6.908	1	.009	1.279	1.065	1.536
Constant	− 3.779	.544	48.247	1	.000	.023		

fewer years of teaching experience have greater likelihood (Wald = 10.102. p = .001, Exp(B) = 1/.853 = 1.17) of using mobile devices in classroom (compared to those with many years of teaching experience). Finally, the higher the values of F2, F3 and F4, the higher the probability of mobile devices' usage in class; stronger perceptions about mobile learning "Benefits" (Wald = 24.290. p = .0001, Exp(B) = 2.318), "Preferences" (Wald = 6.733. p = .009, Exp(B) = 1.482) and "External Influences" (Wald = 6.908. p = .009, Exp(B) = 1.279) were associated with an increased likelihood of using mobile devices in classroom.

6 Discussion and Conclusions

The aim of this study was to explore Greek teachers' readiness to adopt mobile learning in classrooms. The study adds to the body of empirical evidence regarding teachers' acceptance-willingness to implement mobile learning; a fast growing field of research. This investigation is important because teachers' acceptance and/or willingness beliefs are indicators of their preparedness for teaching with technology, and influence their classroom practices. It is crucial for teachers not to remain behind their students who will form the information society of the future (Ozdamli and Uzunboylu 2015). The results may be useful for researchers, educational policymakers, as well as teachers.

With regard to the first research objective (to confirm the factorial structure of the questionnaire for the investigation of teachers' perceptions on mobile learning readiness), the analysis demonstrated that there were four factors: "Possibilities" (F1), "Benefits" (F2), "Preferences" (F3) and "External influences" (F4). This reveals the factorial structure of the MLRS questionnaire and indicates that literature-originated constructs on mobile learning readiness do not differ much between teacher populations of different countries (e.g., in the USA and in Greece). There was strong agreement with the factors proposed by Christensen and Knezek (2018); their four discrete dimensions/factors/constructs constitute a reliable instrument to investigate teachers' readiness to introduce and teach with

mobile devices. These newly-identified constructs could be used for the development of a mobile learning framework (discussed in implications). In our study, the descriptive analysis revealed that, in general, teachers expressed positive perceptions on mobile learning readiness. The highest percentage of agreement regarded the possibilities of mobile learning (over 60% of the sample "agree and strongly agree" with the majority of the items included in the "Possibilities" factor). Indicatively, teachers strongly believe that "technology can be used to level the playing field for special needs students" (agreement 79.9%), "mobile devices can enhance learning if there is adequate support for teachers" (79.6%), "mobile technology can be used to improve 21st century skills" (76.9%) and "mobile learning will bring new opportunities for learning" (62.2%). There is an agreement with earlier research which indicated that teachers held strong perceptions regarding the possibilities of mobile learning such as promoting new ways of knowledge (Domingo and Garganté 2016), interactivity and interest (Leem and Sung 2019). According to Somekh (2008) processes of change in schools and classrooms cannot be understood in isolation because they are constrained or enabled by the regulatory frameworks/policies of national education systems and national cultures. In this study, the statements "my administration is supportive of students having their own device" and "my curriculum is conducive to students having their own technology" had low percentages of agreement, around 20% (Table 2), and this reflects the current situation; the school context often constraints/limits individual efforts, and makes it difficult for mobile technologies to be explored pedagogically (this has implications for school policy and is discussed in the last section).

With regard to the second research objective (to investigate the impact of teachers' characteristics and class conditions on their perceptions), our findings are summarized as follows. The more the years of teaching experience, the stronger (more positive) were teachers' perceptions on the external influences of mobile learning. Teachers who completed training in ICT reported significantly stronger perceptions on "Benefits", "Preferences" and "External influences", while those who participated in ICT conferences had more positive perceptions on "Possibilities", "Benefits" and "Preferences". Teachers who hold a postgraduate degree reported stronger perceptions only on mobile learning "Benefits". Regarding the impact of school level on teachers' perceptions, elementary school and general lyceum teachers reported stronger perceptions on mobile learning "Possibilities", vocational lyceum teachers on "Preferences", while early childhood teachers on "External influences". Teachers who use mobile devices in class reported significantly more positive perceptions on all four factors/constructs, while gender or age had no impact on perceptions.

With regard to the third research objective (to investigate a predictive model of mobile devices' use in class, by using the teachers' characteristics and the mobile learning readiness factors), it was found that: (a) there was a higher probability of mobile devices' usage in class among teachers working in elementary schools in comparison with those working in high schools or general/vocational lyceums, (b) teachers with fewer years of teaching experience are more likely to use mobile devices in classrooms, and (c) more positive perceptions on mobile learning "Benefits", "Preferences" and "External influences" were associated with an increased likelihood of using mobile devices in classroom. With regard to finding (a), in Greece, early childhood and elementary school teachers have, in general, more flexibility to implement learning activities outside the official curriculum

in comparison to secondary school level where national curricula and tests limit teachers' autonomy (Kousloglou and Syrpi 2018). Finding (b) reveals that teachers with fewer years of teaching experience (i.e., younger in age) seem to be more open in innovations and make their own decisions (take initiatives) about mobile technology use; despite the constraints of the current legislation. The latter finding (c) reveals that teachers who use mobile technology in classroom are more likely to recognize the benefits and the role of external influences, and this has implications for teacher training (discussed in implications).

The findings of this study are in some agreement with earlier research which indicated that teachers who were higher in technology integration reported the greatest benefits from mobile learning and recognized the importance of external influences on implementation (Christensen and Knezek 2018), and also that teachers' prior experiences with ICT and tablets had a positive impact on their perceptions (Khlaif 2017, 2018). In parallel, some disagreement with the study of Baek et al. (2017), in Korea, was revealed; in their study secondary school teachers had more positive attitudes. The differences might be attributed to the cultural conditions of the countries. There is also an agreement with recent studies (e.g., Kumar and Chand 2019) in that teachers' positive attitudes were linked to mobile learning adoption.

Limitations of this study include the use of a quantitative inquiry only. Teachers' perceptions could be further explored via interviews and observations that may reveal, for example, teachers' pedagogical thinking and their mobile technology-supported classroom practices. Another limitation is that the schools' culture and infrastructure were not investigated. It would be interesting to explore whether/how these differed among the participants' schools (e.g., whether school leaders' perceptions affected mobile technology use in the schools); ICT related research indicated that school culture/context influences teachers' perceptions and use of technology (Somekh 2008; Ertmer and Ottenbreit-Leftwich 2010; Spiteri and Chang Rundgren 2020). A limitation linked to item S7 (technology can be used to level the playing field for special needs students), was that information regarding participants' background in teaching special needs was not collected (however, as indicated in 5.2.1, this item was excluded from the factorial structure). Other characteristics/attributes (such as confidence to embrace mobile technology in teaching practice) that may influence teachers' perceptions were not explored, and this constitutes an issue for future research.

7 Implications and Recommendations

The findings of this study have initially implications for teacher professional development and educational policy developers. Teachers, in general, expressed positive mobile learning readiness perceptions. However, in-service teacher training regarding mobile technology integration in classrooms is currently non-existent in Greece; this could constitute a sub-theme of ICT training. Teachers' support, in-service training, improving school infrastructure and providing schools with appropriate resources (Khlaif 2018) will equip teachers with the necessary skills, confidence and knowledge (regarding potential benefits, management of barriers etc.) to integrate mobile technology in the classroom. Teachers

need knowledge that enables them, for example, to identify which mobile technologies are needed to support specific curricular goals, to select appropriate technologies, to enable students to use these (Ertmer and Ottenbreit-Leftwich 2010), and to facilitate the management of mobile technology tools in classrooms. Kwon et al. (2019) indicated that teachers' self-efficacy toward mobile technology predicted the integration of the technology. Earlier research on mobile learning implementation in classrooms stressed the need for teachers' professional development (UNESCO 2013; Ditzler et al. 2016; Kim and Kim 2017).

Zeng and Day (2019) reported on opportunities for and experiences of teachers' participation in formally organized professional development (focused on both 'functional' and 'attitudinal' needs of teachers); this could be also applied in the field of mobile learning/technology training. Small communities of practice where teachers jointly explore new teaching methods-approaches (including student-centered practices) and tools, and support each other as they begin transforming classroom practice, opportunities to observe classroom practices, ongoing technical and pedagogical support (Ertmer 2005). Since, in Greece, teachers usually make their own decisions about mobile technology use in classrooms, it is recommended to maintain their enthusiasm; teacher commitment has been found to be a critical predictor of teachers' work performance, retention, as well as having an important influence on students' motivation, achievement, and attitudes towards learning (Day 2002). Educational policy-makers and school leaders have an essential role in supporting teachers' pedagogical adoption (e.g., by restructuring curriculum or school organization). School leadership should encourage-support teachers' efforts to introduce and experiment with mobile technology uses.

Initiatives such as help desks, instructional assistance and support services are recommended as methods to facilitate the integration of mobile technology in the classrooms. We suggest: (i) to investigate small scale practices of teachers who try out appropriate uses of mobile technology (e.g., to identify teachers who are willing to use mobile phones as complementary tools to more traditional teaching), (ii) to initiate discussions about mobile technology usage for learning purposes, and (iii) to develop school policies that support innovative practices and also focus on mobile devices' usage, security and behavioral issues. Effective technology integration is related to eliminating barriers linked to school context/culture (Somekh 2008). Among the barriers/concerns associated with the implementation of mobile technology in K-12 education is e-safety (e.g., the security of personal data, information, images, and video on mobile devices) and fears of schools regarding the use of mobile (Thomas et al. 2014). These are essential issues to be considered, and students need to be informed about the rules before using any mobile device in classrooms. Curriculum planners could incorporate the use of mobile devices as tools in classrooms, with appropriate rules/regulations. Mobile devices are relatively new and evolving; the extensive use of the internet via mobile devices/phones and the development of new features and functions make it crucial for this topic to be examined throughout the years.

Teachers' planning decisions about how to use technology tools are critical to securing learning benefits. Early on, Hennessy et al. (2007) suggested for pedagogic strategies to

include sequencing and structuring of learning activities, and adapting them to the particular student needs. With regard to mobile technology/applications, it is suggested to provide students a degree of control over their own learning (to manipulate apps themselves), opportunities to experiment and to link formal with informal experiences, to integrate technology with other resources, as well as to provide teacher intervention-guidance that challenges and builds upon students' own ideas. Students' increased motivation and engagement/participation have been identified in mobile learning literature as essential challenges/benefits (e.g., Thomas et al. 2014; Sullivan et al. 2019).

Regarding implications for theory and methodology, the MLRS questionnaire was a reliable and valid instrument, and its newly-identified constructs serve as indicators of teachers' readiness to adopt mobile devices in the classroom; it could be used for the development of a mobile learning framework. This instrument is suggested to be used with other teacher populations of different countries, in order to reveal possible similarities and differences. The MLRS survey could also be enhanced with other constructs such as barriers and self-efficacy. Earlier ICT related research indicated that teachers' beliefs regarding technology integration barriers, as well as their ICT self-efficacy affected their classroom practices (Somekh 2008; Nikolopoulou and Gialamas 2015).

Identifying teachers' mobile learning readiness/preparedness perceptions is not an end by itself. Future research is suggested to investigate teachers' perceptions on using mobile devices for teaching specific subjects, the link with the school context, as well as how teachers use mobile technology in the classrooms, the type of devices (and apps) and the pedagogical strategies and activities. Also, how to adapt (school) strategy and curricula, so that mobile technology fits into the wider education strategy?

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Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical Approval All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional and/or national research committee.

Appendix A

See Table 8.

Table 8 Questionnaire [SD: strongly disagree, D: disagree, U: undecided (I am not sure), A: agree, SA: strongly agree]

	SD	D	U	A	SA
F1: Possibilities					
S1. Mobile devices can play an important role in K-12 education	1	2	3	4	5
S2. Mobile learning will bring new opportunities for learning	1	2	3	4	5
S3. Mobile technology should be used to connect learners to people, content, and resources	1	2	3	4	5
S4. Mobile learning will increase flexibility of learning	1	2	3	4	5
S5. Mobile learning can be used to improve traditional literacy programs	1	2	3	4	5
S6. Mobile technology can be used to improve 21st century skills	1	2	3	4	5
S7. Technology can be used to level the playing field for special needs students	1	2	3	4	5
S8. Mobile devices can enhance learning if there is adequate support for teachers	1	2	3	4	5
F2: Benefits					
S9. The use of mobile technology in the classroom makes students more motivated to learn	1	2	3	4	5
S10. The use of mobile technology in the classroom increases student participation in classroom discussions	1	2	3	4	5
S11. The use of mobile technology in the classroom increases student engagement	1	2	3	4	5
S12. The use of mobile technology in the classroom allows students to own their learning	1	2	3	4	5
S13. The use of mobile devices in the classroom allows students to work together more often	1	2	3	4	5
S14. The use of mobile technology in the classroom allows students to develop creativity	1	2	3	4	5
S15. Mobile learning will improve communication between students and teachers	1	2	3	4	5
S16. Mobile learning devices improve communication between students	1	2	3	4	5
S17. Having a mobile device would improve student organization	1	2	3	4	5
S18. Mobile devices would introduce a significant distraction in my classroom	1	2	3	4	5
F3: Preferences					
S19. Using a mobile device will help me be better organized in my daily activities	1	2	3	4	5
S20. Using a mobile device will allow me to be better organized in my teaching	1	2	3	4	5
S21. I prefer to read a book on a mobile device rather than a traditional book	1	2	3	4	5
S22. I prefer to use an electronic textbook rather than a traditional textbook	1	2	3	4	5

Table 8 (continued)

	SD	D	U	A	SA
S23. I prefer to use a mobile device rather than a computer for learning	1	2	3	4	5
F4: External influences					
S24. Students are more knowledgeable than I am when it comes to using mobile technologies	1	2	3	4	5
S25. My school is doing a good job of using technology to enhance learning	1	2	3	4	5
S26. My campus technical infrastructure and wireless network can accommodate students bringing their own technology	1	2	3	4	5
S27. My curriculum is conducive to students having their own technology	1	2	3	4	5
S28. My administration is supportive of students having their own device	1	2	3	4	5

Appendix B

See Table 9.

Table 9 Pearson product-moment correlations among the remaining 20 items for training and validation samples

	1	2	4	5	6	8	10	11	12	13	14	15	17	18	19	20	22	25	26	28
S1		.548**	.544**	.434**	.433**	.508**	.521**	.460**	.539**	.422**	.448**	.489**	.477**	.469**	.458**	.451**	.387**	.053	.085	.075
S2	.522**		.636**	.514**	.516**	.575**	.471**	.586**	.574**	.464**	.573**	.545**	.509**	.517**	.611**	.470**	.378**	.046	.059	.135**
S4	.521**	.630**		.450**	.680**	.553**	.448**	.516**	.581**	.523**	.550**	.525**	.508**	.449**	.516**	.435**	.428**	.095*	.100*	.140**
S5	.414**	.429**	.400**		.449**	.458**	.358**	.405**	.401**	.361**	.341**	.399**	.375**	.378**	.423**	.414**	.326**	.017	.063	.081
S6	.445**	.510**	.650**	.328**		.467**	.395**	.411**	.501**	.425**	.442**	.453**	.402**	.357**	.397**	.387**	.336**	.085	.073	.127**
S8	.456**	.518**	.549**	.401**	.490**		.308**	.508**	.485**	.420**	.488**	.423**	.428**	.369**	.404**	.349**	.283**	.082	.066	.035
S10	.574**	.435**	.525**	.372**	.414**	.343**		.437**	.462**	.456**	.488**	.476**	.449**	.512**	.423**	.445**	.387**	− .019	.032	.127**
S11	.457**	.579**	.555**	.370**	.397**	.406**	.489**		.592**	.575**	.650**	.534**	.489**	.457**	.422**	.387**	.353**	.009	.007	.033
S12	.477**	.570**	.552**	.333**	.416**	.420**	.450**	.585**		.479**	.598**	.549**	.569**	.534**	.465**	.462**	.328**	− .014	.069	.107*
S13	.401**	.427**	.464**	.314**	.391**	.354**	.494**	.576**	.480**		.653**	.524**	.520**	.429**	.477**	.373**	.389**	− .009	− .054	.104*
S14	.454**	.530**	.545**	.377**	.436**	.396**	.486**	.622**	.528**	.555**		.559**	.593**	.493**	.517**	.437**	.417**	.047	.024	.118*
S15	.448**	.487**	.444**	.453**	.415**	.466**	.460**	.503**	.467**	.518**	.524**		.591**	.427**	.544**	.516**	.380**	− .054	.016	.068
S17	.397**	.509**	.424**	.356**	.361**	.425**	.382**	.477**	.508**	.515**	.480**	.543**		.456**	.600**	.477**	.424**	− .015	− .020	.141**
S18	.485**	.407**	.462**	.299**	.336**	.344**	.586**	.471**	.496**	.424**	.435**	.451**	.434**		.452**	.417**	.407**	.072	.112*	.137**
S19	.366**	.533**	.441**	.420**	.432**	.403**	.389**	.441**	.458**	.413**	.434**	.513**	.628**	.368**		.606**	.474**	.028	.022	.154**
S20	.472**	.437**	.457**	.385**	.442**	.382**	.457**	.400**	.415**	.367**	.403**	.452**	.513**	.392**	.565**		.456**	.057	.047	.144**
S22	.417**	.383**	.363**	.303**	.315**	.360**	.406**	.412**	.376**	.400**	.364**	.394**	.416**	.385**	.485**	.467**		.112*	.020	.146**
S25	.057	.042	.049	.054	.051	.001	.040	.054	.046	.095*	.073	.026	.017	.032	.018	.033	.098*		.468**	.470**
S26	.096*	.120**	.157**	.074	.102*	.032	.068	.099*	.112*	.115*	.078	.070	.106*	.051	.070	.112*	.055	.552**		.389**
S28	.097*	.071	.140**	.051	.112*	.075	.094*	.176**	.178**	.160**	.146**	.092*	.144**	.154**	.111*	.118*	.112*	.518**	.421**	

Under and above the diagonal the correlation coefficient for training and validation samples respectively

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