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Teachers' Attitudes toward Mobile Learning in Korea

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ABSTRACT
Mobile devices have become ubiquitous, and their uses are various. In schools, many discussions about mobile devices are ongoing as more and more teachers are adopting the technology for use in their classrooms. Teachers' attitudes toward mobile learning takes an important role in initiating its usage in schools. This study aims to investigate the attitudes toward mobile learning among Korean teachers. The authors' primary focus lies on the teachers' attitudes toward mobile learning in view of their differences in gender, school level, teaching experience, and subjects taught. In order to find out teachers' attitudes toward mobile learning, the Mobile Learning Perception Scale (MLPS) developed by Uzunboylu and Özdamlı was utilized. The results of this study showed Korean teachers' mobile learning attitudes was low in general. Female teachers were more positive than male teachers in their attitudes. Secondary school teachers' attitudes on the Forms of Mobile Learning Application and Tools' Sufficient Adequacy of Communication (FMA&TSAC) was significantly higher than elementary school teachers. The group with more than 15 years of teaching experience showed higher attitudes toward mobile learning than those groups that were less experienced. Language teachers showed higher attitudes toward FMA&TSAC domain than all other subjects' teachers.

Keywords: mobile learning, teachers' awareness, teachers' attitude, learning through mobile devices

INTRODUCTION
With the rapid development of the technology as well as advances in electronic learning technologies, mobile learning has begun to occupy a great part of our lives. Accordingly, use of mobile devices in teaching and learning expands. Recently, various mobile devices are easy to find in schools. However, the use of mobile devices in teaching and learning raises an ongoing debate on the concept of mobile learning. Mobile learning can be defined as a type of learning where mobile devices, such as cell phones, smart phones and tablets are being used as teaching and learning tools. One of its characteristics is that mobile learning can be used independently of place and time (Bal & Arıcı, 2011).

Teachers and educators are trying to adopt it into the classrooms. Mobile devices such as laptops, personal digital assistants, and mobile phones have become a learning tool with great potential in both classrooms and outdoor learning (Sung, Chang & Liu, 2016). Mobile devices are used in a variety of teaching and learning environments. For example, mobile devices can be used to access learning materials. Gikas and Grant (2013) did their study about mobile computing devices in higher education and concluded that mobile devices are efficient tools for learners to access content and communicate with classmates and instructors, no matter where they are. They found students themselves communicating more because of the mobile devices. A second example could be that mobile devices are used to deliver learning materials to students. Ally and Stauffer (2008) conducted a study where students had the option of accessing their course materials from anywhere and at any time using their mobile devices. Their results indicated that the majority of students felt that the use of the mobile device to access the course materials was useful and provided both flexibility and convenience. A third example of usage could be that mobile devices are in use to communicate with other students, Edirisingha, Rizzi, Nie and Rothwell (2007) did a study focused on the benefits of integrating podcasts into a first year unergraduate module on English Language and Communication at Kingston University. In their study, podcast was one type of mobile

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device through which students could gain experience of peers conveyed in online discussions.

As in other instructional media, teachers play an important role in mobile learning. Teachers can be a presenter, moderator, and/or consultant. In order to respond to the learners' changed role and responsibility toward their own learning, the role of the teacher as a consultant cannot be emphasized too much. In this role, teachers need to be able to identify the learners' interests, relate these interests to topic related learning goals, and offer opportunities to reach these goals that are related to the specific conditions of a learner. As mobile technology is about to be used more widely, teachers' attitudes toward mobile devices could be a driving factor to facilitate their use in schools. However, in order to make mobile learning happen on a large scale we need to revisit and address how many teachers are trying to perform their primary role as a consultant.

This study's aims are to determine teachers' attitudes toward mobile devices and to find out whether their attitudes toward mobile learning differs or not in terms of their gender, school level, teaching experience and subjects they are teaching. This study will provide answers to the following questions.

- What are the attitudes toward mobile learning among Korean teachers?
- Do their attitudes toward mobile learning differ significantly according to their gender?
- Do their attitudes toward mobile learning differ significantly according to the school levels they are teaching at?
- Do their attitudes toward mobile learning differ significantly according to their levels of teaching experience?
- Do their attitudes toward mobile learning differ significantly according to their school levels?

REVIEW OF PREVIOUS STUDIES

There have been studies on teachers' attitudes toward mobile learning in many countries. In Turkey, Serin (2012) analyzed mobile learning attitudes and mobile learning levels of the prospective teachers at a university in the Turkish Republic of Northern Cyprus according to their departments and gender. The study showed no significant difference according to the respondents' department and gender. They, prospective teachers, were less positive towards mobile learning. In another study, Nawi et al. (2015) investigated the attitudes of the religious teachers' readiness to use mobile phones in their classrooms. They investigated the types of handset used, the use of mobile applications, mobile learning activities, and the acceptance of mobile phones in teaching and learning. According to this study, the religious teachers were exposed to learning activities using mobile phones and had positive attitudes toward the use of mobile phones as learning tools. The positive attitude toward mobile learning was reported also by Güleroğlu's (2015). In this study, student teachers showed positive opinions on game based learning and on the integration of educational mobile games into teaching. Student teachers, as this study revealed, expressed willingness to integrate mobile games in their future profession. According to the researcher, this willingness is reported as a result of the main enablers which were the benefits of using or creating a game, the game being accessible and easy to use, teacher's personal interest and game based learning knowledge of teacher. However, an unprepared learning environment and technology, absence of teachers' qualifications and negative beliefs toward technology, content inappropriateness for game implementation, and factors inhibiting mobile game design and development process were noted as the barriers to the mobile learning implementation. These three studies performed in Turkey inform us that there are positive attitudes toward mobile learning and student teachers are willing to use it in teaching and learning on the premise that it is easy and fun to use mobile devices in the classrooms. However, there are a lot of barriers as mentioned above. Student teachers' attitudes were not different depending on their gender and major which can be interpreted as their major subjects.

In Malaysia, Ismail, Bokhare, Azizan & Azman (2013) performed a case study on Malaysian teachers' mobile phone acceptance and readiness. They found that the acceptance among respondents in terms of awareness and motivation to use technology in education, training and courses related to technology applied in the classrooms, the design of content for their training, technological support and facilities was high. But their readiness to use the technology was found to be at a considerably low level. However, there was a significant positive correlation between teachers' readiness for mobile learning with their awareness and motivation to use technology in education. They concluded that teachers' readiness for mobile learning would most likely increase if their awareness and motivation to use technology was also increasing. In another study on mobile learning, Pullen, J-F, Swabey, Abadooz, & Ranjit Sing (2015) performed a study on student teachers' acceptance and use of mobile learning in Malaysia. They found that performance expectancy, effort expectancy, social influence, attitude toward technology and self-efficiency are all significant determinants of behavioral intentions to use mobile devices for learning. What these two studies performed in Malaysia informed us that most of the teachers' acceptance toward mobile learning is at a high level, which means that they think mobile learning has many advantages for their teaching. However, their readiness to use mobile devices is considerably low. The

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behavioral intentions of student teachers are very important, because their thinking and attitude can significantly affect teaching and learning.

A study on mobile learning was performed by Domingo & Garganté (2016) in Spain. They discussed a question which was what is the impact on learning that teachers perceive when mobile technology was used in their classrooms. The analysis showed that specific items that get higher scores deal with issues such as encouraging learner interest for learning content, promoting new ways of knowledge building, and improving information searching skills. Conversely, items with lower scores were fostering collaborative learning among students, encouraging work in team-based learning and promoting decision making processes among learners. It concluded that using mobile learning in classrooms had been seen by teachers mainly as a way to facilitate access to information, to provide new ways to learn, and to increase engagement in learning. By contrast, collaborative learning is the least appreciated learning impact.

In a study performed in the United States, Goad (2012) applied a Mann-Whitney U test to find no significant differences between STEM teachers and teachers of other disciplines in their attitudes to the importance of using technology in the classroom. However, a t-test showed STEM teachers rated themselves at a significantly higher skill level in their ability to design and access lessons using technology than the teachers of other disciplines. A significant and positive relationship was found that as the level of technology use increased the teacher's ability to design and access lessons improved. This study implies that technology skills precede mobile learning implementation. In the study of O'Bannon & Thomas (2014), they focused on teachers' age as it affects their attitudes on using mobile phones. They found that there were no significant differences for the teachers who were less than 32 years old and the ones who were 33–49 years old; however, they both significantly differed from those over 50 in mobile phone ownership and support for the use of mobile phones in the classroom as well as in their attitudes regarding the useful mobile features for school related work and instructional barriers. In each instance, the older teachers were less likely to own smartphones, were less supportive of the usage of mobile phones in the classroom, were less enthusiastic about the features, and found the barriers to be more problematic. Hur, Wang, Kale & Cullen (2015) did research which addressed how student teachers perceive mobile device integration in classrooms. The results showed that 72.5% of variances in student teachers' intention to use mobile devices were explained by perceived usefulness and self-efficacy for technology integration jointly, where perceived usefulness was the strongest predictor. The findings also demonstrated that constructivist beliefs and perceived ease of use indirectly influenced student teachers' intention to use mobile devices for teaching. The results of Hur & Bannon (2013) indicated that a majority of student teachers considered integration of a mobile device very useful for students, and they were willing to use them for teaching. However, they had concerns about classroom management issues, and a lack of skills hindered them from using the tool in classrooms. The above four studies performed in the United States inform us that teachers who are skillful with technology implement mobile learning in the classroom well. The group of teachers who are over 50 years of age experience difficulties and are less likely to utilize mobile devices in their class. Student teachers consider mobile devices highly useful yet they are not confident in managing their class with the use of mobile tools.

METHOD

Participant

The participants in this study consisted of 140 teachers at elementary and secondary schools in South Korea. They were invited to participate in this study while they were attending teacher training programs at several universities in Korea. Table 1 shows the demographic characteristics of these participants. Of these teachers, there were 64 (45.7%) males and 76 (54.3%) females. Elementary school teachers were 71 (50.7%), Secondary school (Middle school & High school) teachers were 69 (49.3%). Their teaching experience ranged from 2 to 34 years. They were divided into three groups so that each group could have a quite comparable number of teachers. Thus, teachers with less than 9 years' teaching experience were 51 (36.4%), teachers with teaching experience between 9 and 15 years were 47 (33.6%), and teachers with teaching experience with more than 15 years were 42 (30.0%), As to their subjects, there were 32 (22.9%) teachers in language arts, 42 (30%) teachers in science and 42 (30%) teachers are teaching all subjects. They are mostly elementary school teachers.

Table 1: Demographic Characteristics of Samples

	Independent variables	N	%
Gender	Male	64	45.7
	Female	76	54.3
School Level	Elementary	71	50.7

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	Secondary	69	49.3
Teaching Experience	Less than 9 years	51	36.4
	Between 9 and 15 years	47	33.6
	More than 15 years	42	30.0
Subject	Language	32	22.9
	Science	42	30.0
	All	42	30.0

Questionnaire

The Mobile Learning Perception Scale (MLPS) developed by Uzunboylu and Özdamlı (2011) was used in this study. It includes three dimensions seeking teachers' feedback on three facets of mobile learning. They are 'Aim-Mobile Technologies Fit (A-MTF)', 'Appropriateness of Branch (AB)', and 'Forms of Mobile Learning Application and Tools' Sufficient Adequacy of Communication (FMA and TSAC)'. The first dimension, A-MTF, has eight items (1, 2, 5, 8, 11, 13, 20, and 23). The second dimension, AB, has nine items (4, 9, 10, 14, 15, 17, 18, 21, and 24), the third dimension, FMA and TSAC, has nine items (3, 6, 7, 12, 16, 19, 22, 25, and 26). Thus, the Mobile Learning Perception Scale with 26 items was applied to the participants in this study.

The dimension of 'A-MTF (Aim-Mobile Technologies Fit)' contains statements describing the appropriateness of mobile learning goals to the goals of learning activities such as 'Mobile learning systems increase the quality of lessons', 'Mobile learning tools remove the limitation of time and space' and 'Utilization of mobile learning technologies increases students' motivation'. The dimension of 'AB (Appropriateness of Branch)' contains statements about the appropriateness of mobile learning to teaching such as 'Mobile learning applications are reliable for personal use', 'I would like to supplement my classes in future with mobile learning method' and 'Mobile learning applications are convenient to share my specialized knowledge with my colleagues'. The authors renamed this dimension as 'Appropriate of Mobile Devices to Teaching (AMDT) because the AMDT is better understandable to readers. In the dimension of 'FMA and TSAC (Forms of Mobile Learning Application and Tools' Sufficient Adequacy of Communication)', it contains statements about the position of mobile learning in education and the sufficient merits of the applications of mobile learning for the purpose of communication such as 'Mobile learning applications can be utilized as a supplement of traditional education' and 'teacher-student communication can be established by means of mobile learning tools'.

Cronbach's alpha (a) value of this scale was 0.970; half-split reliability of the scale was .932. In detail, for the 'A-MTF' dimension, Cronbach's alpha (a) value was calculated as 0.894, half-split reliability was 0.881. For the 'AMDT' dimension, Cronbach's alpha (a) value was measured as 0.940, and half-split reliability was .915. Finally, for 'FMA and TSAC' dimension, Cronbach's alpha (a) value was calculated as .944, and half-split reliability was 0.942. The closer the reliability coefficient value gets to 1.0, the higher the reliability becomes. Thus, the internal consistency reliability of the scale used in this study can be considered as good (Uzunboylu & Özdamlı, 2011). As per the validity of the questionnaire, the Kaiser-Meyer-Olkin (KMO) was over .90 ($p > .60$), so the appropriation of data to the factor analysis was considered as the best. Approximately X2 value for BTS (Barlett's Test of Sphericity) was found 10163.312 ($p < .001$) for the study. The total variance obtained by three factors was estimated as 66.950% which is at the acceptable border. Besides, the interaction among all dimensions is strong (Uzunboylu & Özdamlı, 2011). Thus, it turned out reliable and valid as a scale in this study.

Analysis of Data

A T-test procedure was used to compare the means of male and female teachers' attitudes. Also a t-test was applied to test the teachers' attitudes according to their school levels. The ANOVA procedure of SPSS was adopted to analyze the differences among teaching experience levels and subjects. Tukey's HSD post hoc analysis was performed to locate the specific group differences in the teachers' attitudes.

RESULTS

Attitudes levels of Korean teachers

The first research question was "What are the attitudes toward mobile learning among Korean teachers?" A descriptive analysis was done as in Table 2 to answer this question.

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Table 2: Descriptive Statistics on Teachers' Mobile Learning Attitudes

	N	Mean	Std. Deviation
A_MTF		17.11	4.12
AMDT	140	20.60	4.29
FMA_TSAC		21.63	4.59
Total Attitudes		60.34	10.28

In Table 2, the mean of FMA&TSAC dimension is the highest, A-MTF is the lowest, which denotes teachers' attitudes toward forms of mobile learning application and tools' with sufficient adequacy of communication are higher than the appropriateness of mobile learning to teaching. From the above table, the appropriateness of mobile learning goals to the goals of learning activities are the lowest. Each item value ranges from 1 to 5. So A-MTF (8 items) dimension can range from 8 to 40 in its value, resulting in the median score of 24. AMDT (9 items) dimension can have a value from 9 to 45. This is the same with FMA & TSAC (9 items) dimension. These two dimension's median is 27. The means of all three dimensions in Table 2 are below the median. Thus, teachers' mobile learning attitudes can be said as "low" in general.

Difference by gender

The second research question was "Do their attitudes toward mobile learning differ significantly according to their gender?" To answer this question, a t-test procedure was applied. The result is presented in Table 3.

Table 3: T-test for the Gender Difference on Mobile Learning Attitudes

	Male (n=64)		Female (n=76)		Mean	t	Sig.
	Mean	SD	Mean	SD	Difference		(2-tailed)
A-MTF	15.33	3.87	18.62	3.73	-3.29	-5.11	.000
AMDT	19.70	3.53	23.20	4.24	-3.49	-5.24	.000
FMA&TSAC	19.27	3.92	23.62	4.18	-4.35	-6.31	.000
Total Attitudes	54.30	8.46	65.43	8.85	-11.14	-7.57	.000

Notes. df = 138

As seen in Table 3, male and female teachers are different in attitudes toward mobile learning in three dimensions of "Aim-Mobile Technologies Fit", "Appropriateness of Mobile Devices to Teaching" and "Forms of Mobile Learning Application and Tools' Sufficient Adequacy of Communication". Female teachers show higher attitudes than male teachers in all three domains. Especially in the dimension of 'Forms of Mobile Learning Application and Tools' Sufficient Adequacy of Communication', the biggest difference exists (Mean Difference=-4.35). In sum, female teachers' attitudes are higher than male teachers. These differences are all significant statistically.

Difference by School Level

The third research question was "Do their attitudes toward mobile learning differ significantly according to the school levels they are teaching at?" To answer this question, t-test procedure was applied. The result is presented in Table 4.

Table 4: T-test for the School Level Difference on Mobile Learning Attitudes

	School level						
	Elementary (n=71)		Secondary (n=69)		Mean	t	Sig.
	Mean	SD	Mean	SD	Difference		(2-tailed)
A-MTF	16.92	3.97	17.32	4.29	-.40	-.58	.565
AMDT	21.94	4.53	21.25	4.03	.70	.96	.338
FMA&TSAC	20.14	4.61	23.16	4.07	-3.02	-4.10	.000
Total Attitudes	59.00	10.11	61.72	10.35	-2.72	-1.58	.117

Notes. df = 138

As seen in Table 4, elementary school teachers and secondary school teachers are not so much different in attitudes on dimensions of "Aim-Mobile Technologies Fit" and "Appropriateness of Mobile Devices to Teaching". But two groups show a difference in the dimension of "Forms of Mobile Learning Application and Tools' Sufficient Adequacy of Communication". This difference is significant statistically ($p < .001$). Thus, it can be said that secondary school teachers' attitudes on forms of mobile learning application and tools' sufficient adequacy of communication is significantly higher than elementary school teachers. The mean difference is 4.10.

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In the total attitudes, secondary teachers are higher than elementary teachers. But this difference is not significant. So secondary teachers are likely to put more focus on the forms of mobile learning application and tools' sufficient adequacy of communication than elementary teachers.

Difference by Teaching Experience

The fourth research question was "Do their attitudes toward mobile learning differ significantly according to their levels of teaching experience?" To answer this question, an ANOVA procedure was applied. The result is presented in Table 5.

Table 5: Means and Standard Deviations of Mobile Learning Attitudes by Experience Level

	< 9 (n=51)		9-15 (n=47)		> 15 (n=42)	
	Mean	SD	Mean	SD	Mean	SD
A-MTF	17.12	3.58	15.85	4.60	18.52	3.79
AMDT	20.14	3.16	21.77	4.45	23.19	4.76
FMA&TSAC	21.96	3.90	20.04	4.91	23.00	4.58
Total Attitudes	59.22	8.57	57.66	11.30	64.71	9.81

As seen in Table 5, the teachers with more than 15 years of teaching experience show higher attitudes than two other groups of teaching experience. The table shows that the teachers with less than 9 years' of teaching experience are more positive in the attitudes on forms of mobile learning application and tools' sufficient adequacy of communication, the teachers with 9 to 15 years' of teaching experience are higher in the attitudes on appropriateness of mobile devices to their teaching, and the teachers with more than 15 years' of teaching experience are lowest in the attitudes of aim-mobile technologies. One-way ANOVA was conducted to test the differences shown in Table 5. The result of one-way ANOVA was presented in Table 6. All differences among groups are statistically significant.

Table 6: ANOVA for Mobile Learning Attitudes by Experience Level

		Sum of Squares	df	Mean Square	F	Sig.
A-MTF	Between Groups	158.444	2	79.222	4.925	.009
	Within Groups	2203.728	137	16.086		
	Total	2362.171	139			
AMDT	Between Groups	216.659	2	108.330	6.340	.002
	Within Groups	2340.941	137	17.087		
	Total	2557.600	139			
FMA&TSAC	Between Groups	202.849	2	101.425	5.086	.007
	Within Groups	2731.836	137	19.940		
	Total	2934.686	139			
Total Attitudes	Between Groups	1205.791	2	602.895	6.125	.003
	Within Groups	13485.752	137	98.436		
	Total	14691.543	139			

The above table shows that there is a significant difference on the three domains of teachers' attitudes toward mobile learning at the .01 level for the three conditions [F (2,137) = 4.925, p =0.009], [F (2,137) = 6.340, p =0.002], [F (2,137) = 5.086, p =0.007]. Thus it can be said that all differences among the three groups of different teaching experience are statistically significant. In order to test which specific groups are different, Tukey's HSD post hoc analysis was performed and presented its result in Table 7.

Table 7: Multiple Comparisons

Tukey HSD

Dependent Variable	(I) Teaching Experience Group	(J) Teaching Experience Group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
A-MTF	< 9	9-15	1.27	.81	.266	-.655	3.188
	9-15	>15	-2.67*	.85	.006	-4.691	-.655
	> 15	< 9	-1.41	.84	.216	-3.386	.574
AMDT	< 9	9-15	-1.63	.84	.129	-3.609	.352
	9-15	>15	-1.42	.88	.239	-3.504	.655

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	>15	< 9	-3.05*	.86	.002	-5.094	-1.012
FMA	< 9	9-15	1.92	.90	.089	-.221	4.058
&	9-15	>15	-2.96*	.95	.006	-5.204	-.711
TSAC	>15	< 9	1.04	.93	.505	-1.165	3.244
Total	< 9	9-15	1.56	2.01	.719	-3.1973	6.3095
Attitudes	9-15	>15	-7.05*	2.11	.003	-12.0464	-2.0630
	>15	< 9	5.50*	2.07	.024	.6002	10.3970

Notes. The mean difference is significant at the 0.05 level.

The above Table 7 presents the results of multiple comparisons showing which group differs from other groups. As seen in the above table, there is a significant difference between the teachers with 9 to 15 years' teaching experience and the teachers with more than 15 years' of teaching experience ($p < .01$) in Aim-Mobile Technologies Fit (A-MTF) dimension. The mean difference is 2.67. Thus it can be said that the group of teaching experience with more than 15 years shows more positive attitudes toward aim-mobile technologies fit dimension than the group of teaching experience with 9 to 15 years. In Appropriateness of Mobile Devices to Teaching (AMDT) dimension, there is a significant difference between the group of teaching experience with less than 9 years and the group of teaching experience with more than 15 years ($p < .01$). The mean difference is 3.05. Thus it can be said that the group of teaching experience with more than 15 years shows higher attitudes toward Appropriateness of Mobile Devices to Teaching (AMDT) dimension than the group of teaching experience with less than 9 years. In the Forms of Mobile Learning Application and Tools' Sufficient Adequacy of Communication (FMA & TSAC) dimension, there is a significant difference between the group of teaching experience with 9 to 15 years and the group of teaching experience with more than 15 years ($p < .01$). The mean difference is 2.96. Thus it can be said that the group of teaching experience with more than 15 years shows more positive attitudes toward Forms of Mobile Learning Application and Tools' Sufficient Adequacy of Communication (FMA & TSAC) dimension than the group of teaching experience of 9 to 15 years. As per the total attitudes, there is a significant difference between the group with teaching experience of less than 9 years and the group of teaching experience with more than 15 years ($p <. 05$). There is also another significant difference between the group of teaching experience with 9 to 15 years and the group of teaching experience with more than 15 years. The mean difference is 5.50 for the former groups and 7.05 for the latter groups. Thus it can be said that the group of teaching experience with more than 15 years shows higher attitudes toward mobile learning than the groups of the less experienced.

Difference by Subject Matter

The fifth research question was identified as "Do their attitudes toward mobile learning differ significantly according to their school levels?" To answer this question, an ANOVA procedure was applied. The result was presented in Table 8.

Table 8: Means and Standard Deviations of Mobile Learning Attitudes by Subject Matter

	Language (n=32)		Science (n=42)		All (n=42)	
	Mean	SD	Mean	SD	Mean	SD
A-MTF	17.28	4.14	16.69	3.89	17.33	4.17
AMDT	21.41	4.57	20.55	3.39	22.29	4.95
FMA&TSAC	22.75	5.18	21.74	3.66	19.86	4.86
Total Attitudes	61.44	11.03	58.98	8.56	59.48	11.41

In Table 8 language, science teachers and teachers teaching all subjects have less positive attitudes toward Aim-Mobile Technologies Fit (A-MTF) dimension compared with the other two dimensions. As to appropriateness of mobile devices to their teaching, teachers teaching all subjects, mostly elementary teachers, show the most positive attitudes while science teachers show least positive attitudes. As to forms of mobile learning application and tools' sufficient adequacy of communication, language teachers are in the highest attitudes while all subject teachers are in the lowest attitudes. A one-way ANOVA was conducted to test the differences shown in Table 8. As a result, Table 9 was presented. There exists a significant difference in the Forms of Mobile Learning Application and Tools' Sufficient Adequacy of Communication (FMA & TSAC) dimension among groups.

Table 9: ANOVA for Mobile Learning Attitudes by Subject Matter

		Sum of Squares	df	Mean Square	F	Sig.
A_MTF	Between Groups	10.360	2	5.180	.314	.731
	Within Groups	1866.778	113	16.520		

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	Total	1877.138	115			
AMDT	Between Groups	63.443	2	31.721	1.689	.189
	Within Groups	2122.695	113	18.785		
	Total	2186.138	115			
FMA&TSAC	Between Groups	162.626	2	81.313	3.908	.023
	Within Groups	2351.262	113	20.808		
	Total	2513.888	115			
Total Attitudes	Between Groups	118.561	2	59.280	.553	.577
	Within Groups	12107.327	113	107.144		
	Total	12225.888	115			

The above table shows there does not exist a significant difference on the A-MTF (Aim-Mobile Technologies Fit) as well as on AMDT (Appropriateness of Mobile Devices to Teaching) dimensions of teachers' mobile learning attitudes. However, there exists a significant difference on the Forms of Mobile Learning Application and Tools' Sufficient Adequacy of Communication (FMA & TSAC) dimension of teachers' mobile learning attitudes at the $p < .05$ level among three groups [$F(2,113) = 3.908$, $p = 0.023$]. Thus it can be said that the three groups are different on the FMA&TSAC dimension of teachers' attitudes toward mobile learning. In order to test which specific groups are different, Tukey's HSD post hoc analysis was performed as in Table 10.

Table 10: Multiple Comparisons

Tukey HSD

Dependent Variable	(I) Subject	(J) Subject	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
FMA&TSAC	Language	Science	1.01	1.07	.613	-1.530	3.554
	Science	All	1.88	1.00	.146	-.483	4.245
	All	Language	-2.89*	1.07	.021	-5.435	-.351

Notes. The mean difference is significant at the 0.05 level.

The above Table 10 presents the result of multiple comparisons showing which group differed from other group. We can see from the above table that in FMA&TSAC domain there is a significant difference between Language teachers and All subjects' teachers($p<.05$). The mean difference is 2.89. Thus it can be said that language teachers have higher attitudes toward FMA&TSAC domain than all subjects' teachers.

DISCUSSION AND CONCLUSION

Korean teachers' attitudes toward mobile learning are at as low level as in Turkey. Their attitudes are below the median in all three dimensions. However, among three dimensions, the Forms of Mobile Learning Application and Tools' Sufficient Adequacy of Communication (FMA & TSAC) dimension shows the highest, while Aim-Mobile Technologies Fit (A-MTF) dimension is the lowest. That means teachers are more likely to admit that communication between teachers and students as well as among students are facilitated by means of mobile learning tools. They think that a mobile learning system increases the quality of teaching. Female teachers show more positive attitudes than male teachers in all three dimensions. Especially, female teachers approve the Forms of Mobile Learning Application and Tools' Sufficient Adequacy of Communication than male teachers. Even though female teachers' attitudes are higher than male teachers in Korea. This is not the case of Turkey. Turkish teachers' attitudes were not different depending on their gender (Serin, 2012).

Secondary school teachers' attitudes on the Forms of Mobile Learning Application and Tools' Sufficient Adequacy of Communication (FMA & TSAC) dimension are significantly higher than elementary school teachers. In the overall attitudes, secondary teachers are higher than elementary teachers. This implies that secondary teachers are more positive about the effectiveness of mobile learning applications for communication. They have more positive attitude that mobile learning is needed in teaching and learning than elementary school teachers. But this difference is not significant. So secondary school teachers are likely to put more focus on the forms of mobile learning application and tools' sufficient adequacy of communication than elementary school teachers. There were no studies from the others' countries available on the differences between mobile learning attitudes of elementary and secondary school teachers. But they did some research which concentrated on student teachers. Generally, the student teachers showed a high and positive willingness on the game based learning and integrating mobile games in their future profession. However, there are still some barriers make them feel less confident in managing their class with the use of mobile tools so that they are less confident in using them (Güleroğlu, 2015).

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The teachers with more than 15 years of teaching experience show higher acceptance than the two other groups of teaching experience. Differences among the three groups with different teaching experience are statistically significant. Teachers with more than 15 years' teaching experience show more positive attitudes toward Aim-Mobile Technologies Fit (A-MTF) dimension than the teachers with 9 to 15 years' teaching experience. Teachers with more than 15 years' teaching experience show more positive attitudes toward Appropriateness of Mobile Devices to Teaching (AMDT) dimension than teachers with less than 9 years' teaching experience. Teachers with more than 15 years' teaching experience show higher attitudes toward the Forms of Mobile Learning Application and Tools' Sufficient Adequacy of Communication (FMA & TSAC) dimension than those with 9 to 15 years' teaching experience. Thus it can be said that teachers with greater teaching experience approve using mobile learning than the less experienced. On the contrary, American teachers' mobile learning attitudes are different from Korean teachers' from the perspectives of teaching experience. In the study of O'Bannon & Thomas (2014), there were no significant differences for the teachers who were less than 32 years old and the ones who were between 33 and 49 years old. However, the group of teachers who are over 50 years old feel difficulties and are less likely to utilize mobile devices in their class.

There is not a significant difference on the Aim-Mobile Technologies Fit (A-MTF) dimension and the Appropriateness of Mobile Devices to Teaching (AMDT) dimension of teachers' mobile learning attitudes according to the subjects they are teaching. However, there was a significant difference on the Forms of Mobile Learning Application and Tools' Sufficient Adequacy of Communication (FMA & TSAC) dimension of teachers' mobile learning attitudes among teachers' group based on their teaching experience. That is, language teachers show higher attitudes toward FMA&TSAC dimension than all subjects teaching teachers. In a study performed in Turkey, teachers' attitudes were not different depending on their department which can be interpreted as their major subjects (Serin, 2012).

Mobile learning is a relatively new field in research and exploration by many researchers around the world. It offers a way of learning new techniques to improve the mastery of knowledge in society (Nawi, Hamzah & Abdul Rahim, 2015), especially for teachers and students. This is because teachers' attitudes toward mobile learning could be an initiating drive for this new medium to exert its power to enhance learning achievements of student in as well as outside of classrooms. The next step for the research in this field would be how teachers' attitudes forces mobile devices' use in classroom and how they will improve teaching and learning in terms of students' achievements.

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