STUDENTS' PERCEPTIONS AND EXPERIENCES OF MOBILE LEARNING

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This study focused on how students perceive the use of mobile devices to create a personalized learning experience outside the classroom. Fifty-three students in three graduate TESOL classes participated in this study. All participants completed five class projects designed to help them explore mobile learning experiences with their own mobile devices, incorporating technologies such as YouTube and VoiceThread. We identified characteristics of these mobile users in Mobile Language Learning (MLL), and the results illuminate how MLL opens up new pedagogical scaffoldings.

Keywords: Students' Perceptions, Learning Experiences, Mobile Learning

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INTRODUCTION

In recent years, researchers have begun to investigate language learning using various mobile devices such as mobile phones (e.g., Wong, Chin, Tan, & Liu, 2010), pocket PCs (e.g., Wong & Looi, 2010), and Apple iPhones (e.g., Jong, Specht, & Koper, 2010). These researchers often concern themselves with design features that capitalize upon Wi-Fi access, Internet browsers, and text input. Most of these researchers have found that embracing the mobility and connectivity of mobile devices may lead to innovation in language learning for students across different environments (Looi et al., 2010; Tai, 2012). For instance, it has been shown that mobile phones are increasingly used for improving knowledge of vocabulary (Stockwell, 2010; Zhang, Song, & Burston, 2011), grammar, listening, and speaking (Rueckert, Kiser, & Cho, 2012), in both formal and informal settings (Demouy & Kukulska-Hulme, 2010). Furthermore, the use of mobile technologies to support content with social communication features (e.g., the ability to review content and then leave comments) can empower students to participate in more collaborative learning environments.

Advances in mobile technologies have enabled educators to send instructional messages in flexible ways. With new technologies including mobile computers, Pocket PCs, Apple iPhones, Android phones, and tablets, instructors and students can communicate through voice and image as well as text. Using mobile devices for educational purposes is becoming a common expectation of learners (Lan & Huang, 2012). For instance, Valk, Rashid, and Elder (2010) demonstrated how mobile phone-facilitated learning can give students in developing countries increased access to educational materials and services, particularly in rural and remote regions. In some previous studies on small displays (e.g., Chen et al., 2003; Maniar, Bennett, Hand, & Allan, 2008), small screen size was found to create cognitive disadvantages related to students' attention and visual perception (Kim & Kim, 2012). However, students have also reported wanting to have more options to make learning tools more convenient so they can study when and where they want to. Typically, the use of personal devices affords students' ownership of learning, which may

lead to positive language learning experiences (Kukulska-Hulme, 2009).

However, the innovation of technology-based learning (referred to in this study as Mobile Language Learning or MLL) continues to challenge educators to develop new teaching and learning methods. Unfortunately, many teachers and students resist change in teaching and learning with new technology because they do not think of themselves as part of a new learning culture. In addition, technology-oriented trainings and resources may not meet the needs of individuals in understanding the nature of learning. Stockwell (2007) argued that survey results about mobile learning (e.g., Thornton & Houser, 2002) in classroom settings will be different when the learners have a choice to use mobile devices (e.g., mobile phones) or something else (e.g., desktop PCs) outside the classroom. In later studies, Stockwell (2008, 2010) indicated that technological, pedagogical, psychological, or even environmental barriers often prevent learners from selecting mobile devices like smartphones for vocabulary learning activities, even though they have a positive view of mobile learning.

Technology Adopter Category Index

Rogers (2003) defined five categories of adopters (Innovators, Early Adopters, Early Majority, Late Majority, and Laggards) and proposed that the adoption of an innovation follows an S-curve when plotted over time. In the case of MLL, it will first be adopted by the innovators, followed in turn by the early adopters, early majority, and late majority, with laggards finally adopting MLL when it is widely available. In order to accommodate and support these diverse adopters, understanding their characteristics in the process of adopting MLL is essential, especially when educators seek to promote successful personal learning with new mobile technologies. It is thought that students' positive perceptions and experiences with mobile technologies will encourage participation and acceptance of MLL (Pollara & Kee Broussard, 2011).

In this study, we followed Dugas's (2005) Technology Adopter Category Index (TACI), which describes different ways in which participants can adopt new technology including mobile devices. An overview of this categorization is shown in Table 1.

Table 1. *Technology Adopter Category Index* (Dugas, 2005)

Index	Adopter Category Description
1	I tend to latch onto new technology as soon as it is available to me. My interest lies more with the technology itself than with its application to specific problems.
2	Between 1 and 3
3	I explore new technologies for their potential to bring about improvements. I am willing to try new things, and am not averse to occasional failure.
4	Between 3 and 5
5	I adopt a "wait and see" attitude toward new technology and want examples of close-to-home successes before adopting. I want to see value in an innovation before adopting it.
6	Between 5 and 7
7	I accept new technology later in the game, once the technology has become established among the majority.
8	Between 7 and 9
9	I am usually not interested in adopting new technology.

The TACI score is inversely proportional to the participants' degree of comfort with innovation. That is, an individual with a low TACI score is very comfortable with innovation, while an individual with a high TACI score is not comfortable with innovation. For the purpose of this study, a TACI classification

demonstrates participants' willingness to adopt MLL in their own classrooms in the future.

Reflection for Learning

The value of reflection has been extensively explored as being a form of learning process through individual experiences (Wu & Looi, 2012). Denton (2011) has pointed out that "reflection represents the human capacity for higher-order thinking, specifically, our ability to make connections between thoughts" (p. 838). However, to encourage students to think about their learning, researchers have used the term *reflection* to represent different levels of thinking, such as content-based reflection, meta-cognitive reflection, self-authorship reflection, and intensive reflection (Grossman, 2009). In light of the goals of our study, participants' content-based reflections about their personal experiences, thoughts, and feelings about MLL were thought to be most beneficial and therefore were sought.

There has been little investigation of the uses of mobile devices in current language learning; few of these studies include learner reflections. Language teachers' and language students' views concerning the use of MLL for their own teaching and learning are also not well known. In this study, we focused on how students in a graduate program in Teaching English to Speakers of Other Languages (TESOL) use their personal mobile devices (including mobile computers) as learning tools. We specifically tried to document when their coursework allowed them to create personal experiences that engaged their emotions and learning processes while using mobile learning environments outside the classroom.

The study asked the following research questions:

1. What are students' perceptions of personal mobile devices used for learning?
2. How do students use mobile devices to connect, communicate, and collaborate with other students as they create personalized mobile learning experiences?

METHODOLOGY

Three instruments were used to collect primary data: a pre-study survey, student reflections for class projects, and a post-study survey. All participants were required to complete the pre-study survey, which was administered one week prior to the beginning of the study. This survey gathered students' views on their use of personal mobile devices; results of this survey determined the students' different TACI classifications (i.e., their degree of comfort with adopting new technology). Based on the types of mobile devices they owned—determined from the results of the pre-class survey—participants were divided into two user groups (A and B) to complete this study's six class projects.

After finishing each class project, all students were required to complete a student reflection as a separate assignment. Approximately one week after all the projects were completed, a post-study survey was administered and collected to re-examine the students' TACI classification score. The post-study survey scores were used as a proxy for understanding how exposure to and use of mobile technologies by a student can impact overall willingness to adopt new technology.

Participants

A total of 53 MA students in TESOL were recruited from three different graduate classes during the spring 2012 semester at one Central US university. As shown in Table 2, of the 53 students, 17 were male and 36 were female. Participants' ages ranged from 21 years to 50 years. Some students were simultaneously enrolled in more than one class in which they used the mobile devices. Participants varied in their levels of experience as language teachers and came from various countries around the world.

Table 2. *Range of Participants' Ages*

Age	21–25	26–30	31–35	36–40	41–45	46–50	Total
Male	0	2	8	4	2	1	17
Female	13	6	5	4	8	0	36
Total	13	8	13	8	10	1	53

Using the results of the pre-survey, the participants were separated into two groups based on the devices they recorded as owning: Group A consisted of mobile device users and Group B consisted of mobile computer users. These groups were defined in order to compare the results of six class projects in the specialized learning environments as shown in Table 3.

Table 3. *Mobile Device User Groups*

Group	Group A	Group B
Number of participants	25 students	28 students
Registered devices	Apple iPhones, Android Phones, iPads, tablets, and other mobile devices	Laptops, MacBook, Netbooks, and other mobile computers

Survey Questionnaires

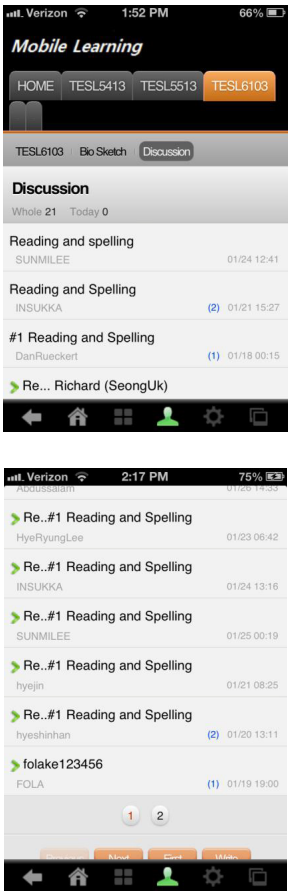
The pre-study survey was used to gather students' perceptions toward new technology such as mobile devices and to determine the students' pre-study TACI classification. The post-study survey was used to re-evaluate students' TACI classification and to investigate how exposure to and use of mobile technologies as a student can impact the students' overall willingness to adopt new technology.

Class Projects

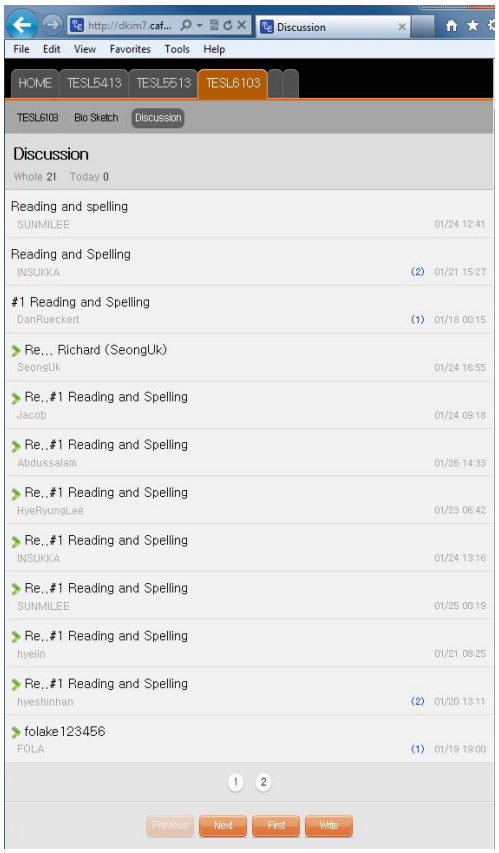
A specialized learning environment (i.e., a mobile learning site) was created to simplify the students' use of their personal mobile devices, when tasked to complete the different mobile activity assignments. The authors developed the layout and design of the learning environment to support different mobile operating systems (e.g., iOS, Android OS, Windows Phone, etc.), mobile browsers (e.g., the native Android browser, Opera Mini, Firefox, etc.) and to support the significantly reduced screen sizes of their mobile devices. For example, the learning content was fitted to the different screen sizes so that the learners could easily access it with their mobile devices when they logged in to the mobile learning site. Students could post their responses to topic prompts that the instructor had posted on a discussion board and then respond to postings made by their peers. This learning site facilitated the use of social online sites such as YouTube, Facebook, and VoiceThread, as shown in Figure 1.

Class projects were designed according to the following criteria: (a) projects must demonstrate the use of personal mobile devices for connecting, communicating, and collaborating as students create personalized learning experiences; (b) projects must demonstrate the use of personal mobile devices for MLL such as participating in individual and group discussion activities; (c) projects must demonstrate the use of everyday technologies (already known or easily learned) for MLL; and (d) projects must demonstrate both quantitative and reflective information that it promotes new learning experience with mobile technologies.

Based on these criteria, a total of six class projects were generated: a bio-sketch, an online discussion,



View of iPhone user



View of laptop user

Figure 1. An example of the specialized learning environment for different users.

Spring Break Facebook updates, YouTube video watching, VoiceThread presentations, and YouTube video authoring. These projects shared concerns such as the need to engage with mobile activities and the perceived benefits of using mobile devices to cooperate with others as a way to trigger personally meaningful learning experiences in MLL. Appendix A further describes the different learning tasks in each of these projects. All class projects spanned a 12-week period between January 2012 and April 2012. For each project, students were given two weeks to make their contributions.

Student Reflections

We also sought to document what students thought about their learning experiences with mobile devices. To this end, we developed a student reflection questionnaire to elicit their thoughts and suggestions. We also focused on student resistance and possible reasons why the use of mobile technologies would be resisted. The reflection questions solicited students' thoughts on four categories of interaction with the mobile resources: how to connect, communicate, collaborate, and create personalized learning. Each category more specifically asked about the types of tools students used, the number of times they used their mobile devices, the time period, their feelings about the tools used, and their suggestions for improvements. The full questionnaire is shown in Appendix B.

RESULTS

Pre-Survey Questionnaire

Fifty-three language education students responded to the pre-survey during the first week of class (see

Appendix C). One interesting finding was that 84% of the participants indicated that they use a mobile computer "many times a day" outside of class, but less than half the students use a smartphone (48%) or other mobile devices (28%) with Internet (see Figure 2). Although the results of the survey may not be generalized to all language students, this finding would imply that many students are reluctant to use their advanced mobile devices like smartphones outside of class as Stockwell has found (2007, 2008, 2010).

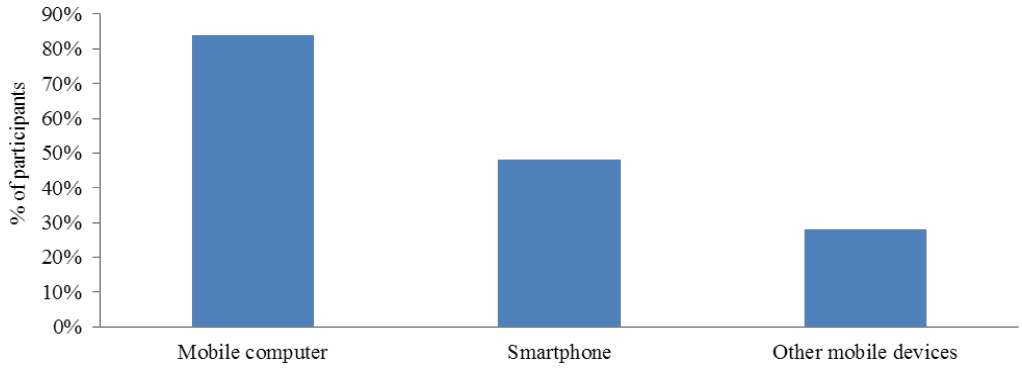


Figure 2. Percentage of students who use mobile devices with Internet many times a day outside of class.

This finding may also indicate that students do not have widespread access to these mobile devices. However, the participants also generally had positive views towards the use of mobile devices, particularly that these devices increased access to resources (44% of students agreed and 44% of students strongly agreed) as well as improved communication with teachers and classmates (52% of students agreed and 28% of students strongly agreed).

Student adopter index classifications were measured using the TACI as shown in Figure 3. With a skewness of .07, this distribution was not significantly skewed. An independent-samples *t*-test was conducted to compare the mean TACI classifications between these two user groups. There was a significant difference between the mobile device users of Group A ($M = 4.0$, $SD = 1.68$) and the mobile computer users of Group B ($M = 5.54$, $SD = 1.86$), $t(47) = -3.04$, $p = .04$, $d = .87$ (large effect size).

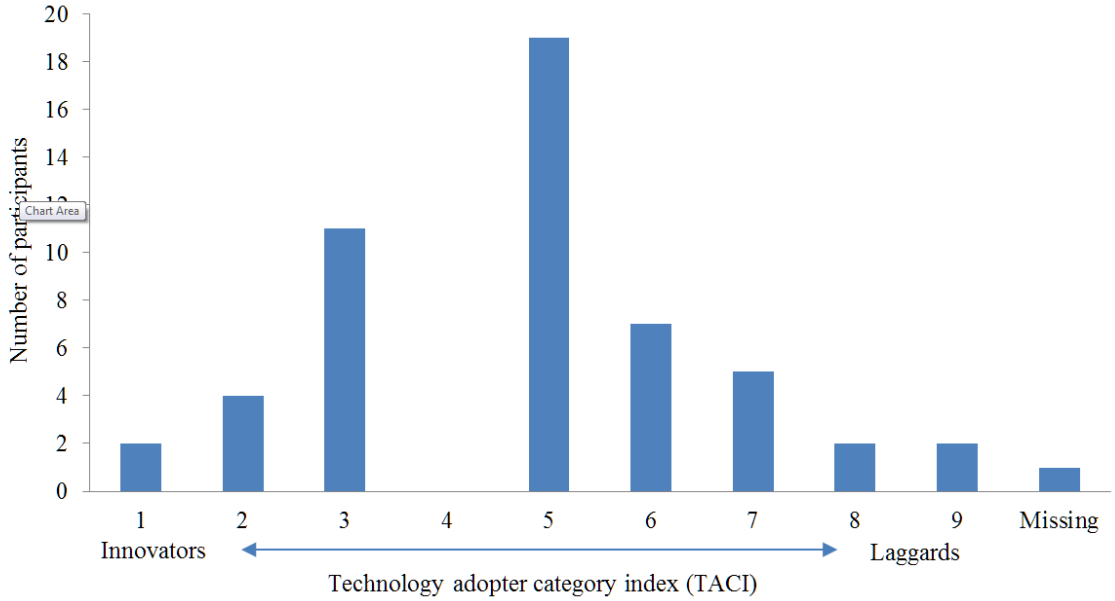


Figure 3. Frequency of students' pre-study TACI classifications.

Group A had lower adopter category index scores than Group B, which suggests that the participants in Group A—the mobile device users—are more open to using new technologies compared to Group B—the mobile computer users. As a general conclusion, it can be inferred that the students who are mobile device owners would be more likely to use mobile technologies in their future classrooms.

Class Project Reflections

Approximately one week after completing each class project, students were required to complete the reflection questionnaire regarding the project. For four out of six class project activities, it was observed that some students who had originally registered their mobile devices for learning stopped using them and switched to laptop computers, as shown in Table 4. Switching from mobile devices to mobile computers, such as laptops, is a common event among users, as documented by Stockwell (2010). This can happen for a number of reasons, which may include small screen size, keyboard complexity, and even battery drainage. Although the members of this group were considered to be early adopters, the actual practicality and difficulty level of using the mobile devices frustrated them, and a large percentage of them ultimately switched to a more comfortable means of completing their tasks.

Table 4. *Number of Group Participants by Class Projects*

	Group A	Group B
Registered user	25	28
Bio-sketch	15	37
Online discussion	13	36
Spring Break	N/A	N/A
Watching YouTube	10	35
VoiceThread	9	38
Creating YouTube	22	23

Overall, a total of 237 student reflections regarding five of six class projects were analyzed (because of technical difficulties with the Facebook account, this project had to be excluded from the study). Reflections were first analyzed by raw numbers (i.e., frequency and time/hours) and then with other information about participants' personal views on the use of personal mobile devices for learning (e.g., feelings, suggestions, and advantages/disadvantages). The four themes that students were asked to reflect upon were clearly identifiable in the data: (a) how to connect (i.e., mobile connectivity), (b) how to communicate (i.e., mobile communication), (c) how to collaborate (i.e., mobile collaboration), and (d) how to create personalized learning experience (e.g., mobile learning experience). Each item from the student reflections was tallied to create the frequency distributions shown in Appendix D.

An independent-samples *t*-test was conducted to discover if significant differences existed between the groups in numerical data from the student reflections. The results revealed that there were three statistically significant differences between the groups in the amount of connection in the "Watching YouTube video" project as well as in the amount of communication in both the "Bio-sketch" and "VoiceThread" projects (see Table 5). We are led to determine that the ease of connecting and communicating on mobile devices in learning activities facilitated the Group A participants' more frequent interaction.

Table 5. *Three Statistically Significant Differences and Effect Sizes*

Project	Group A		Group B						
	M	SD	M	SD	t	df	p	d	C.I.
Watching YouTube video	4.89	2.98	2.93	1.76	2.433	35	.020	.80	.33–3.60
Bio-sketch	2.75	.62	1.96	.98	2.551	35	.015	.96	.16–1.50
VoiceThread	7.00	5.93	3.85	.32	2.050	40	.047	.75	.05–6.25

The information from the open-ended questions (e.g., feelings, suggestions, and advantages/ disadvantages) was used to determine the participants' subjective views. Overall, the comments in the reflections revealed a positive attitude toward learning with mobile devices (including mobile computers), but there are still a number of barriers as shown in the representative quotes listed in Table 6.

Post-Survey Questionnaire

Figure 4 shows the different distributions of the students' TACI scores from both the pre- and post-survey. Of particular interest was if and how the participants' TACI changed through exposure to activities that encouraged them to use their own mobile devices to complete their coursework. We used the

Table 6. *Examples of Students' Responses to Open-Ended Questions*

Category	Group A	Group B
Mobile connectivity	"I felt that it was convenient and advantage of using time effectively." "easy to connect" "accessibility (advantage), download speed (disadvantage)"	"I felt okay about it." "Easy connection; convenience" "It was easy to watch the video. The video was a good change of learning."
Mobile communication	"Overall, I felt using my mobile phone to complete my assignment and communicate with my peers was convenient." "It was different using my phone instead of my laptop." "The advantage was doing it while being away from the computer. The disadvantages were slower Internet connectivity and smaller keypad."	"I felt it was easy to communicate with others." "I feel it is a useful tool (Online discussion board) for communication and we can communicate with each other and get the ideas easily." "I felt good about it. It has many advantages like communicating with people easily."
Mobile collaboration	"It was uncomfortable to read other's opinion on smaller devices." "I was amazed at the convenience of using the iPhone." "It's a big challenge for collaboration but it's useful."	"It's a good way for us to learn and experience." "One of the disadvantages is that collaboration may not be very effective. As an advantage, the learner has the time to think freely and comfortably."
Personalized learning experience	"I felt it was meaningful." "It was a good tool for creating personalized learning."	"I felt satisfied." "It gives advantages to create personalized learning."

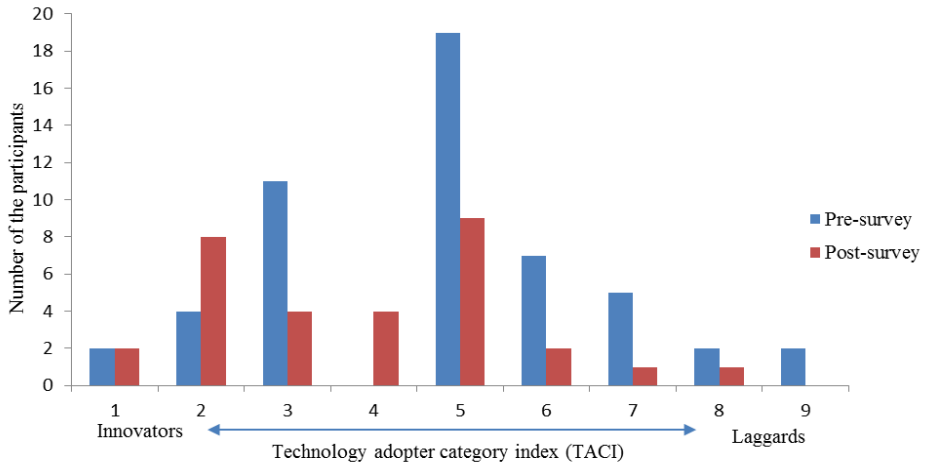


Figure 4. TACI in the pre- and post-survey results.

independent-samples *t*-test to evaluate the difference between the means of TACI from the pre-survey ($M = 4.79$, $SD = 1.913$) and post-survey ($M = 3.81$, $SD = 1.778$), and the result was statistically significant, $t(81) = 2.321$, $p = .023$, $d = .53$, 95% CI [.41, 1.82]. Fewer students participated in the post-survey due to attrition. This indicates that exposure to mobile device use in the MA in TESOL program was effective in lowering the overall TACI of these students.

Although we did not assess depth of learning in this study, we believe that the ways of learning with mobile technologies are different even when the same learning activity is required for all students. For instance, the use of mobile devices has added a potential new dimension for language learning such as opportunities to learn and practice anytime and anywhere (Demouy & Kukulska-Hulme, 2010).

DISCUSSION

Research Question 1

The TESOL students in this study provided a useful view of what learners are currently doing and of what they can do with mobile devices regarding MLL outside of the classroom. In terms of activities, the participants felt that as the use of mobile devices becomes more pervasive, these devices will have more potential to provide greater mobile connectivity and communication. Other researchers (e.g., Cavus & Ibrahim, 2009; Lu, 2008; Stockwell, 2010) have also reported positive reactions to the use of mobile devices for language learning because of these devices' portability and perceived convenience. However, there are also practical challenges. For example, students might have limited access to mobile devices due to device and service costs. The participants in this study also reported frustration with new technology when used as a learning tool. This has no bearing on whether or not more mobile content should be developed, but it is important to remember that students may not have consistent access to mobile technologies (including new mobile devices) for learning at home. For instance, one student in this study remarked, "Never assume that all students have access to all new technologies."

Unsurprisingly, Group A participants who used mobile devices (e.g., Android phones, Apple iPhones, iPads, tablets, etc.) for learning had lower TACI scores than participants who registered only their mobile computers (e.g., laptops, netbooks, MacBook, etc.). It seems that the individual who is more highly receptive to innovation (i.e., being an innovator or early adopter) are more eager to use mobile technologies as a learning tool beyond their primary function as a simple communication or entertainment tool.

Figure 5 shows the plot of the pre- and post-TACI utilizing Rogers' Adopter Categories: Innovators

(index 1), Early Adopters (index 2 and 3), Early Majority (index 4 and 5), Late Majority (index 6 and 7), and Laggards (index 8 and 9). As stated above, there was a statistically significant difference in individuals' TACI between the pre-survey and post-survey; specifically, more participants were classified with a lower TACI in the post-survey than in the pre-survey.

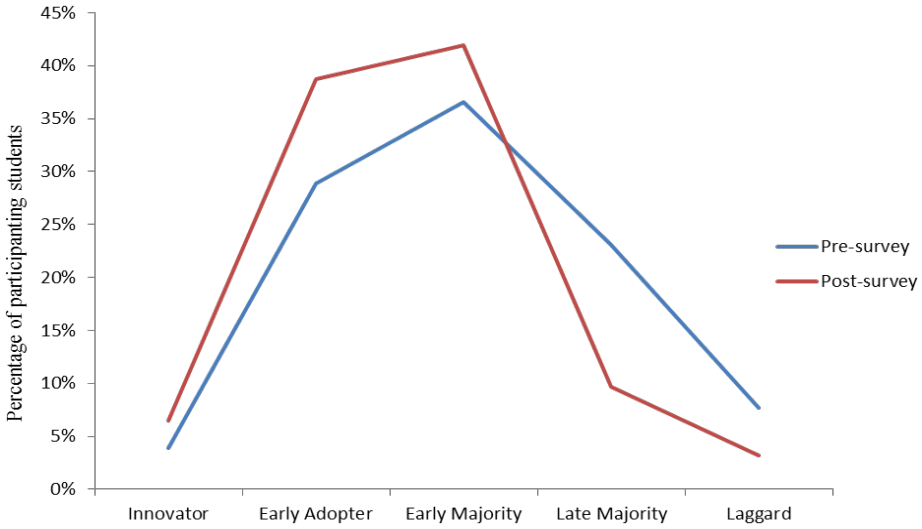


Figure 5. A comparison of adopter categories from the pre- and post-survey.

These results demonstrate that providing a mobile learning environment to language educators may help them become more comfortable with using their own devices. As students used their mobile technologies, their TACI scores generally went down. It appears that students will change their receptivity to technological innovation (i.e., adopter category) and embrace learning with mobile technologies when they have been exposed to MLL over the length of time required to pass through the innovation-decision process. Moreover, it became clear that current mobile learning environments have to cater to the earlier adopters (e.g., Innovator and Early Adopter) to supply convenient access to mobile content while also accommodating the students who fall more on the laggard end of the TACI spectrum. As mobile technologies develop and become more readily available for all students, the number of adopters of mobile technology will increase. As more learners are exposed to and make use of mobile learning environments, they will have richer learning opportunities. This is especially true for TESOL students in the field of language education. As they become more comfortable with using mobile learning devices and change their receptivity to new technology, they can see more value in adopting new technology in their classes. If they change their beliefs about the use of new technology, they should be more likely to use mobile learning devices for pedagogical purposes in their future classes.

Although many educators and schools have worked hard to make mobile learning available to all students, the usage of mobile technologies for language learning should be carefully implemented and should take student perceptions into consideration. In other words, educators should embrace students' perceptions and recognize them as essential when designing effective mobile learning environments. This can potentially empower students by engaging them in personalized learning experiences with mobile technologies. If future teachers have positive experiences using mobile technologies while they are students, they will be more likely to use those mobile technologies when they become classroom teachers.

Research Question 2

Understanding how students use their mobile devices to connect, communicate, and collaborate as they create new learning experiences can better illuminate how MLL opens up new pedagogical scaffoldings.

To answer our research question, we explored the characteristics of mobile learners in terms of their experience (i.e., mobile connectivity, mobile communication, mobile collaboration, and personalized learning experience); we also explored the practical and pedagogical considerations in designing a positive mobile learning environment that cultivates confidence in technology use. Krashen and Terrell (1983) discussed the importance of lowering the affective filter when teaching language to facilitate greater retention of language. The use of mobile learning environments and activities can be very effective, but for those who identify more closely as laggards, the anxiety caused by having to use new technologies may increase their affective filters. If the activity is not designed to be easy to use in practice, these students will walk away in frustration and the learning objective of the activity may be obscured due to the increased stress and anxiety of using the new technology.

Mobile Connectivity & Communication

In the "Watching YouTube video" project, Group A participants (M = 4.89, SD = 2.98) more frequently connected to mobile content with their mobile devices (e.g., Apple iPhones, Android phones, iPads, tablets, etc.) than Group B participants (M = 2.93, SD = 1.76) who used mobile computers. These individuals demonstrated their ability and willingness to use their mobile devices when the project was related to simple mobile activities such as viewing mobile content. This is not to say that all learning needs to require such simple activities, but it should be kept in mind that learners may be more willing to engage in activities that incorporate easy-to-use features of their mobile devices. That is in part because "mobile devices offer unique opportunities to deliver multimedia content in authentic learning situations" (Jong, Specht, & Koper, 2010, p. 110). Small screens such as those on smartphones often have technical limitations (Kim & Kim, 2012) compared to laptops' relatively larger screens. However, our general results and conclusions drawn from these students' reflections suggest that transmitting mobile content through small mobile devices (e.g., Apple iPhones, Android phones, iPads, and tablets) might be just as useful as providing content through mobile computers if the learning environment is made pedagogically user friendly. Statements from the participants such as "I like watching YouTube videos on my mobile device, so doing it for a class assignment made me more excited about it" and "I felt that it was convenient and had the advantage of using time effectively" support this conclusion.

Recently, adding Internet access to mobile devices has extended users' communication ability from simply telephoning to emailing, creating and sharing multimedia messages, accessing social media like Facebook, and so forth. When applied to learning activities, these mobile communication services can increase students' extrinsic motivation to participate in learning, which may lead to positive learning outcomes (Rau, Gao, & Wu, 2006). There were significant differences in the amount of mobile communication for two of the five projects. In particular, the participants in Group A (M = 7.00, SD = 5.93) used their mobile devices to communicate with other learners more often than the learners in Group B during the "VoiceThread" project (M = 3.85, SD = .32). We assume this was because the participants were able to use voice commentary as a primary type of communication, which is easier to do using the built-in camera and microphone on a smartphone than with a laptop, which may or may not have a webcam. This interesting condition demonstrates that incorporating the voice commentary feature in mobile learning activities can increase the interactions between students as a positive result of using advanced mobile technology. This same tendency was observed in the "Bio-sketch" project (Group A, M = 2.75, SD = .62 and Group B, M = 1.96, SD = .98), in part because this particular project was related to simple mobile activities such as viewing and writing short answers.

The analysis of the reflection question "What kind of tools did you use…?" indicate that the learners preferred to use their laptops as a connecting tool, especially if they were required to participate in activities related to sharing or creating (See Appendix D). Overall, the choice of mobile devices was laptop > netbooks > Apple iPhones > Android phones > tablets. In other words, even if students own advanced mobile devices (e.g., Android phones, Apple iPhones, and tablets), they might not necessarily be able to use them as a primary learning tool for completing mobile learning activities. Learners often to

chose not to use advanced mobile devices because of concerns similar to those reported in Stockwell's (2010) study, such as small screen and keyboard. Indeed, some students wrote "It was uncomfortable to read other's opinion on smaller devices" and "I am not good at typing with mobile device." It appears that students' final decision of which mobile device to use for completing learning activities was not necessarily a result of having the ability and willingness to use the device as a learning tool. For example, the online discussion board was the primary communication tool to facilitate learning activities that involved communicating with their classmates. In particular, students cited difficulty providing written commentary in that particular learning environment: "I used my iPad to read discussion board posts, but preferred to use my laptop to post my own responses"; "When responding to the video, I didn't love using the keyboard on my mobile device."

Similarly, while participants in Group A seem to be more willing and confident about using mobile technologies, learning using these devices was sometimes still very challenging for them. This may also be due to challenges related to the instructional design features involved with the commonly used technologies that were employed in this study. For example, the "Creating a YouTube Video" project was made more difficult because of participants' inability to upload large video files with their mobile devices. In addition and as mentioned in the previous section, students faced an unintended practical issue with VoiceThread (at the time of the study, there was an app for the Apple iPhone, but not for Android phones). When faced with this obstacle, Android users switched to portable computers to complete their projects. It appears that many of these technologies, though well designed for entertainment purposes, became less user-friendly when applied to pedagogical activities.

Though we initially expected to see differences between learner groups as we observed how they thought about their learning experiences with mobile devices, our results showed no significant differences between groups in terms of the questionnaire categories addressing mobile collaboration and personalized learning experience.

Mobile Collaboration

We intended to use discussion board activities as a mode of collaboration among participants in this study. The majority of participants reported that discussion boards have many benefits (e.g., creating and sharing messages) as an online collaboration tool for mobile learning activities. However, there were some technical problems with the discussion boards in this study. For example, Group A participants may have encountered more technical obstacles such as frustration with the format of the collaboration and with how long it took to type out complex ideas on their mobile devices. In addition, the format of our discussion board with YouTube and VoiceThread features was confusing because it had too many steps (e.g., logging in to different online tools with different passwords and permissions); participants were constantly busy with technical details instead of being able to focus on more important learning issues. Thus, there is potential for future versions of these activities to be excellent learning tools on mobile devices, but these were not practical or user-friendly enough to be pedagogically effective. In contrast, as mobile computer technology has evolved, Group B participants sometimes felt that there was no difference in benefits between mobile devices, as the following statement indicates: "I didn't use my phone, because I didn't feel there were any advantages greater than using my laptop."

Personalized Learning Experience

The student reflection summary (See Appendix D) suggests that the participants in this study felt that they could create a personalized meaningful learning experience no matter which mobile device they used for their learning activities.

One interesting finding was that fewer participants of Group A felt that the "Bio-sketch" (53.3% of the participants) was a personally meaningful learning experience than "Watching YouTube video" (90.0% of the participants) and "Creating YouTube video" (95.5% of the participants). This seems to indicate that

students were more interested in using their mobile devices for the latter two projects, which coincidentally included a YouTube component, and the students created a greater personally meaningful use of tools than projects that required text entry only without a multimedia component. In other words, the students did not like writing about themselves, by themselves, as much as they liked watching videos and commenting to each other. This would support the conjecture that writing simple texts without peer interactions could negatively impact the perceived personally meaningful nature of the learning activity. Without meaningful interactions with the language, a language cannot be learned effectively (Norton, 2000).

Limitations of the Study

There are a few limitations of this study. First, this study was designed to observe how students are thinking about learning experiences with mobile devices that engage their emotions. Thus, the findings from this study may not be generalized to assessing depth of learning with mobile technologies. Second, the number of participants was small ($N = 53$), so their reflections may not be equally applicable to all mobile learner perceptions. Another limitation was that the practical disadvantages of small devices seen in this study may have already been resolved by other technological innovations (e.g., wireless keyboard and screen share).

CONCLUSION

The findings of this study suggest that mobile technologies have the potential to provide new learning experiences. In these experiences, students can engage more frequently in learning activities outside of class, providing them with more learning opportunities in their community of practice. The fact that the students' TACI scores dropped significantly after participating in these activities indicates that the use of mobile technologies in these classes opens up new avenues for interaction and learning. The participants became more willing to adopt new technologies into their own lives, which revolve around teaching English as a profession. Furthermore, the *t*-test results indicated statistically significant changes in their views towards mobile technology. While changes in views do not necessarily result in immediate changes in behavior, this experience may have given the participants the impetus they need to adopt mobile technologies more fully in their own classrooms. In addition, increased participation in a community of practice should result in greater proficiency in language (Norton, 2000) and other content areas.

Although many educators and teachers already use technology in class, they should consider modifying existing class activities to make them more practical and meaningful for language learning when using mobile technologies. How students use mobile technology as a learning tool is dependent on their ever-changing relationship with these mobile technologies. Teachers should remember the technological demands of mobile devices when planning activities in order to give the activities a valuable pedagogical component while being easy to use. In order to facilitate training and planning, this study has provided insight into the views of mobile learners as they connect, communicate, and collaborate to create personalized learning experiences with mobile technologies. We hope that our analysis of the characteristics of mobile users will provide some constructs for pedagogical thinking about enhancing MLL with new mobile technologies. Key issues in facilitating future language learning with new mobile technologies include developing seamless learning environments for all users that capitalize on technologies and incorporate a variety of available content while reducing the devices' limitations. In addition to their ease of use, universal availability of the mobile technologies makes them a viable and exciting option for language learning. Keeping these issues in mind, developers and educators should furnish students with options they can use to create personally meaningful language learning with mobile technologies.

APPENDIX A. Summary of the Six Class Projects

Project	Description
Bio-sketch	On their first day of class, students in all three classes were given the task of introducing themselves to their peers via the online discussion board. Specifically, they were asked to give their names, to state where they are from, and to answer two or three questions providing information about themselves that was relevant to the course content.
Online discussion	An online discussion board was used in each class to prompt students to think more deeply about the topics being studied and to articulate their ideas and opinions about a variety of issues related to their course(s). Students were required to post their own responses to the topic prompts that the instructor had posted and then to respond to postings made by two of their peers. This project promoted collaboration by posing problems and requiring students to engage in discussion to find solutions to those problems.
Spring break	The authors created Facebook pages for each class and friended the students to include them in the groups. Students were required to use their mobile devices to report what they were doing during spring break on their class's Facebook page.
Watching YouTube videos	Students in each class were assigned to watch a YouTube video that provided information about their course. There was no additional component to this task. Students simply logged into the mobile learning website and were able to watch YouTube videos that were already embedded there.
VoiceThread	Every student was supplied a VoiceThread membership. Students were assigned the specific task of creating a collaborative learning experience using VoiceThread as an instructional tool. All projects required students to create a unique VoiceThread presentation and to post audio comments on their own and others' presentations. These projects asked students to collaborate to better serve their future students by creating practical and useful activities using this technology.
Creating a YouTube video	All students were assigned presentations that would require them to create their own video and then post it to the class YouTube channel. Peers had to leave comments for these newly created videos. The comments were designed to give peer assessment of the strengths and potential modifications that could be made to improve the quality of the recorded presentations.

APPENDIX B. Reflection Questionnaire

	Category	Items	
1.	Connecting	1.1	What kind of tools (apps) did you use to connect to this project? (e.g., Safari, iPhone, Netbook, Firefox, etc.)
		1.2	How many times did you use your mobile device for this project? (e.g., 10 times total)
		1.3	How long did you use your mobile device for this project? (e.g., 1 hour total)
		1.4	How did you feel? Any suggestions? What advantages/ disadvantages did you feel?
2.	Communicating	2.1	What kind of tools did you use to communicate for this project? (e.g., telephone, online discussion board, etc.)
		2.2	How many times did you communicate with your classmates for this project? (e.g., 5 times total)
		2.3	How long did you use your mobile device to communicate for this project? (e.g., 1 hour total)
		2.4	How did you feel? Any suggestions? What advantages/ disadvantages did you feel?
3.	Collaborating	3.1	What kind of tools did you use to collaborate for this project? (e.g., telephone, online discussion board, etc.)
		3.2	How many times did you collaborate for this project? (e.g., 5 times total)
		3.3	How long did you use your mobile device to collaborate for this project? (e.g., 1 hour total)
		3.4	How did you feel? Any suggestions? What advantages/ disadvantages did you feel?
4.	Creating personalized learning	4.1	How effective were the tools you used in terms of creating a personally meaningful learning experience for yourself?
		4.2	While working on this project, how frequently did you consider that your learning was personally meaningful? (e.g., 50% of the time it was personally meaningful)
		4.3	While using your mobile device, how long was your learning personally meaningful? (e.g., 1 hour total)
		4.4	How did you feel? Any suggestions? What advantages/ disadvantages did you feel?

APPENDIX C. Frequency Summary of the Survey Questionnaire

	Many times per day	Once a day	Two or three times per week	Once a week	N/A
1. Use a desktop PC outside of class.	42%	10%	24%	16%	8%
2. Use a mobile computer (e.g., laptop) outside of class	84%	8%	6%	2%	0%
3. Use a smartphone (e.g. Apple iPhone or Android Phone with Internet) outside of class.	48%	2%	8%	14%	28%
4. Use other mobile devices (e.g. iPad or Galaxy Tab with Internet) outside of class.	28%	6%	2%	28%	36%

	Read the instruction manual	Try to use it with your limited knowledge	Ask somebody to teach you how to use it	Other	N/A
5. Reaction to new technology like other mobile devices (e.g. smartphones, iPhones, iPads, Galaxy Tabs).	16%	40%	32%	10%	0%

	Educational value	Entertainment value	Business value	The challenge of learning new technology	N/A
6. Motivation to use new technology like other mobile devices (e.g., smartphones, iPhones, iPads, Galaxy Tabs).	24%	42%	8%	24%	2%

	Lack of time	Lack of money	Lack of interest	Difficulty level of the technology	N/A
7. Impediment of using new technology like other mobile devices (e.g. smartphones, iPhones, iPads, Galaxy Tabs).	10%	50%	18%	20%	2%

	Immediately	A couple of hours	A couple of days	Weeks or months	N/A
8. Time to master new technology like other mobile devices (e.g. smartphones, iPhones, iPads, Galaxy Tabs).	8%	40%	32%	20%	0%

APPENDIX C. continued. Frequency Summary of the Survey Questionnaire

		More teacher instruction about the technology	More time to adopt the new technology	Hands on practice with the technology	Other	N/A
9.	Need to effectively adopt new technology like other mobile devices (e.g. smartphones, iPhones, iPads, Galaxy Tabs).	12%	34%	46%	4%	2%

		SD	D	NS	A	SA	N/A
10.	Mobile devices with Internet offer seamless access to digital information, and hence is a boost to this information (or technology) age.	2%	6%	38%	28%	20%	6%
11.	The use of mobile devices can increase flexibility of access to resources (like D2L, slides, notes, YouTube videos, etc.).	8%	0%	4%	44%	44%	0%
12.	The use of mobile devices is not generally very secure and so I wouldn't want to use it when I can use my desktop.	12%	38%	22%	26%	2%	0%
13.	The use of the mobile devices can improve communication with teachers and classmates.	4%	4%	12%	52%	28%	0%
14.	The use of the mobile devices can improve the learning (pedagogic) value of the course and courses are more recommendable to others.	4%	12%	26%	50%	8%	0%
15.	With mobile devices I do not need to depend on desktops	8%	28%	22%	28%	14%	0%
16.	Do you prefer mobile devices to be used for learning rather than desktop PCs?	8%	26%	32%	20%	14%	0%

Notes. E = Effective, N = Not effective, O = Other SD = Strongly disagree, D = Disagree, NS = Not Sure, A = Agree, SA = Strongly agree.

APPENDIX D. Student Reflection Summary Tables

Table 1. *Mobile Connectivity*

Question item		Bio-sketch		Online discussion		Watching YouTube video		VoiceThread		Creating YouTube video	
		Group		Group		Group		Group		Group	
		A	B	A	B	A	B	A	B	A	B
1.1	Tools used (%)	29	71	27	73	22	78	19	81	49	51
1.2	Frequency	2.86	4	6	5.29	4.89	2.93	22	8.66	12.06	12.39
1.3	Time/ hour	0.56	1.05	1.41	1.32	1.3	0.89	2.29	3.1	3.7	4.33

Table 2. *Mobile Communication*

Question item		Bio-sketch		Online discussion		Watching YouTube video		VoiceThread		Creating YouTube video	
		Group		Group		Group		Group		Group	
		A	B	A	B	A	B	A	B	A	B
2.1	Tools	Board, Phone	Board, Phone, E-mail, Face-to-Face	Board, Phone	Board, Phone	Board, Phone	Board, Phone, Face-to-Face	Board, Phone	Board, Phone	Board, Phone, E-mail, YouTube	Board, Phone, E-mail, YouTube
2.2	Frequency	2.75	1.96	3.58	3.31	3.38	2.67	7.00	3.85	8.29	7.82
2.3	Time/ hour	0.44	0.56	1.12	0.98	1.29	0.77	2.23	1.32	1.13	2.83

APPENDIX D, continued. Student Reflection Summary Tables

Table 3. *Mobile Collaboration*

Question item	Bio-sketch		Online discussion		Watching YouTube video		VoiceThread		Creating YouTube video	
	Group		Group		Group		Group		Group	
	A	B	A	B	A	B	A	B	A	B
3.1 Tools	Boar, Phone	Board, Phone Face-to-Face	Board, Phone	Board, Phone	Board, Phone	Board, Phone	Board, Phone	Board, Phone	Board, Phone, E-mail, YouTube, Face-to-Face	Board, Phone, E-mail, YouTube
3.2 Frequency	4.29	2.78	3.50	3.77	3.71	3.06	6.00	4.36	9.42	6.29
3.3 Time/ hour	0.36	0.83	1.15	1.01	1.14	1.27	2.25	1.43	2.96	2.90

Table 4. *Mobile Learning Experience*

Question item	Bio-sketch		Online discussion		Watching YouTube video		VoiceThread		Creating YouTube video	
	Group		Group		Group		Group		Group	
	A	B	A	B	A	B	A	B	A	B
4.1 Tools	E: 53.3 N: 0.0 O: 46.7	E: 75.7 N: 108 O: 3.5	E: 66.6 N: 6.7 O: 6.7	E: 2.2 N: 1.1 O: 6.7	E: 90 N: 0 O: 10	E: 82.9 N: 0 O: 7.1	E: 77.8 N: 0 O: 2.2	E: 78.9 N: 7.9 O: 3.2	E: 5.5 N: 0 O: 4.5	E: 91.3 N: 0 O: 8.7
4.2 Frequency (units)	68.5	63.9	69.1	61.9	71.11	73.17	72.5	76.5	77.6	73.0
4.3 Time/ hour	0.53	0.90	0.80	1.14	0.69	0.81	1.96	2.05	2.80	2.58

Notes. E = Effective, N = Not effective, O = Other (unsure, N/A, etc.).

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REFERENCES

Cavus, N., & Ibrahim, D. (2009). m-Learning: An experiment in using SMS to support learning new English language words. *British Journal of Educational Technology, 40*(1), 78–91. doi: 10.1111/j.1467-8535.2007.00801.x

Chen, L., Xie, X., Fan, X., Ma,W., Zhang, H., & Zhou, H. (2003). A visual attention model for adapting images on small displays. *ACM Multimedia Systems Journal, 9*(4), 353–364. doi: 10.1007/s00530-003-0105-4

Demouy, V., & Kukulska-Hulme, A. (2010). On the spot: Using mobile devices for listening and speaking practice on a French language programme. *Open Learning*, *25*(3), 217–232. doi: 10.1080/02680513.2010.511955

Denton, D. (2011). Reflection and learning: Characteristics, obstacles, and implications. *Educational Philosophy and Theory, 43*(8), 838–852. doi: 10.1007/s00530-003-0105-4

Dugas, C. A. (2005). *Adopter characteristics and teaching styles of faculty adopters and nonadopters of a course management system*. Unpublished doctoral dissertation, Indiana State University, Terre Haute, IN.

Grossman, R. (2009). Structures for facilitating student reflection, *College Teaching*, *57*(1), 15–22. doi: 10.3200/CTCH.57.1.15-22

de Jong, T., Specht, M., & Koper, R. (2010). A study of contextualised mobile information delivery for language learning. *Journal of Educational Technology & Society, 13*(3), 110–125. Retrieved from http://www.ifets.info/journals/13_3/11.pdf

Kim, D., & Kim, D. (2012). Effect of screen size on multimedia vocabulary learning. *British Journal of*

Educational Technology, *43*(1), 62–70. doi: 10.1111/j.1467-8535.2010.01145.x

Kukulska-Hulme, A. (2009). Will mobile learning change language learning? *European Association for Computer Assisted Language Learning, 21*(2), 157–165. Retrieved from http://oro.open.ac.uk/16987/2/

Krashen, S.D., & Terrell, T.D. (1983). *The natural approach: Language Acquisition in the Classroom*. New York, NY: Pergamon Press.

Lan, Y.-F., & Huang, S.-M. (2012). Using mobile learning to improve the reflection: a case study of traffic violation. *Educational Technology & Society, 15*(2), 179–193. Retrieved from http://www.ifets.info/journals/15_2/16.pdf

Lu, M. (2008). Effectiveness of vocabulary learning via mobile phone. *Journal of Computer Assisted Learning, 24*, 515–525. doi: 10.1111/j.1365-2729.2008.00289.x

Looi, C.-K., Seow, P., Zhang, B., So, H.-J., Chen, W., & Wong, L.-H. (2010). Leveraging mobile technology for sustainable seamless learning: A research agenda. *British Journal of Educational Technology, 41*(2), 154–169. doi: 10.1111/j.1467-8535.2008.00912.x

Maniar, N., Bennett, E., Hand, S., & Allan, G. (2008). The effect of mobile phone screen size on video based learning. *Journal of Software, 3*(4), 51–61. Retrieved from http://ojs.academypublisher.com/index.php/jsw/article/view/03045161/974

Norton, B. (2000). *Identity and language learning: Gender, ethnicity and educational change*. London, UK: Pearson Education Limited.

Pollara, P., & Kee Broussard, K. (2011). Student perceptions of mobile learning: A review of current research. In M. Koehler & P. Mishra (Eds.), *Proceedings of Society for Information Technology & Teacher Education International Conference 2011* (pp. 1643–1650). Chesapeake, VA: AACE.

Rau, P., Gao, Q., & Wu, L.-M. (2006). Using mobile communication technology in high school education: Motivation, pressure, and learning performance, *Computers & Education, 50*(1), 1–22. doi: 10.1016/j.compedu.2006.03.008

Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). New York, NY: The Free Press.

Rueckert, D., Kiser, R., & Cho, M. (2012, March). "Oral language assessment made easy via VoiceThread!" *TESOL International Convention and English Language Expo*, Philadelphia, PA, March 28–31.

Stockwell, G. (2007). Vocabulary on the move: Investigating an intelligent mobile phone-based vocabulary tutor. *Computer Assisted Language Learning, 20*(4), 365–383. doi: 10.1080/09588220701745817

Stockwell, G. (2008). Investigating Learner Preparedness for and Usage Patterns of Mobile Language Learning. *ReCALL, 20*(03), 253–270. doi:10.1017/S0958344008000232

Stockwell, G. (2010). Using mobile phones for vocabulary activities: Examining the effect of the platform. *Language Learning & Technology*, *14*(2), 95–110. Retrieved from http://llt.msu.edu/vol14num2/stockwell.pdf

Tai, Y. (2012). Contextualizing a MALL: practice design and evaluation. *Educational Technology & Society, 15*(2), 220–230. Retrieved from http://www.ifets.info/journals/15_2/19.pdf

Thornton, P., & Houser, C. (2002). M-learning: Learning in transit. In P. Lewis (Ed.), *The changing face of CALL: A Japanese perspective* (pp. 229–243). Lisse, The Netherlands: Swets & Zeitlinger

Valk, J., Rashid, A.T., & Elder L. (2010). Using mobile phones to improve educational outcomes: An analysis of evidence from Asia. *International Review of Research in Open and Distance Learning, 11*(1), 117–140. Retrieved from http://www.irrodl.org/index.php/irrodl/article/download/794/1507

Wong, L. H., & Looi, C. K. (2010). Vocabulary learning by mobile-assisted authentic content creation and social meaning-making: Two case studies. *Journal of Computer Assisted Learning, 26*(5), 421–433. doi:10.1111/j.1365-2729.2010.00357.x

Wong, L. H., Chin, C. K., Tan, C.L., & Liu, M. (2010). Students' personal and social meaning making in a Chinese idiom mobile learning environment. *Journal of Educational Technology & Society, 13*(4), 15–26. Retrieved from http://www.ifets.info/journals/13_4/3.pdf

Wu, L., & Looi, C.-K. (2012). Agent prompts: Scaffolding for productive reflection in an intelligent learning environment. *Journal of Educational Technology & Society*, *15*(1), 339–353. Retrieved from http://www.ifets.info/journals/15_1/29.pdf

Zhang, H., Song, W., Burston, J. (2011). Reexamining the effectiveness of vocabulary learning via mobile phones. *TOJET: The Turkish Online Journal of Educational Technology*, *10*(3), 203–214. Retrieved from http://www.tojet.net/articles/v10i3/10323.pdf