EFFECTS OF PRACTICE TYPE IN THE HERE AND NOW MOBILE LEARNING ENVIRONMENT

By

JEREMY I. TUTTY * FLORENCE MARTIN **

* Interim Faculty Chair, Rio Salado College.
** Associate Professor in Instructional Systems Technology, University of North Carolina Charlotte.

ABSTRACT

This generation of technology is characterized by mobile and portable devices such as smartphones and tablet computers with wireless broadband access. Mobile technologies enable a new kind of learning called "here and now learning," where learners have access to information anytime and anywhere to perform authentic activities in the context of their learning. The purpose of this study was to investigate the effects of three levels of practice type (assessment Aligned, Reflective, None) on student performance and attitude in the here and now mobile learning environment. Results indicated that, the inclusion of practice activities in mobile instruction had a positive effect on student performance. Study participants who received either assessment aligned or reflective practice significantly outperformed, participants who did not receive practice. Further, the study results also indicated that, the inclusion of practice activities in here and now mobile learning have a positive effect on students attitude. Through the systematic consideration of a specific element of instruction, this study begins the process of building the framework for the effective design and implementation of here and now mobile learning.

Keywords: Mobile Learning, Here and Now Learning, Practice, Instructional Design, Student Performance, Ubiquitous Learning.

INTRODUCTION

The notion of the anytime, anywhere computing paradigm is a reality. The capabilities of using the Internet to deliver instruction have been well documented over the past 15 years with perhaps the key characteristic being accessed (Anderson, 2009).The mobile technologies in the market today, enable access instruction anytime and anywhere while students are in the context of their learning. These devices comes with the promise of extending the online learning revolution, by placing ubiquitous learning in the hands of students. The anytime, anywhere availability of mobile devices has potential to promote a seamless 360-degree learning experience, that breaks down the barriers between formal and informal educational environments (Ching, Shuler, Lewis, & Levine, 2009, p. 28). It stands to reason that, Educational institutions would seek to leverage this technology in an effort to diversify and improve the instructional opportunities for students. Yet, empirical data is needed to determine the framework for and optimal characteristics of mobile instruction for learning, particularly in the higher education environment. An urgent need exists for ubiquitous learning opportunities (Pollara & Broussard, 2011). This research has the potential to inform the possibilities for implementing here and now mobile learning in higher education.

Here and Now Mobile Learning

Quinn (2000) defines Mobile Learning as "the intersection of mobile computing and e-learning which includes anytime, anywhere resources; strong search capabilities; rich interaction; powerful support for effective learning" (p.8). Traxler's (2010) three part definition specifies that mobile learning is (a) learning delivered and supported by handheld, mobile computing devices; (b) comprised of formal and informal components; and (c) authentic and situated in context for the learner. In this study, the author connect with the definitions from both those researchers, while the author agree with the definitions proposed by Quinn and Traxler, which will specifically focus the discussion to the context of here and now mobile learning.

Martin and Ertzberger (2013) defined Here and Now mobile

Learning as "learning occurs when learners have access to information anytime and anywhere via mobile technologies to perform authentic activities in the context of their learning (p.77)." They characterized Here and Now Mobile Learning as "Engaging, Authentic and Informal" (Martin & Ertzberger, 2013). In this study, the definition proposed and characteristics recommended by Martin and Ertzberger (2013) will serve as the foundation. This concept of Here and Now Mobile Learning is not new. It has been studied as 'situated learning', often used synonymously with the term 'authentic learning' (Brown, Collins, & Duguid, 1989). This term refers to a theoretical model in which instruction is learner-centered, where learning takes place in the same context in which it is applied, and in which the learner is an active participant in the learning process (Jonassen, 1991). Lave (1988) explained that, most of the learning occurs naturally through activities, contexts, cultures. Mobile devices have added a new dimension to this learning. Students now have the ability to access and produce information from their own observations easily with those new mobile technologies.

The ubiquitous nature of mobile learning allows the natural extension of instruction into the context of the real (Dede, 2011).Further, Quinn defined learning as "you can tie alternate reality games to location and time, and thus serve as an interesting channel for a meaningful embedding of practice in context"(Quinn, 2012, p. 22.).Each of the characteristics identified is an inherent characteristic of the capability, of delivering instruction within a locational context. If the learner's location is known, particular information relevant to the site can be provided. Further, knowing where the user is, in terms of task, relevant information could be provided to scaffold performance and reinforce the learning goal (Quinn, 2012). Mobile learning cannot be accomplished without a more complete understanding of the optimal design for mobile learning environments and of the affective factors influencing mobile learning.

Here and Now Practice

The mobile learning environment presents a number of design similarities to the regular online learning environment. Universal design principles remain a key consideration to ensure that the systems remain useful to people with diverse abilities (Arrigo & Cipri, 2010). Principles of sound multimedia integration also must be followed. And, the time-tested principles of systematic instructional design still apply, such as Gagné's Nine Events of Instruction (Gikas, 2011).

Practice is the elicitation of performance from learners prior to assessment (Gagne et al., 2005). Opportunities for practice are typically provided after learners have received the information required to master an objective. It provides the opportunity for learners to reinforce new knowledge by strengthening the connections for recall and use (Reiser, 2007). According to Martin and Klein (2008), practice assists the confirmation of correct understanding, and repetition of practice increases the likelihood of retention. The same researchers also found that practice has a significant positive effect on learning in a computer-based environment (Martin & Klein, 2008; Martin, Klein, & Sullivan, 2007). Furthermore, Martin and Klein (2008) found that, practice had the largest positive impact on student performance when compared with three other instructional events such as, Objectives, Recall, and Transfer in a web-delivered lesson.

Assessment aligned practice

This form of practice is one in which, the format, modality, and objectives are the same as the final assessment (Merrill, 2002). Merrill (2002) and Reiser and Dick (1996) have noted that, practice is effective when it is aligned with the assessment, skills, knowledge, and dispositions defined by the objectives. Crisp (2012) argues for the integration of practice and assessment that is both aligned and designed to enhance the future learning.

Reflective practice

The concept of reflective practice was influenced by the thinkers such as John Dewey (1933), David Kolb (1981), and Malcolm Knowles (1984).John Dewey (1933) stated that, "We do not learn from experience. We learn from reflecting on experience" (p. 78).This form of practice commonly consists of a learning exercise in which students express their understanding and response to, or analyze an event, experience, or concept (Knowles, Tyler, Gilbourne, &

Eubank, 2006).

Much of the literature discussing reflective practice is found in the medical field teacher preparation programs, and the training of professionals (Disabato, 2011). Theorists in the area of reflective practice suggest that, for it to be effective, it should be social, situated, relational, and experiential (Reynolds, 2011). These characteristics align well with Troxler's (2009, 2010) three defining characteristics of mobile learning: (a) learning delivered and supported by handheld, mobile computing devices; (b) comprised of formal and informal components; and (c) authentic and situated in context for the learner. If those characteristics of mobile learning are accurate, perhaps a method of eliciting performance that aligns with the modality of the learning rather than the form of the assessment, it may be most appropriate and effective.

Due to the emergent nature of m-learning and its requisite technology, the quantity of empirical studies in the mobile environment is small. The theoretical foundations for m-learning are largely in the formational stages, and a single unifying theory has yet to be emerged (Solvberg & Rismark, 2012). Subsequently, researchers are left to apply the theories and standards of e-learning when approaching the mobile realm (Cavus & Ibrahim, 2009). Thus, it is imperative to empirically determine the framework and optimal characteristics of mobile instruction for learning.

Purpose of this Study

The purpose of this study is to investigate the effects of three levels of practice type (assessment Aligned, Reflective, None) on student performance and attitude within the context of mobile instruction. The research questions for this study are:

1) What is the effect of practice type (Assessment Aligned, Reflective, None) on participant performance in the here and now mobile learning environment?
2) What is the effect of practice type (Assessment Aligned, Reflective, None) on participant attitude in the here and now mobile learning environment?

Methodology

Design

A quantitative, quasi-experimental, pretest-posttest with nonequivalent group design was used for the study. The university where the study took place offers a teacher credentialing program and a number of preservice teacher preparation courses. To avoid the variation in treatments within the class, each of the participating course sections, rather than individuals, were randomly assigned to a practice type treatment (Assessment Aligned, Reflective, None).This quasi-experimental design was used to avoid the differences in content, attitude, or time spent on the program between the students enrolled in the same class. Participants completed the treatment individually and were unaware of other treatment groups.

Each practice type treatment consisted of a practice activity administered at the conclusion of a mobile-enabled online instructional module. Participant performance was measured by researcher, who developed the pretest and post-test. The post-test was a computer-based proctored exam administered following completion of the treatment.

Participants

Participants for this study were 132 undergraduate students enrolled in one of four pre-service teacher preparation courses at a public university in the southeastern United States. The sample consisted of 78% female and 22% male participants with 88% of participants reporting an age of 18-24 years old. Less than 3% of participants reported an age of 35 years old or greater. Approximately 90% of the participants were reported as Caucasian; 5% reported Hispanic or Latino; the remaining 5% of participants reported race/ethnicity was either Asian or African American. Participants reported a mean level of proficiency in using mobile devices of 3.6 on a five-point Likert scale (1 – not proficient at all to 5 – very highly proficient). 55% of participants rated themselves as highly or very highly proficient. Less than 1% of participants rated themselves as not at all proficient.

A mobile-enabled online program was the source of instruction for this study. The mobile instructional module was based on the instruction, developed by Martin (2012) titled *Here and Now Mobile Learning.* The instructional module was developed using Articulate Storyline™ and consisted of instruction related to five pieces of art found on

the participating university campus. A screen capture of the instruction is shown in Figure 1. The instructional module consisted of an introductory screen, 20 instructional screens, and a completion acknowledgment (no practice condition) or practice screens (aligned and reflective condition). The content of the module was optimized for delivering to smart phones and tablet computers. Each information screen was accessed by scanning a QR code located adjacent to each piece of art. Information about each piece included biographical information about the artist, historical significance of the piece, and interpretations. Participants were able to navigate within the module non-linearly after scanning the QR codes to access the instructional module for each piece. However, participants were required to access all instructional screens for each painting before access to the practice was allowed.

Treatments

Three levels of practice type (assessment aligned, reflective, and none) were administered to participants. In this study, the assessment-aligned treatment consisted of a 10-item, multiple choice practice quiz. This practice type used objective, multiple choice questions that are aligned with the content and modality to the post-test. The reflective treatment consisted of a short reflective writing activity. This practice type used open-ended reflective writing prompts designed to stimulate metacognition and to build connections between instructional content and individual experience. An example of each treatment method is included in Table 1.

Main screen | Assessment Aligned Practice Screen | Reflective Practice Screen

Figure 1.Mobile Instructional Module Screen Capture. Image: Tarkay, I. (Artist). (2000). Two by two [seriolithograph].

Assessment Aligned	
	Who created King Hall Window? a) ItzchakTarkay b) Steffan Thomas c) Virginia Wright-Frierson d) James Jansom
Reflective	
	Discuss your impressions of the painting Two by Two What is a connection to your life that can be made with this piece?

Table 1. Sample Practice Type Items

Instrumentation

Student Performance

Student performance was measured using researcher-developed pre and post-tests. The pretest consisted of 10 multiple choice questions covering the art pieces. The post-test consisted of 25, multiple choice questions covering the same art pieces. The post-test items were aligned to the instructional module designed by Martin (2012) and modified by the researcher. Post-test items were similar to the assessment aligned example item which is shown in Table 1.

A post-test administered by Martin (2012) to 200 students in the initial study utilizing this instruction yielded a Cronbach's reliability coefficient of .71. The measured reliability coefficient for this administration was .83. Content and face validity of the pre and post-tests was established through expert review of the instrument. A high degree of criterion validity, or the extent to which performance on this instrument is similar to the performance on another instrument measuring the same constructs which was also present in the post-test. The overall mean performance for the participants in Martin's (2012) study was 46%, while the overall mean performance for this administration was 44%.

Attitude

An 'Attitude Survey' was developed by the researcher based upon the TAM (Technology Acceptance Model) (Venkatesh & Davis, 1996) to measure the participants' perceived usefulness, perceived ease-of-use, and user-acceptance of mobile technologies and mobile-enabled instruction in relation to their perceptions of practice efficacy and feeling of preparedness for the post-test. The survey contained 15, five-choice Likert-type items (4-strongly agree, 0-strongly disagree), three open-ended

questions, and five demographic items. The survey was initially designed to include three sections (perceived usefulness, perceived ease-of-use, and attitude toward using) with five items per section.

Content validity was established through the selection of items from TAM model assessments and expert review of the instrument. A confirmatory factor analysis was conducted on the instrument administration. Based on the analysis of TAM instruments and the a priori hypothesis that the instrument was three-dimensional and so, three factors were rotated using a Varimax rotation procedure. The rotated solution yielded three interpretable factors of the loading of which confirmed the instrument design. The "attitude toward using" factor accounted for 31% of the item variance. Perceived ease of use accounted for 27% of the item variance, and perceived usefulness accounted for 20% of the item variance. The measured Cronbach's Alpha for this administration was .96.

Five additional items were included on the survey to collect demographic information, as well as mobile device ownership and the self-reported proficiency with the mobile devices. The demographic information and participant reported ownership of and proficiency with mobile devices are described in the following section.

Procedures

The study began with the random assignment of course sections to treat the groups by the researcher using a computer-generated randomization protocol. After being introduced to the study, participants were presented with information regarding the intention of researchers to collect performance data, provided with an explanation of informed consent, and informed that, there were no perceived risks to participation in the study. Participants were also informed that, they had the option to opt out of participating. Information about the specific treatments was not provided. The data for any students, who opted out of the study was not made available to the researcher for analysis. Any participants without access to a smartphone or other web-enabled mobile device were provided an Apple® iPod Touch for the activity by the co-operating university. The participants were not aware of the treatment condition in which they were enrolled.

Following the introductory procedures, participants completed the pretest, and were released to participate in the mobile learning activity. The five paintings addressed by the mobile instructional module were located in a single hallway of the education building. Students walked through the area, using either a personal mobile device or the provided Apple® iPod Touch to scan the QR codes associated with each painting and complete the instructional module.

The treatments were accessed for the completion of the instructional component of the mobile module. Each group received practice activities according to their treatment condition. Upon completion of the final practice activity, participants completed the Post-test designed by the researcher immediately followed by the attitude instrument. The post-test was a computer-based proctored exam, that was taken for the completion of the instructional module in the regular classroom.

Results

Analysis of Covariance (ANCOVA) was conducted with a sample (N = 132) of undergraduates majoring in education at a University located in the southeastern United States to determine if an effect for varying practice types was significant on student performance. The ANCOVA was selected to control the differences in pretest performance of the participants. There are two key considerations when interpreting the outcome of ANCOVA such as (1) it is assumed that, the covariate and treatment effect are independent, and (2) it is assumed that, the regression slopes are homogenous (Miller & Chapman, 2001).In order to satisfy these assumptions, the ANCOVA was run with the covariate as the dependent measure. This analysis showed that the covariate and treatment effect were indeed independent, $F(2,126) = .17$, $p > .05$, partial $\eta^2 < .01$. A preliminary analysis evaluating the homogeneity of slopes assumption which indicated the relationship between the covariate and the dependent variable that did not differ significantly as a function of the independent variable, $F(1,126) = .68$, $p > .05$, partial $\eta^2 = .01$. Further, analysis of variances (ANOVA) on the pre-test revealed no significant differences across the groups. The Means and Standard Deviations for participant performance on the pretest by

practice type are presented in Table 2.The ANOVA for practice type was not significant, F(2,126) = 1.65, p > .05, partial η^2 = .03.

A Multivariate Analysis of Variance (MANOVA) was conducted with the same sample as described above (*N* = 132) to determine whether an effect for varying practice types were significant on student attitude. The MANOVA was selected to evaluate the linear combination of attitude subscales. The assumption of homogeneity of covariance matrices was tested due to the use of un-equivalent cell sizes. A Box's *M* test indicated the assumption was satisfied.

Participant Performance

An ANCOVA was conducted to evaluate the effects of three practice type conditions (assessment aligned, reflective, none) on participant performance. The Adjusted Means and Standard deviations for participant performance on the posttest by practice type are presented in Table 3.The ANCOVA was significant for practice type, *F*(2,125) = 13.99, *p*< .01, partial η^2 = .18. Therefore, approximately 18% of the variance between groups can be explained by participation in the practice treatment condition.

Follow-up analyses to the ANCOVA for practice type consisted of pairwise comparisons of main effects to evaluate differences among the adjusted means. The Holm's Sequential Bonferroni procedure was used to control for Type 1 error across the three pairwise comparisons. Participants in both the aligned (*M* = 12.61) and reflective practice condition (*M* = 11.22) significantly outscored participants in the no practice condition (*M* = 8.70). No significant difference was found between the assessment aligned and reflective practice conditions. Examination of the adjusted mean scores indicated that participants receiving aligned practice, performed the best on the post-test. The results of the pair wise comparisons are reported in Table 3.

Participant Attitude

A MANOVA was conducted to determine the effects of three practice type conditions (assessment aligned, reflective, none) on participant attitude. Significant differences were found among the three practice types on the attitude subscales (attitude toward using, perceived ease of use, perceived usefulness), Wilks's Λ = .87, *F*(6,248) = 2.93, *p*< .01.However, the multivariate partial η^2 based on Wilks's Λ was small as, .07. Table 4 contains the means and Standard Deviations on the attitude subscales for the three groups.

Analyses of variances (ANOVA) on each subscale were conducted to the MANOVA. To avoid Type I error, each ANOVA was tested at the .01 level. The ANOVA on perceived ease of use was significant, *F*(2,126) = 5.22, *p*< .01, partial η^2 = .08. The ANOVA on attitude toward using was not significant, *F*(2,126) = .69, *p*> .025, partial η^2 = .01.The ANOVA on perceived usefulness was also not significant, *F*(2,126) = .18, *p*> .01, partial η^2< .01.

Post hoc analyses to univariate ANOVA for perceived ease of use consisted by Tukey HSD multiple comparisons are used to find which practice type affected attitude most strongly. The participants in the aligned practice condition produced the most positive attitude in comparison with either of the other two groups, and reported a significantly more positive attitude than the participants in the no practice condition, *p*< .05. No other significant differences were measured.

Discussion

Results indicated that, the inclusion of practice activities in here and now mobile learning have a positive effect on student performance. Study participants who received either assessment aligned or reflective practice significantly outperformed participants who did not receive

Group	n	M	SD
No Practice	42	2.88 (29%)	1.50
Aligned	47	2.62 (26%)	1.40
Reflective	43	3.01 (30%)	1.56

Table 2. Pretest Performance by Practice Type

Group	n	Adjusted M	SD
No Practice	42	8.70 (35%)[a,b]	3.07
Aligned	47	12.61 (50%)[a]	3.20
Reflective	43	11.22 (45%)[b]	4.10

Table 3. Posttest Performance by Practice Type

practice. While not significant, participants who received assessment aligned practice performed better on the posttest than participants receiving a reflective practice activity.

The study results also indicated that, the inclusion of practice activities in here and now mobile learning have a positive effect on student attitude. Study participants who received assessment aligned practice reported significantly more positive attitudes than participants who did not receive practice. Participants who received assessment aligned practice also reported more positive attitudes than participants receiving a reflective practice activity; the difference was not significant.

The statistically significant findings of the study reinforce the importance of the role of practice in sound instructional design. The findings of this study further confirm the investigations of practice of numerous researchers including: Caverly, Ward and Caverly (2009); Kukulska-Hulme and Shield (2008); Martin and Klein (2008); and Martin, Klein, and Sullivan (2007).The findings are consistent with those of Martin and Klein (2008) who asserted that practice assists the confirmation of correct understanding and repetition of practice increases the likelihood of retention. The same researchers also found that practice has a significant positive effect on learning in a computer-based environment (Martin & Klein, 2008; Martin, Klein, & Sullivan, 2007).

Student Performance

Contemporary researchers and theorists

Elias (2011); Farmer et.al (2008); Knoernschild (2010); Kreutzer (2009); Nihalani and Mayrath (2010); Ryu and Parsons (2009); and Traxler (2010) indicate that, mobile learning has the potential to facilitate: (a) learning on demand, (b) multitasking and increased productivity, and (c) the translation of all environments into sites of learning. These assertions rely on the theoretical constructs, paint a picture of mobile learning that is based on ubiquity and socialization.

	Perceived Ease of Use		Attitude Toward Using		Perceived Usefulness	
Group	M	SD	M	SD	M	SD
No Practice	3.30[a]	1.08	3.42	1.14	3.27	.970
Aligned	3.98[a]	1.05	3.68	1.27	3.38	1.18
Reflective	3.82	.901	3.43	1.13	3.40	1.11

Table 4. Attitude by Practice Type

Those theories may lead to the deduction, that reflection-oriented activities are better suited to the highly contextual and social nature of mobile-based instruction (Quinn, 2012).Yet, there was no significant difference for performance between participants who completed reflective practice and participants who completed assessment aligned practice in this study.

Assessment aligned practice is a form of practice in which the format, modality, and objectives are same as the final assessment (Merrill, 2002).Merrill (2002) and Reiser and Dick (1996) also noted that, practice is effective, when it is aligned with the assessment, skills, knowledge, and dispositions defined by the objectives. As operationalized from this study, assessment aligned practice consisted of multiple choice, knowledge-based items. Moreover, Dewey defined reflective thought as an "active, persistent, and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and further conclusions to which it tends" (1933, p. 9). This form of practice commonly consists of a learning exercise in which students express their understanding of, response to, or analysis of an event, experience, or concept (Knowles, Tyler, Gilbourne, & Eubank, 2006). Theorists in the area of reflective practice suggest that, for it to be effective, it should be social, situated, relational, and experiential (Reynolds, 2011).

The results of the study suggest that, not only is the inclusion of practice an important consideration in the design of here and now instruction, but also the alignment to the outcome dispositions. Surprisingly, a method of eliciting performance that aligns with the modality of the learning rather than the form of the assessment ultimately may not be most appropriate and effective.

Student Attitude

The findings for attitude parallel the findings for achievement

Overall, the reported attitude was positive across treatment groups ($M = 3.53$ of 5). The majority of students expressed positivity towards the creativity, freedom, and interactivity of the mobile instructional activity. When asked, "What did you

like about the technology?" participants regularly reported the following comments such as,

- "I liked that it was interactive and it made learning fun;"
- "Easy to use, fun, easy to collaborate with fellow students;"
- "It kept my attention and engaged my brain more in learning the information."

Further, the findings for attitude are consistent with much of the mobile learning literature examining student perception. In studies of perceptions regarding mobile learning, participants generally report positive attitudes (Al-Fahad, 2009; Wang, Shen, Novak, & Pan, 2009). For example, Uzunboylu, Cavus, and Ercag (2009) surveyed both students and instructors and found that a majority of students liked using mobile devices. Instructors and students reported the seeing potential of mobile technologies for learning, and indicated that the use of discussion tools with mobile learning could be useful.

In this study, participants who received some form of practice reported more positive attitudes towards here and now mobile learning than participants who did not receive any form of practice. Participants who received assessment aligned practice reported significantly more positive attitudes than participants who did not receive practice. Examination of student responses to open-ended survey items suggest that, this result may be due to the student's perceived level of success on the post-test. Participants were not made aware of their post-test score; however, the attitude instrument was administered immediately following the post-test.

A pattern emerged in the attitude data that may inform conclusions about both attitude and performance. When asked about how to improve the learning activity, students in the no practice condition reported comments such as,

- "Include a way to go back to the information;"
- "Have fewer paintings to remember;"
- "If there was a way to help remember the information better since all of the terms, names, and information was hard to remember."

Participants in the reflective practice condition reported comments such as,

- "More time to study it before the test;"
- "More time for students to participate;"
- "More time allowed."

This pattern of responses indicates that, participants in the no practice condition may have felt unprepared for the posttest, and appear to have suggested that, the inclusion of some form of practice or review would have assisted their performance and improved their attitude towards the instruction. The emphasis on desiring additional time among participants in the reflective practice condition may reinforce the metacognitive nature of reflective practice, and that additional time for reflection would have assisted their performance and improved their attitude towards the instruction.

The last comment noted above was unexpected because no time constraints were placed on the activity. Participants in the reflective practice condition did spend more time in the instructional activity than participants in the no practice and aligned practice conditions. However, the mean time spent was only 18 seconds greater for reflective condition participants (M = 19:49, SD = 6:30, max = 29:42) than aligned practice participants (M = 19:31, SD = 3:50, max = 24:37).Participants in the no practice condition spent a mean time of 14:20 (SD = 3:45, max = 20:11).It should also be noted that, the standard deviation for the reflective condition is considerably larger.

Implications

There are a number of promising implications for the design of here and now mobile-based instruction that stem from the study results. The significance found for the inclusion of practice in the design of mobile learning environments implies that, the time-honored elements of systematic instructional design remain relevant even in contemporary learning environments. The study findings suggest that students may benefit from the inclusion of practice activities and those activities can be delivered to the student via the mobile medium.

A method of eliciting performance that aligns with the modality of the learning, rather than the form of the assessment ultimately may not be most appropriate and effective. The significance of including practice was found

for both performance and attitude, implying that the inclusion of practice leads to a sense of readiness and ultimately influences the affective domain.

Further supporting this implication are the open-ended responses of students in the reflective practice condition to the question, "How could the mobile learning activity be improved?"Many participants commented on the lack of reinforcement of facts, with one student stating the activity needed "more multiple choice questions," and another suggesting, "use practice questions that are more similar to the test."Based on those findings, the researcher contends the intended outcome dispositions of the study; but, the effect of the practice types may have been different. Those findings support the benefit to students of the principles of systematic instructional design in the development of mobile learning, and perhaps other here and now mobile learning environments.

Recommendations for Future Research

Recommendations for future research stemming from the current study are derived from both the study findings and the technological capabilities of the mobile platform. The implication from the practice type found that, alignment of assessment modality with desired outcome dispositions is a preferable method of eliciting performance to alignment with the learning modality, even in novel environments, is worthy of further consideration. As the study has shown a significant effect for practice type in the mobile learning environment, future studies of this nature could be similar in construction to the current study, but utilize a variety of assessment types. The transition of the assessment itself to the mobile environment would be also a factor of interest, that could further inform the design of instruction for mobile learning environments.

Second, the ubiquitous nature of mobile devices invites the opportunity to examine the factors of practice among many others in less restrictive environments. The current study was limited in scope in the sense, that the learning application was static in nature. It is recommended that, future research push further into pedagogically rich learning applications such as instruction utilizing the location awareness capabilities of mobile devices, content sharing, or the use of collaborative learning activities in the mobile environment.

Conclusions

As mobile instruction proliferates, it becomes increasingly more important to determine the impact of ubiquity afforded by the platform which will have on current models of instructional design. As researchers attest (Elias, 2011; Farmer, 2008; Knoernschild, 2010; Kreutzer, 2009; Nihalani & Mayrath, 2010; Traxler, 2010), mobile learning has the potential to facilitate (a) learning on demand, (b) multitasking and increased productivity, and (c) the translation of all environments into sites of learning (Ryu & Parsons, 2009).Mobile learning offers the possibility of situated learning (Dede, 2011; Quinn, 2012) and supports authentic tasks in both formal and informal learning (Mann & Reimann, 2007; Shih, Chu, & Hwang, 2009; Uzunboylu, Cavus, & Ercag, 2009). However, this cannot be accomplished without a more complete understanding of the optimal design of instruction for mobile learning environments and the affective factors influencing the mobile learning. The findings for practice implicate the possibility even in such a dynamic and robust environment as mobile, practice activities may be more effective when aligned with the modality of the assessment than with the learning modality.

References

[1]. Al-Fahad, F. (2009). Student's attitudes and perceptions towards the effectiveness of mobile learning in King Saud University, Saudi Arabia. *The Turkish Online Journal of Educational Technology, 8*(2).

[2]. Anderson, T. (2009). Toward a theory of online learning.In T. Anderson, *Theory and Practice of Online Learning.* Athabasca, AB: Athabasca University Press.

[3]. Arrigo, M. & Ciprì, G. (2010). Mobile learning for all.*Journal of the Research Center for Educational Technology*, 6(1), pp. 94 - 102

[4]. Brown, J. S., Collins, A., & Duguid, S. (1989). Situated cognition and the culture of learning, *Educational Researcher*, Vol.18, pp.32-42.

[5]. Caverly, D., Ward, A., & Caverly, M. (2009). Techtalk: mobile learning and access. *Journal of Developmental Education*, *33*(1), pp.38-39.

[6]. Cavus, N., & Ibrahim, D. (2009). Mobile learning: An experiment in using SMS to support learning new English language words. *British Journal of Educational Technology*, *40*(1), pp.78-91.

[7]. Ching, D., Shuler, C., Lewis, A., & Levine, M. (2009). Harnessing the potential of mobile technologies for children and learning. In *mobile technology for children: designing for interaction and learning* (2). doi: 10.1016/B978-0-12-374900-0.00002-8

[8]. Dede, C. (2011). Emerging technologies, ubiquitous learning, and educational transformation.In *Towards Ubiquitous Learning* (*Kloos, Gillet, Crespo, Wild, WolpersEds*). Heidelberg, Springer. doi: 10.1007/978-3-642-23985-4_1

[9]. Dewey, J. (1933). *How We Think. A restatement of the relation of reflective thinking to the educative process* (Revised edn.), Boston: D. C. Heath.

[10]. Disabato, J. (2011). Reflective Practice.*Journal for Specialists in Pediatric Nursing*, *16*(2), pp.89-89.

[11]. Elias, T. (2011). Universal instructional design principles for mobile learning.*International Review of Research in Open and Distance Learning*, *12*(2), pp.143-156.

[12]. Farmer, B., Yue, A., & Brooks, C. (2008). Using blogging for higher order learning in large cohort university teaching: A case study.*Australasian Journal of Educational Technology*, *24*(2), pp.123-136.

[13]. Gagné, R. M., Wager, W. W., Golas, K. C., and Keller, J. M. (2005). *Principles of Instructional Design.* Belmont, CA.: Wadsworth/ Thomson Learning.

[14]. Gikas, J. (2011). Understanding change: Implementing mobile computing devices in higher education. (Doctoral dissertation). Retrieved from ProQuest. (3485889)

[15]. Jonassen, D.,H. (1991). Evaluating constructivistic learning. *Educational Technology*, 31, pp.28-33.

[16]. Knoernschild, K. (2010). Market Profile: Rich Mobile Application Platforms for the Smartphone 2010. *Burton Group, Application Platform Strategies In-Depth Research Market Profile*, pp.1-25.

[17]. Knowles, M. S. (1984). *Andragogy In Action: Applying Modern Principles Of Adult Learning* (The Jossey-Bass Higher Education Series)

[18]. Knowles, Z., Tyler, G., Gilbourne, D., & Eubank, M. (2006). Reflecting on reflection: Exploring the practice of sports coaching graduates. *Reflective Practices, 7*(2), pp.163-179.

[19]. Kolb, D. A. (1981). Learning styles and disciplinary differences. *The modern American college*, pp.232-255.

[20]. Kreutzer, T. (2009). *Generation mobile: Online and digital media usage on mobile phones among low-income urban youth in South Africa*. Retrieved from http://tinokreutzer.org/mobile/MobileOnlineMedia-Survey Results-2008.pdf.

[21]. Kukulska-Hulme, A., & Shield, L. (2008). An overview of mobile assisted language learning: From content delivery to supported collaboration and interaction, *ReCALL*, 20(3), pp. 271-289. doi: 10.1017/S0958344008000335

[22]. Lave, J. (1988). *Cognition in practice: Mind, mathematics, and culture in everyday life.* Cambridge, UK: Cambridge University Press.

[23]. Mann, S., & Reimann, P. (2007). Mobile technology as a mediating tool for learning in the convergences from technology, collaboration and curriculum perspectives. In *6th International conference of Mobile Learning, MLearn 2007*.

[24]. Martin, F., & Ertzberger, J. (2013). Here and now mobile learning: An experimental study on the use of mobile technology, Computers & Education, Vol.68, pp.76-85

[25]. Martin, F., & Klein, J. (2008). Effects of objectives, practice, and review in multimedia instruction. *Journal of Educational Multimedia and Hypermedia*, 17(2) pp. 171-189.

[26]. Martin, F, Klein, J. D. & Sullivan, H. (2007). The impact of instructional elements in computer-based instruction. *British Journal of Educational Technology*, 38(4), pp. 623 - 636

[27]. Merrill, M. D. (2002). First principles of instruction. *Educational Technology Research and Development, 50*(3), pp.43-59.

[28]. Miller, G. A. & Chapman, J. P. (2001). Misunderstanding analysis of covariance. *Journal of*

Abnormal Psychology, 110(1), pp.40-48. Doi: 10.1037//0021-843x.110.1.40

[29]. Nihalani, P. K., & Mayrath, M. C. (2010). Statistics I. Findings from using an iPhone app in a higher education course.*White Paper*.

[30]. Pollara, P., & Broussard, K. K. (2011). Student perceptions of mobile learning: A review of current research. In Proceedings of Society for Information Technology & Teacher Education International Conference 2011 (pp. 1643-1650). Chesapeake, VA: AACE.

[31]. Quinn, C. (2000). mLearning: Mobile, Wireless, In-Your-Pocket Learning.LineZine: Learning in the New Economy e-magazine.

[32]. Quinn, C., N. (2012). Mobile learning: The time is now. The eLearning Guild. Santa Rosa, CA.

[33]. Reiser, R. A. (2007). What field did you say you were in? *Trends and issues in instructional design and technology*, 2-9.

[34]. Reiser, R.A., & Dick, W. (1996). *Instructional planning: A guide for teachers* (2nd ed.). Boston , Massachusetts : Allyn & Bacon.

[35]. Reynolds, M. (2011). Reflective practice: Origins and interpretations. *Action Learning: Research and Practice*, *8*(1), pp.5-13.

[36]. Ryu, H., & Parsons, D. (2012). Risky business or sharing the load? – Social flow in collaborative mobile learning. *Computers & Education, 58*(2), pp. 707-720

[37]. Shih, J. L., Chu, H. C., & Hwang, G. J. (2011). An investigation of attitudes of students and teachers about participating in a context-aware ubiquitous learning activity. *British Journal of Educational Technology*, *42*(3), pp.373-394.

[38]. Solvberg, A., M. &Rismark, M. (2012). Learning spaces in mobile learning environments.*Active Learning in Higher Education,* 13(1) pp. 23-33. doi: 10.1177/1469787411429189

[39]. Traxler, J. (2009). Learning in a mobile age. *International Journal of Mobile and Blended Learning (IJMBL)*, *1*(1), pp.1-12.

[40]. Traxler,J. (2010). Distance education and mobile learning: Catching up, taking stock. *Distance Education*, *31*(2), pp.129-138. doi: 2136676921

[41]. Uzunboylu, H., Cavus, E. E., & Ercag, F. (2009). Using mobile learning to increase environmental awareness. *Computers & Education*, *52*(2), pp.381-389

[42]. Venkatesh, V., & Davis, F. D. (1996). A model of the antecedents of perceived ease of use: Development and test. *Decision Sciences, 27*(3), pp.451-468.

[43]. Wang, M., Shen, R., Novak, D., & Pan, X. (2009). The impact of mobile learning on students' learning behaviours and performance: Report from a large blended classroom. *British Journal Of Educational Technology*, *40*(4), pp.673-695. doi:10.1111/j.1467-8535.2008.00846.x