



# Here and now mobile learning: An experimental study on the use of mobile technology



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## ABSTRACT

Mobile technology opens the door for a new kind of learning called *here and now learning* that occurs when 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 here and now mobile learning on student achievement and attitude. The research questions addressed were (1) Does “Here and Now” mobile learning significantly improve student achievement when compared with Computer based Instruction? (2) Does “Here and Now” mobile learning significantly improve student attitude when compared with Computer based Instruction? (3) Are there differences in student achievement and attitudes when “Here and Now” mobile learning is delivered using a tablet versus ipod? 109 undergraduate students enrolled in preservice instructional design and instructional technology courses at a regional southeastern university participated in the study. Participants took a pretest at the beginning of the study, and then were assigned to one of the versions of an art lesson (CBI version and iPad/iPod version) which were developed using Lectora Inspire incorporating information on five different paintings in the education building. After the lesson, they completed the posttest and an attitude survey. ANOVA was conducted on data obtained from the achievement posttest and on the attitude survey results for the Likert type items (Items 1–12). Analyses on achievement and attitude data revealed positive significant differences. The CBI treatment achieved positive posttest scores on the posttest while the iPad/iPod treatments had positive attitudes. This study has implications for those designing and implementing mobile learning.

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## 1. Introduction

The proliferation of mobile technology provides a myriad of opportunities to support learning and performance both inside and outside the classroom. With mobile technology, the learning environment can go with the student to the field site, to the laboratory and beyond. There is an opportunity to leverage mobile technology to better support students not only in the classroom, but also as students navigate to the context of their learning. Mobile technology opens the door for a new kind of learning and performance support in the field, providing anytime and anywhere access to information, processes, and communication. While mobile devices are increasingly being used for learning in the classroom (Lacina, 2008; Meurant, 2010; Sheppard, 2011), there is still a need for research on mobile devices used in the context of their learning which could be outside the classroom. This study explores how mobile devices were used to learn art content situated in the context of the learning which was while viewing the art in the education building.

### 1.1. Here and now learning

Elearning was transformed by the internet and now it is being redefined by the power of mobile wireless technologies (McGreal, 2009). There were 6 billion mobile subscriptions globally by the end of 2011 and in developing countries a majority of people access the Internet from their mobile devices (International Telecommunication Union, 2012). Canals (2012) reported that smartphones numbers overtook

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client PCs in 2011. This has provided educators an opportunity to deliver meaningful learning via the mobile device. Quinn (2000) defined Mlearning as “the intersection of mobile computing and e-learning and includes anytime, anywhere resources; strong search capabilities, rich interaction, powerful support for effective learning, and performance-based assessment”. Stevens and Kitchenham (2011) described Mlearning as “meaningful learning that occurs through the use of wireless handheld devices such as cell phone, personal digital assistant, mini-computer, or iPod”. In this study, the mobile devices used were iPads, iPod touches and smartphones, and the study focuses on the specific aspect of mobile learning termed “*here and now mobile learning*”.

The concept of here and now learning is a decade old and has widely been researched as situated learning (Lave & Wenger, 1991). However, mobile devices have added a new dimension and capabilities to situated learning. Some of the mobile functionalities that help in situated learning include (1) geospatial technologies (GIS data, GPS chips, RFID chips, Bluetooth, 2D and 3D bar codes, sensors, and NFC/near-field communication (radio frequency technologies)); (2) mobile search (visual search), (3) use of camera for image capture (4) social networking (Greer, 2009). Enrichment of context-aware technologies has enabled students to learn in an environment that integrates learning resources from both the real world and the digital world (Chen & Huang, 2012).

Situated learning requires knowledge to be presented in authentic contexts. This is based on the concept of situated cognition, which explains that knowledge cannot be known and fully understood independent of its context (David, Chalon, Champalle, Massarey & Yin, 2007). Lave (1988) explained that most learning occurs naturally through activities, contexts, and cultures. He added that schools too often abstract learning, “unsituate” it, and teach concepts removed from natural contexts and applications. With the ability to access information, and produce information from their own observations easily with these new mobile technologies, teachers can assign their students out of class location based activities in ways not before possible.

Greer (2009) defined location-based learning as “a type of knowledge transfer based on location-based intelligence enabled by wirelessly networked interfaces and sensors adapting to the presence of the user at a specific location”. Though definitions on location-based learning and context-based learning are available, there is no clear definition of *here and now mobile learning*. For the purpose of this study, here and now mobile learning is defined as

learning that occurs when learners have access to information anytime and anywhere via mobile technologies to perform authentic activities in the context of their learning.

Here and now mobile learning gives students the opportunity to be in the context of their learning and have access to information that is related to what they are seeing and experiencing at the moment.

## 1.2. Here and now mobile learning framework

In order to represent the effect here and now mobile learning has on the learning environment; a three characteristic framework was created. In the following sections, we review the characteristics of the above framework applied to this study (Fig. 1).

## 1.3. Engaging students in the context

Here and now learning has the ability to engage learners because of its authentic learning and context based applications. Traditional work on engagement in education refers to specific procedures, strategies, and skills that instructors should implement in order to obtain the engagement of students (McMahon & Portelli, 2004). It has been argued that in today’s current culture of video games and interactive entertainment, students have come to expect a high level of engagement during their learning activities. Prensky (2001) argues that, “It is now clear that as a result of this ubiquitous environment and the sheer volume of their interaction with it, today’s students think and process information fundamentally differently from their predecessors.” (p. 1). Most instructional design theorists agree that engagement is a necessity. In a look at most instructional design models, all contain some component of getting the learner’s attention. Robert Gagne’s nine events of instruction begin with gaining the learner’s attention (Gagne, 2005). Reiser and Dick suggest that motivation be the first thing considered in a unit of instruction (Reiser & Dick, 1996). John Keller’s popular ARCS’ model of motivation begins with getting the attention of your learners (Gagne, 2005, p. 115). Researcher Robert Marzano pointed out how corrective, timely feedback can be one of the best strategies an instructor can use (Marzano, Pickering, & Pollock, 2001, p. 96).

Here and now learning provides this engagement in new and powerful ways. Initial research has shown that mobile game-based learning can engage students and through that engagement provide more knowledge over pupils who received regular project based instruction (Huizenga, Admiraal, Akkerman, Dam, 2009). Mobile learning allows consistent involvement with other professionals, regardless of their

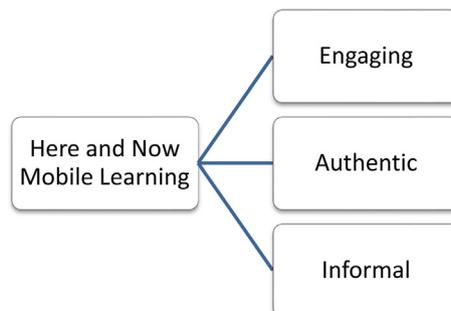


Fig. 1. Here and now learning characteristics.

geographical, cultural, or socio-political isolation (Beckmann, 2010). This involvement increases engagement, and leads into authentic activities by participants.

#### 1.4. Authentic activities

The basis of here and now framework is that knowledge should be situated within the context of authentic tasks because learning can be influenced in fundamental ways by the context in which it takes place (Bransford, 2000). Authentic activities are the only way learners can gain access to the type of environment that enables practitioners to act meaningfully and purposefully (Brown & Duguid, 2002). “Integrating content and process together with the design of learning activities offer the opportunity to increase students’ experience with authentic activities although achieving deeper content understanding” (Soa & Konga, 2010). A mobile-based learning environment, by virtue of its portability, will provide scaffolding WHEN and WHERE students need it—whether in the classroom or investigating in the field. Mobile technology can sustain the learning environment regardless of where the student or the investigations are situated.

New mobile devices make authentic activities easier than ever to produce. Mobile devices are available to be used in any context, and can draw on those contexts to enhance the learning experience. Mobile devices can support learners by allowing the learners to maintain their attention to the context and by offering appropriate assistance when required. Here and now learning supports both access and production of information, since learners have a key opportunity to create content as well as receive it. Students can make notes of their perceptions, document observations from the environment, record local sounds, and develop their own location-based projects to share with others (NMC, 2009). Students doing fieldwork can acquire variety of information from the location they are visiting and reinforce the connection between the accessed information (theoretical knowledge) to the environment (situated knowledge). Klopfer, Squire and Jenkin (2008) recommend that to utilize the mobile device to its full potential, one has to tap into the context sensitivity characteristics of mobile devices. These authentic learning activities also include many forms of informal learning.

#### 1.5. Informal learning

Informal learning refers to learning that takes place naturally and without directed effort. Frank Smith calls this type of learning Classical Learning, and defines it as learning from people around us with whom we identify. Smith also states that this learning occurs even without one knowing that they are learning (Smith, 1998). This informal or classical view of learning believes that learning happens by being in the world, not as a way of coming to know about it (Lave & Wenger, 1991). “Rather than learning by replicating the performances of others or by acquiring knowledge transmitted in instruction, we suggest that learning occurs through centripetal participation in the learning curriculum of the ambient community” (Lave & Wenger, 1991). Because of mobile technologies ability to work within the specific context and environment of the learning, it has the ability to increase the ease of informal learning.

While research on the effectiveness of informal learning using here and now technologies is just beginning, many studies have shown that here and now learning can be an effective instructional strategy. In here and now learning research studies, students have shown significantly improved post-test scores (Chen & Huang, 2012), improved learning outcomes (Wu, Hwang, Su, & Huang, 2012), and significant positive results in terms of the students’ learning in studies of here and now learning (Ju-Ling, Chien-Wen, & Gwo-Jen, 2010). While these studies have shown the ability of here and now learning to be effective in transferring informal learning, there is a need for more research on here and now learning effects on student achievement, engagement, and attitude toward learning.

#### 1.6. Ubiquitous learning

Ubiquitous learning is described as context sensitive anyhow, anytime anywhere learning using ubiquitous devices. Chen, Chang & Wang (2008) refer to the term “ubiquitous learning environment” as a setting that allows learning with various mobile devices such as PDA’s, WebPads, Tablet PCs, laptops in indoor, outdoor, individual and group situations. Schroeder and Haskell (2011) describe ulearning as social media plus mobile learning. Huang, Po-Sheng, Liu and Tzung-Shi (2011) developed a list of ulearning characteristics. Some of these characteristics are applicable to here and now learning.

- Urgency of learning need (on demand and just in time)
- Initiative of knowledge acquisition (providing information to learners timely request)
- Situation of instructional activity (learning embedded into the flow of everyday activities)
- Context awareness (interaction controlled by context (user location, time, activity etc)
- Self-regulated learning (learners actively control their learning process)

In this study, these five characteristics of ubiquitous learning were implemented. However, ubiquitous learning has other characteristics such as interaction, personalization, adaptive learning, and learning community. These characteristics were not used in this here and now learning study. However, it can be aspects that can be included in future studies. Based on Schroeder and Haskell’s (2011) description social media is critical in ubiquitous learning. However, it is not as critical to the definition of here and now mobile learning as described in this study. This brings us to the conclusion that here and now learning is a subset of ubiquitous learning where learners learn anytime at anyplace situated in the context of their learning using a mobile device. Many relevant research studies have been done on Here and Now Learning. Many of these are featured in the next section.

#### 1.7. Relevant research studies on here and now learning

Chen and Huang (2012) proposed a context-aware ubiquitous learning system (CAULS) based on radio-frequency identification (RFID), wireless network, embedded handheld device, and database technologies to detect and examine real-world learning behaviors of students.

Their results demonstrated that the CAULS learning system enhanced their learning intention and the posttest survey result revealed that most students' testing scores improved significantly.

Yang, Hwang and Chu (2008) developed a series of learning activities of a butterfly ecology unit of the natural science course for K-4 students and conducted the lesson in the learning environment where students were guided to observe real-world objects with personalized supports from the system. Preliminary experimental results revealed the effectiveness of the novel approach.

Wu et al. (2012) developed a context-aware mobile learning system that was used as a sensing device for nursing training courses. The learning system guided the individual students to perform each operation of the physical assessment procedure on dummy patients, and also provided instant feedback and supplementary materials to them if the operations or the operating sequence was incorrect. Students' learning outcomes were notably improved by utilizing the mobile learning system for nursing training.

Hung, Lin and Hwang (2010) developed e-library activity worksheets that helped the students focus their outdoor ecology observation tasks. The e-library provided reliable resources to clarify their observed descriptions, while the automatic scoring and feedback systems were helpful in sustaining the students' persistent effort. Most students demonstrated substantial improvements in their observation skills, and extended their inquiry abilities.

Shih, Chuang and Hwang (2010) carried out a study with fifth grade students at the Peace Temple of southern Tainan with the inquiry-based mobile learning system. They used pre- and post-questionnaires along with observations and focus group interviews. The study showed significant positive results for students' learning.

Reynolds, Walker, & Speight (2010) developed and evaluated web-based museum trails for university-level design students to access handheld devices in the Victoria and Albert Museum (V&A) in London. The trails were used in multiple ways to explore the museum environment and collections. Student feedback showed the trails enhanced students' knowledge, interest and closeness to the objects.

Sharples, Lonsdale, Meek, Rudman, and Vavoula (2007) conducted an evaluation of MyArtSpace which is a combined mobile phone and web-based service to support learning between schools and museums. The study showed that MyArtSpace had a positive impact on school museum visits, and identified areas for improvement in the technical and educational aspects of the service.

### 1.8. Purpose of the study

The purpose of this study was to investigate the effects of here and now mobile learning on student achievement and attitude. Specifically, the researchers wanted to investigate if here and now mobile learning improved student achievement and attitude when compared with computer based instruction, and if there were differences for here and now mobile learning delivered via a tablet versus a smartphone or iPod?

### 1.9. Research questions

1. Does "Here and Now" mobile learning significantly improve student achievement when compared with Computer based Instruction?
2. Does "Here and Now" mobile learning significantly improve student attitude when compared with Computer based Instruction?
3. Are there differences in student achievement and attitudes when "Here and Now" mobile learning is delivered using a tablet versus iPod?

## 2. Method

### 2.1. Participants

Participants were 109 undergraduate students enrolled in preservice instructional design and instructional technology courses at a regional southeastern university. Students participated in this study as part of the course requirement. 87% of the participants were female, and 13% were male. 75% of the participants were in the 18–22 age range. 65% of the participants were juniors and 31% were sophomores.

A question was asked if the participants owned a mobile device and how they used mobile devices. Figs. 2 and 3 below provides the percentage on the different mobile devices the participants had and how they used the devices.

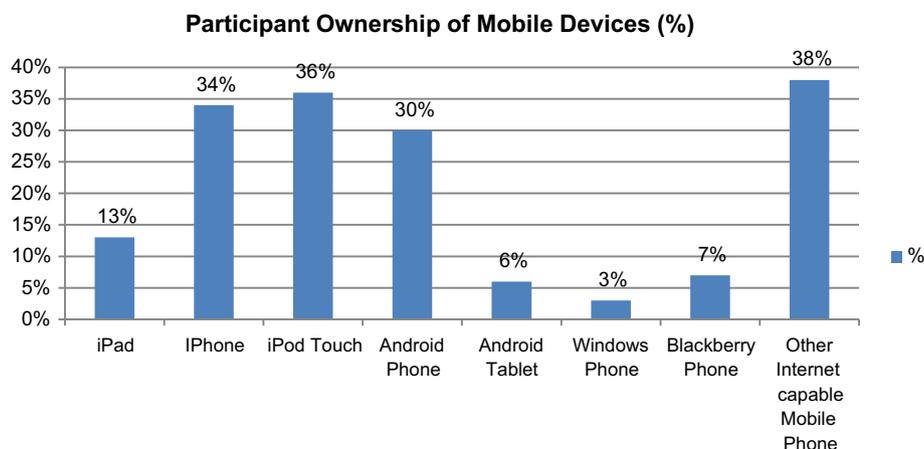


Fig. 2. Participant ownership of mobile devices.

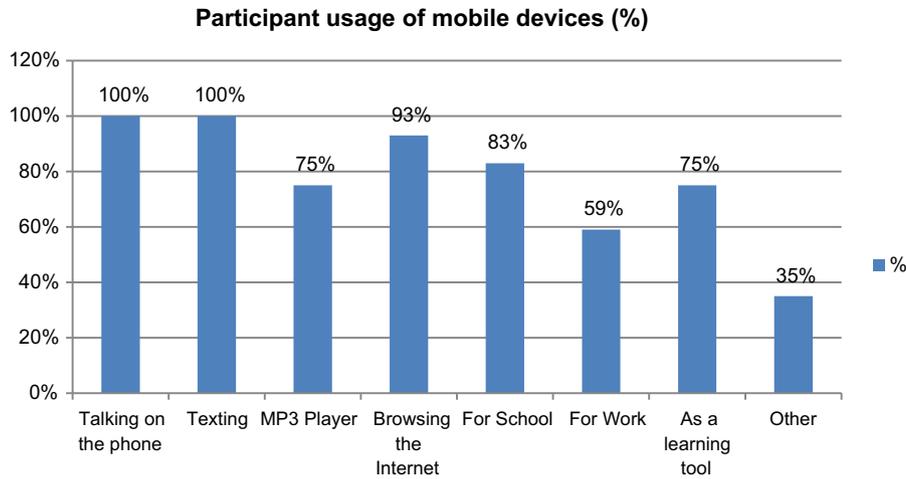


Fig. 3. Participant usage of mobile devices.

## 2.2. Materials

Two versions of an art lesson (CBI version and iPad/iPod version) were developed using Lectora Inspire and the various versions incorporated information on five different paintings. The five paintings chosen were: Head of a Women, On the Back of Looking in, Two by Two, The Gathering, and King Hall Window. For each painting, information about the artist, the artwork, the medium, and style were provided. The content used in this study was not part of the required content for the course but students received extra credit for participating in this study.

The iPad and iPod version used the same instructional material, except that the iPad version the material was zoomed out and easier to read when accessed on the tablet (Figs. 4 and 5).

## 2.3. Procedures

Eight sections of students ( $n = 109$ ) enrolled in the instructional design/instructional technology course were blocked by classes and randomly assigned to the three treatment groups.

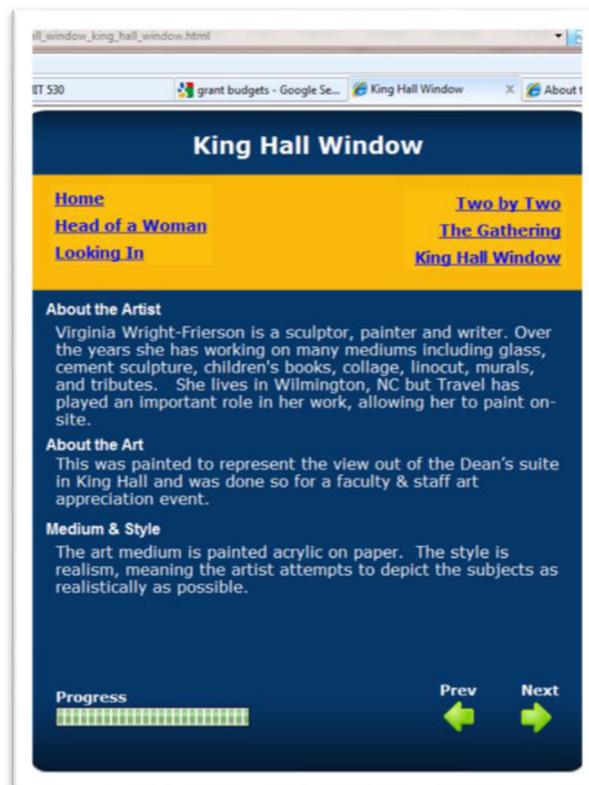


Fig. 4. Computer based screenshot.

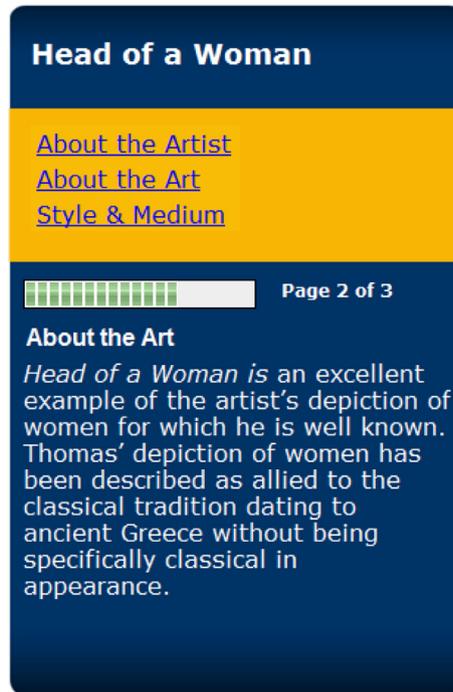


Fig. 5. iPad/iPod screenshot.

To avoid the variation in treatments within the class, the students were assigned to the treatments by class and not by individual. The classes were randomly assigned to one of the three treatments (iPods, iPads and computer based instruction). It was a quasi-experimental study due to this nature of assignment to the treatments. This was one of the limitations to the study but helped to avoid differences in content, attitude or time spent on the program between the students enrolled in the same class.

The pretest, which took approximately 10 min to complete, was administered first. The participants were then directed to the instructional material for their particular treatment. All three treatments were given a map with the location of the five different paintings marked.

The students in the computer based treatment went and viewed the painting and came back to the classroom to read about the paintings following which they completed the posttest and attitude survey. The iPad/iPod treatments were given a map, and were also checked out an iPad and iPod depending on which treatment they were part of. The devices had QR Readers installed. Directions were given to them on how to scan the QR codes when they were at the painting and read information about the painting. The participants in these two treatments read information about the paintings while they are in front of the painting, and then came back to the classroom to complete the posttest and the attitude survey (Figs. 6 and 7).



Fig. 6. Students reading about the painting in the iPod treatment.



Fig. 7. Study procedure.

The entire intervention time lasted about 30–40 min. Here is a graphical representation of the procedure.

#### 2.4. Criterion measures

The criterion measures consisted of a posttest and a student attitude survey. In addition, a pretest was used to assess subjects' knowledge of the content prior to the instruction.

*Pretest.* The pretest consisted of 10 multiple-choice questions covering the content with four response choice questions. A sample question that appeared on both the pretest and posttest is shown below.

*In the painting "Two by Two" the artist*

- a. Expresses contemporary pain and anxiety in an original technique
- b. Sums up the characteristics of his model subject without relying copying natural forms in exact detail
- c. Depicts subjects as realistically as possible
- d. Blurs the lines between drawings and paintings

The overall mean score on the pretest was 2.61 or 26%, indicating that participants were not very knowledgeable about the content prior to instruction.

*Posttest.* The posttest consisted of the same 10 multiple-choice questions that were on the pretest. The reliability of the posttest was .71. This was another limitation of the study, as the students were exposed to the items on the pretest and this could have influenced their response to the posttest.

*Attitude Survey.* The attitude survey assessed student attitudes toward their learning experience. The survey included 12 Likert-type questions that were rated strongly agree (scored as 4) to strongly disagree (scored as 0). The survey also included two open-ended questions that asked the participants what they liked best and least about the program. The survey was administered after the lesson and the posttest were completed. The reliability of the attitude survey was .88.

#### 2.5. Data analysis

A  $2 \times 2$  analysis of variance (ANOVA) test was conducted on data obtained from the achievement posttest.  $2 \times 2$  ANOVA was also conducted on the attitude survey results for the Likert type items (Items 1–12). Post-hoc Tukey tests were conducted to identify significant differences between the treatments. All analyses revealed positive significant differences.

### 3. Results

#### 3.1. Achievement

The first research question investigated the effects of here and now mobile learning on student achievement. Table 1 shows the mean scores and standard deviations for achievement on the pretest and posttest by treatment. The average pretest score was 2.61 and posttest score was 5.01. The CBI treatment scored the highest both on the pretest ( $M = 2.83$ ) and the posttest ( $M = 5.83$ ).

A  $2 \times 2$  ANOVA conducted on the pretest data revealed no significant difference for student achievement.  $2 \times 2$  ANOVA conducted between the treatment groups on the posttest revealed a significant difference,  $F(2,106) = 5.023$   $p = 0.008^*$ . Thus, there was a significant difference between the three treatments (Computer based instruction, iPad and iPod).

Follow up Tukey tests revealed significant difference between CBI and iPad ( $p = 0.009$ ) and no significant difference between CBI and iPod ( $p = 0.051$ ).

#### 3.2. Attitude

The next research question dealt with the effects of here and now mobile learning on student attitude. Table 2 shows means for responses to the 12 Likert-type items on the attitude survey. The items were rated on a 4 point Likert scale from strongly agree ( $N = 4$ ) to strongly disagree ( $N = 1$ ).

On comparing overall means, the iPad group had the highest attitudes ( $M = 3.78$ ), whereas the CBI treatment had the lowest ( $M = 3.41$ ).

**Table 1**  
Student achievement.

	Pretest $M$ (SD)	Posttest $M$ (SD)
CBI ( $n = 36$ )	2.83 (1.48)	5.83 (2.05)
iPad ( $n = 35$ )	2.43 (1.36)	4.74 (1.72)
iPod ( $n = 38$ )	2.58 (1.44)	4.47 (2.02)

**Table 2**  
Student attitude.

		CBI	iPad	iPod
1	Clear instructions were provided on how to access the content	3.74	3.87	3.83
2*	The content was presented in a easy to understand manner	3.52	3.91	3.81
3*	The length of the content was appropriate	3.48	3.87	3.61
4*	The learning content maintained my interest	3.00	3.53	3.22
5*	The learning content provided precise information	3.39	3.81	3.69
6	I was able to quickly access the learning content	3.56	3.82	3.79
7	Text was legible without zooming	3.71	3.90	3.86
8	I did not have to scroll up and down or left and right to view content	3.35	3.59	3.58
9	The clickable navigation was helpful	3.68	3.78	3.69
10*	I enjoyed learning using the mobile device	3.00	3.81	3.69
11*	I view this type of mobile learning as effective	3.19	3.78	3.64
12*	I would be interested to learn using this method in the future	3.29	3.69	3.58
		3.41	3.78	3.65

\* signifies significant items at  $p < .05$ .**Table 3**  
Significant items for student attitude by treatment.

	Significant items	CBI and iPod	CBI and iPad	iPod and iPad
2	The content was presented in a easy to understand manner	*	*	
3	The length of the content was appropriate		*	
4	The learning content maintained my interest		*	
5	The learning content provided precise information	*	*	
10	I enjoyed learning using the technology	*	*	
11	I view this type of learning as effective	*	*	
12	I would be interested to learn using this method in the future	*		

\* signifies significant items at  $p < .05$ .**Table 4**  
Open ended attitude items.

Treatments	What did you like the most?	What did you like the least?
CBI	Seeing the paintings (19 students)	It was not a subject that I was interested in. (5 students)
iPad	I liked using the iPad and scanning to learn about the artwork (17 students)	Too much information to know in that short of period of time. (5 students)
iPod	Looking at all the paintings (4 students) I thought it was really cool how to scan and use a QR code (12 students) It got the students out of the classroom and being active in their learning (5 students)	There was nothing I didn't really like (11 students) The information was rather dry (4 students)

2 × 2 ANOVA conducted on the attitude data indicated significant differences for 7 out of the 12 items. Post hoc Tukey tests were conducted to check for these significant differences between the treatments. There were no significant differences on the items when comparing iPod and iPad, whereas five of the seven items had significant differences when comparing CBI and iPod, and six of the seven items had significant differences comparing CBI and iPad (Tables 3 and 4).

The attitude survey also included two open-ended questions that asked the participants what they liked the best and least about the program.

#### 4. Discussion

This study examined the effects of here and now mobile learning on achievement and attitude. Undergraduate students enrolled in an instructional design/technology course used versions of mobile lesson (iPad and iPod) and computer based lesson to learn about art content. The computer based treatment came back to the classroom to read about the art content after seeing the paintings, whereas the iPad and iPod treatment were given access to the content while they were seeing the painting. Results indicated that there was a positive significant difference between the computers based treatment group and the iPad/iPod group both for achievement and attitude.

##### 4.1. Achievement

The researchers had anticipated the iPad/iPod groups to outperform the CBI treatment. Surprisingly, the CBI treatment scored higher than the iPad and iPod treatments. There have not been many research studies done comparing computer based instruction with mobile technology treatments. Previous research (Clark, 1983) has revealed that although significant differences in final exam scores were found in several cases, closer examination revealed that most of the large effect sizes of computer-based studies were due to poorly designed studies and other confounding factors (Clark, 1983). In this case, the comparison is not just with the technology but with the here and now concept of learning to see if situating the learner in the context of their learning makes a difference.

The iPad and iPod users were engaged and excited about the technology but did not score as high as the CBI treatment. From observations and attitude data, it was noted that the CBI users who scored the highest were less distracted compared to the iPad/iPod users. Novelty of the device could have added to lower scoring on the posttest for iPad/iPod. [Norwood \(2012\)](#) mentions that “increasing presence of iPods, cell phones, laptops and iPads in the classroom sometimes distracts students from paying attention to their lessons, hurting their ability to retain any of the information that is being taught”.

The iPad/iPod treatments were processing both visual and verbal information at the same time whereas the computer based treatment students were processing the visual information first, and then the verbal information. According to the dual coding theory ([Paivio, 1971](#)) multiple channel representation should benefit the learner, but it is unclear if it overloaded the learner in this instance ([Sternberg, 2006](#)) when compared with the computer-based learners where they were given the visual representation first, and then the verbal representation. The achievement results of this study also goes against [Mayer's \(2009\)](#) temporal and spatial contiguity principle. Temporal contiguity principle states that “students learn better when corresponding words and pictures are presented near rather than far from each other on the page or screen”, and spatial contiguity principle states “students learn better when corresponding words and pictures are presented simultaneously rather than successively.” Though the content was not presented on the same screen, the mobile learners were able to see it at the same time, compared to the computer-based learners who were not able to see it at the same time.

Also, because the iPad and iPod treatment participants accessed the art content situated in context, there is a possibility that they did not navigate to all the informational pages. There was no tracking technology used to keep track of the pages viewed or time spent on each page. [Hwa \(2003\)](#) suggests that it suggests using tracking technologies to monitor student's behavior which in turn may be used to predict whether a student will have a successful learning outcome. The time spent was also not tracked. It is unclear if the mobile technology users felt rushed because they were outside the classroom. CBI users took the posttest immediately after the module whereas there was a delay for the iPad and iPod users to come back to the classroom to take the posttest. If the posttest was administered in their context of learning, it is unsure if it would have made a difference.

#### 4.2. Attitude

Many educators believe that mobile technologies can provide a way to engage students ([Franklin & Peng 2008](#)). The attitude results of this study maintain that thought, and indicate that mobile technologies can indeed be engaging to students. In this study, the iPad group had the highest attitudes, whereas the CBI treatment had the lowest in the attitude survey. This reinforced that the students using the iPad were engaged, excited and motivated by the new technology compared to the computer based treatment that did not have access to the mobile device. There was no significant differences in attitude between the two mobile groups (iPad and iPod), whereas there was significant differences in attitude between CBI and iPad, and CBI and iPod on a number of items on the attitude survey.

The study results indicated that the students enjoyed the authentic learning environment that the mobile technologies allowed them to access. Both the iPad and iPod groups had positive attitudes compared to the CBI group on the items “content presented in a easy to understand manner”, “enjoyed the use of technology” “provided precise information” and “viewed this type of learning as effective”. This shows that students enjoy learning via this type of delivery method. The iPad group had positive attitudes compared with the CBI treatment stating that the length of the material was appropriate, and it maintained their interest. It is also evident from the open ended responses that the CBI group focused on the content, whereas the iPad/iPod group focused on the technology. These findings were consistent with previous research that found mobile devices can provide unique opportunities to deliver content in authentic learning situations ([De Jong, Specht, & Koper, 2010](#)).

While previous studies have shown improved learning outcomes ([Wu et al., 2012](#)) with the use of mobile learning, our study found that the achievement scores favored the CBI group, while the attitude scores favored the iPad and iPod groups. We know that motivated learners are enthusiastic, focused, and engaged. They enjoy what they are doing and persist over time ([Garris, Ahlers, & Driskell, 2002](#)). It is possible that over time the achievement scores of the mobile device group would improve because of their motivation to learn.

#### 4.3. Implications and future research

This study has implications for those designing and implementing mobile instruction for learning inside and outside the classroom. The study revealed that mobile learning keeps the learners engaged, and one is able to deliver learning that is authentic and informal via the mobile learning technologies. This study will help frame a number of future studies which clarifies the concept of here and now learning. It also helps researchers identify design principles specifically for mobile devices taking into account aspects such as contiguity and dual coding ([Mayer, 2009](#)). The study revealed that computer based instruction can still be effective especially in situations where the novelty of mobile technologies distracts the users from the task.

Future research studies should examine design principles for mobile learning in the context of here and now learning. In this study, only informational material was presented. Other instructional elements such as objectives, practice, and review should be provided to the learner. Linear and non-linear navigation techniques can be explored to make sure that the learners in the context of here and now learning navigate through all the needed learning material. Tracking technologies should be used to measure the time spent on the information, and also the pages visited. Studies including audio narration should be conducted to explore if it overloads the learner being in the context of learning. Future studies should also focus on studying the effects of mobile technologies on performance. It would also be beneficial to study if here and now learning has effects on low and high spatial learners.

It should also be noted that this study was very limited in its scope. Future studies should be more pedagogical rich and collaborative in nature. The authors chose to use a “static” learning application instead of a more modern collaborative application that would be more pedagogically rich with collaboration and content sharing among participants. This study was formed with the idea that baseline data, very limited in scope, was needed before larger more complex studies in this area could be conducted by future research. There are examples in research that show that limited studies must be done with increasing complexity before a synthesis of idea can emerge. As Cooper has observed, in the social sciences, the emphasis in research is as much on the why, when, and for whom as on the whether or not ([Locke,](#)

Silverman, Spirduso, 2004 p.5). In addition there are real world instances where static mobile learning application is taking place such as museums and grocery stores use of QR codes for customer information.

The authors believe with Lave and Wenger that learning occurs through centripetal participation in the learning curriculum of the ambient community (Lave & Wenger, 1991) and creating a more rich pedagogical experience that entailed much more collaboration among participants would be a necessity if future studies are to continue to contribute to the research base of modern pedagogical principals.

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