Spring 2014

Universal Design for Learning at the Toledo Museum of Art: Mobile Learning Guide

Katie Hatch
khatch@bgsu.edu

UNIVERSAL DESIGN FOR LEARNING AT THE TOLEDO MUSEUM OF ART: MOBILE LEARNING GUIDE

Katie Hatch

A Project

Submitted to the Graduate College of Bowling Green
State University in partial fulfillment of
the requirements for the degree of

MASTER OF EDUCATION

May 2014

Committee:

Dr. Fei Gao, Advisor

Dr. Kathryn S. Hoff, Advisor

Acknowledgements

I want to thank my two project chairs, Dr. Gao and Dr. Hoff for encouraging me through this process. Without their advice and help I would not have been able to accomplish this project. I also want to acknowledge the cooperation and encouragement of all those who were involved from the Toledo Museum of Art, especially Timothy Motz and Paula Reich. Lastly, a special thanks to Emily Kramer for assisting me in the organization and editing of my document, as well as to Mark Schultz for finding time to do a final edit on my manuscript.

Abstract

Dr. Fei Gao, Advisor

Dr. Kathryn S. Hoff, Advisor

The purpose of this project was to create a mobile learning guide based on Universal Design for Learning (UDL) principles that would help the casual visitor understand and engage with objects or exhibits located in the Toledo Museum of Art's Classic Court. Adhering to the UDL principles (i.e., providing multiple means of representation, action and expression, and engagement), the guide showcased four artifacts in the gallery. The contents of the mobile learning guide included an orientation to the guide and the four artifacts highlighted within, an introduction to visual literacy, and a chapter for each artifact, containing information organized thematically.

Two evaluations were conducted to qualify and quantify the success of this mobile learning guide. Feedback was positive for both, including suggestions for refinement and further application, which has been reviewed in the body of the report. Constructive suggestions recommended adding an iBook tutorial, more interactive content, and language that supported varied levels of ability. Results showed that the guide was ultimately successful in facilitating learning as identified by the Generic Learning Outcomes outlined by Hooper-Greenhill (2007).

Table of Contents

List of Tables

Section 1: Background and Goals

General Statement of the Project

The purpose of this project was to create a mobile learning guide based on Universal Design for Learning (UDL) principles that would help the casual visitor understand and engage with objects or exhibits located in the Toledo Museum of Art's Classic Court. The mobile learning guide had the following specifications:

Intended Audience: Casual visitors, with an emphasis on those 24 – 45 years old. The intended audience was expected to have a basic familiarity with tablets and comfort with the English language.

Platform: Tablet (iPad)

Intended Length of Experience: Visitor-determined

Learning Objectives: This project followed the Generic Learning Outcomes outlined by Hooper-Greenhill (2007), expressed here in italics, followed by corresponding specific learning goals identified by the researcher and Museum educators during the initial stages of the planning process:

1. *Knowledge and Understanding*: Museum visitors would gain a better understanding of the background behind the artwork and the collection as a whole.
2. *Skill:* Museum visitors would cultivate visual literacy skills, improving their ability to interpret artwork in the future.
3. *Activity, Behavior, and Progression:* Museum visitors would engage with objects or exhibits; specifically, Museum visitors would spend longer periods of time interacting with a single object or exhibit using the 30-second average as the base "Dwell Time" (Walker, 2008).

4. *Attitude and Values:* Museum visitors would have the opportunity to connect the exhibit to their attitudes and values through integrated visitor feedback portals.
5. *Enjoyment, Inspiration, and Creativity*: Museum visitors would have a positive Museum experience.

The contents of the mobile learning guide included:

- An orientation to the guide and the four artifacts highlighted within
- An introduction to visual literacy
- A chapter for each artifact, containing information organized thematically:
    - A "snapshot"/generic overview of the work
    - Geographical and cultural information
    - A specialized topic
    - A reflective activity

The following were the project objectives:

1. To design a mobile learning guide that fulfilled the learning goals;
2. To develop a mobile learning guide based on UDL principles that focused on providing multiple means of representation, action and expression, and engagement;
3. To perform a formative evaluation of the mobile guide based on both UDL compliance and the fulfillment of learning outcomes; and
4. To provide suggestions for further research based on study results.

Background

According to the American Alliance of Museums (AAM), there were more than 17,500 museums in the United States with a total of approximately 850 million visitors per year. Because of their unique marriage of entertainment and education, museums are a large enterprise

dedicated to reaching a broad audience who view museums as one of the most trustworthy sources for objective information (American Alliance of Museums [AAM], 2013, Museum Facts section). In fact, more than 80% of casual visitors to museums consider education one of the main purposes of museums (Talboys, 2000). The AAM has reported that museums spend $1 billion and more than 18 million hours annually on educational programs (AAM, 2013, Museum Facts page). Despite the amount of capital and effort that museums put into their educational programs, there is still a large portion of the population that is excluded from the educational offerings currently provided.

The National Institute of Child and Human Development (2010) stated that 15% to 20% of people living in the United States have a language-based disability such as dyslexia (Learning Disabilities section, para. 8). In addition, the 2010 census reported that 2.1% of Americans have a visual disability that drastically impairs their ability to use visual media as a reliable source of information, and 3.4% have a hearing disability that prevents auditory media from being effective (Cornell University, 2010, interactive disabilty statistic report). Given the impact that these disabilities have on how these individuals acquire and retain information, it is important for museums to meet the learning needs of all visitors regardless of ability or disability.

Despite the prevalence of learning disabilities, museums rarely offer learning materials that meet the specific needs of such a diverse population. In 1998, Edward Able, president of the American Association of Museums, wrote a letter highlighting the importance of inclusion:

> This report charges museums to be places of inclusion that welcome a diverse audience and that reflect our society's pluralism in every aspect of its operations and programs…. People with disabilities are part of every family and every community served by museums. Our museums need to be accessible to the broadest possible audience,

> regardless of ability or disability, educational background or learning style. (Salmen, 1998, Letter of Endorsements section)

Despite Able's plea, more than 15 years have passed since this letter was written and museums still struggle to be places of inclusion (Rappolt-Schlichtmann & Daley, 2013). Museums have certainly made efforts to provide more accessible educational resources for visitors with differing abilities, but most of these rely on providing supplemental tours or separate learning resources for visitors with disabilities (Giusti, 2008). Yet even with such offerings, many of these patrons feel segregated and out of place (Reich, 2005). In contrast, Giusti (2008) noted that people with disabilities perceived handheld devices that adhered to Universal Design for Learning principles differently. These devices were used both by the general public and people with disabilities alike, and were deemed to promote a museum experience that enabled equal access to information and environment, regardless of ability status.

Universal Design for Learning (UDL) is a set of principles used by curriculum developers to ensure that all individuals are given equal opportunities to learn. UDL is based on creating a flexible environment that adjusts to learners' physical and cognitive needs (Center for Applied Special Technology [CAST], 2012). The rationale of UDL is that "good design for people with disabilities will benefit everyone" (Edyburn, 2005, p. 18). While the original intent of UDL was to create inclusive classrooms, it became rapidly apparent that these principles held great promise for informal education, notably museums. In fact, by the time the second iteration of principles, UDL 2.0, was published, researchers had already taken into account the applicability of these principles for museums and other informal learning institutions and had adjusted the wording to reflect these environments (CAST, 2012).

Even though UDL may be the key to creating inclusive museums, there is still a major hurdle that must be addressed: its heavy reliance on technology. UDL experts had identified technology as an essential component in creating a truly universal learning experience due to its flexibility (CAST, 2012; Edyburn, 2005). This reliance on technology is problematic for some museum staff; worried that technology taints the traditional cultural experience, they have hesitated to incorporate digital media into the visitor experience (Giusti, 2008). Yet, many museum educators acknowledge the importance of technology in the museum setting and many of them have begun to use mobile devices as a main educational tool (Falk & Dierking, 2008; Tallon, 2008). Bring Your Own Device (BYOD) tours, a system where visitors use their own mobile devices to access museum-created content, have become increasingly prevalent over the past few years (Johnson, Adams Becker, & Freeman, 2013). In fact, many museums, including the Toledo Museum of Art, have adapted the Bring Your Own Device model to the point where the museum no longer lends out the traditional audio tour guide devices but only provides content for personal devices. The shift towards BYOD models not only provides a cost savings, but also offers additional benefits for the visitors, such as the ability to access the materials outside of the museum walls and personalize the device being used (Johnson et al., 2013).

While some museums are finding success with the incorporation of mobile devices, others have experienced many failed attempts. These failed attempts are not due to a flaw in the principle of the endeavor, but, as Smith (2009) says, "failure of the majority of handheld projects to date has been blamed on their trying to do too much, using technology that is too complex, too expensive, or 'not ready for prime time'" (para. 1). Once best practices have been identified and implemented, one could expect a rise in the success rates of technology-based learning materials.

To that end, another reason for success at some museums and failures at others is a lack of cohesion. Currently, very few of the mobile offerings used by museums conform to even the most fundamental UDL principles set by the Center for Applied Special Technology. Petrie and Tallon (2010, Chart 9) found that 66% of the institutions that offer mobile guides only offer audio guides, and are therefore not UDL compliant (CAST, 2012). Thus, the resources that have been allocated to such projects do not benefit significant portions of the population for whom an audio guide is insufficient. With a slight change to the implementation of learning materials, a greater portion of the population could have equal access at little to no extra cost.

Thus, for this mobile learning guide to best serve museums universally, the guide must be developed using a platform that adheres to UDL principles. The guide must also be relatively easy and inexpensive for museums to create, easy for visitors to use, and based on widely adapted technology that can support the Bring Your Own Device model. This guide will help establish best practices for future museum mobile guides based on Universal Design for Learning principles.

Definition of Terms

Docent: a lecturer or tour guide at a museum or other cultural institution (Berry & Mayer, 1989).

Museum: an institution dedicated to the preserving and interpreting of objects (e.g., art museums, science museums, historical museums) (Alexander & Alexander, 2007).

Museum Education: a field devoted to enhancing the visitors' abilities to understand and appreciate museum collections (Talboys, 2000).

Interpretive Information: a form of curatorial guidance used by museum educators to assist visitors in understanding and appreciating museum collections (Interpretation Canada, 2012).

Generic Learning Outcomes: a set of broad learning outcomes designed by the Museum, Libraries, and Archives Council to measure learning in such institutions (Hooper-Greenhill, 2007).

Literature Review

Historical view of museum education and technology. Educational programs offered throughout museum history are diverse, ranging from object labels to mobile tours. Thus it is difficult to make generalizations about museums during different points in history. Therefore, this literature review will focus on several significant educational offerings (techniques and technologies) that still strongly influence museums.

Object labels. The first known museum is the Belshalti-Nannar museum, dating back to circa 530 BCE. An archeologist named Leonard Woolley discovered the first known object labels, which indicated the objects' age in three different languages (Woolley, 1962). Object labels have been a major point of contention throughout the centuries, particularly for art museums (Sayre, 2012). Some curators believe that the objects or works of art should speak for themselves and that extensive labeling or use of other technologies is unnecessary (Giusti, 2008) and ruins the environment or "Sacred Silence" (Tallon, 2008, p. xvii). Others believe that the amount of information provided by object labels is not sufficient, and that in order to truly appreciate the objects or artwork one needs to have an understanding of the context behind the object or exhibit (Giusti, 2008; Sayre, 2012). Object labels are still commonly used by most museums and often are the only information provided to visitors other than docent-led tours.

Docent-led tours. The British Museum was founded in 1753 and was the first national public museum in the world (British Museum, 2003). While the British Museum was nominally open to the public, there were significant rules and stipulations that made it difficult or

impossible for some people to gain entrance. Even though access to the museum was never based on wealth or a particular level of intelligence, the trustees favored the "Learned and Curious persons" (p. 10). Though it was more difficult for people of lower classes to gain entrance to the museum, many succeeded in doing so. When the museum originally opened, visitors received a 3-hour tour given by the curators who took them through the museum's entire collection. In later years, as the less educated began to gain more frequent entrance to the museum, the tours were led by tour guides who followed a guidebook so as to not waste the curators' time giving the tours. Later on, the 3-hour tour was shortened to a 2-hour tour that only consisted of the collections that interested the visitors, as they did not want to bore the guests (British Museum, 2003). Docent-led tours are frequently used in museums today; however, docents now go through extensive training. There has been a recent trend in docents using mobile devices and interactive e-books as part of museum tours. In many ways this mirrors the utilization of guidebooks by docents in the British Museum, but rather than being used as a crutch (as was indicated by the British Museum), these mobile devices are being used to enhance the tour experience (Isaacson, McGuire, Sayre, & Wetterlund, 2011).

Reproductions. The Boydell Shakespeare Gallery opened in 1789, exhibiting oil paintings of scenes from Shakespeare's plays. The admission fee was quite low in order to make the exhibit accessible to the general public. Income from the admission fee was not enough to cover the cost of running the gallery, so they supplemented the costs by allowing visitors to purchase prints of the artwork (Christensen, 2010). Stipple engraving, a new form of technology at this time, allowed the people to not only own a piece of artwork but to also have a tangible connection to it. Similarly, offering interactivities about the museum's collection on personal

mobile devices invokes the same tangible connection that came out of owning the stipple engravings:

> When the [museum collections are] remedialised [*sic*] digitally, and interactivity is added, then it affords possibilities for visitors' participation. The multimedia exhibition form has the implicit condition that the (digital reproductions of the) exhibits must be touched by the visitor… it may take place outside the walls of the museum through the Internet and mobile media. The exhibition and its artefacts [*sic*] can be set free from their local museum context, and the artefacts [*sic*] can then be inserted into other contexts. (Christensen, 2010, p. 12)

Mobile tours. In 1952, the Stedelijk Museum in Amsterdam introduced what is likely the first mobile tour. Using technology that was originally intended to help the hard of hearing, the museum repurposed this technology to offer audio tours in several different languages to its visitors. The system was built using radio frequencies. This system sparked much of the new media technology that has started to make its way into museums today:

> From its origin as an analog radio tour at the Stedelijk Museum… to its subsequent adoption by virtually every major museum by the end of the twentieth century, and to its establishment at the forefront of in-gallery interpretation innovation, handheld technology is today an established companion of the modern museum. (Tallon, 2008, p. xiv)

Present-day museums. Museums offer a unique learning environment and are quite different from formal learning institutions: "museums are, first and foremost, free-choice learning environments" (Falk & Dierking, 2008, p. 19). However, museums have a history of incorporating behaviorist learning theories into their educational curriculum. Even though the behaviorist learning theories are not as pervasive today, they have still left their stamp on current

museum practices. Even though museums are a free-choice learning environment, museum educators still expect visitors to "achieve the 'right' response (i.e., learn what the museum intended them to learn)" (Falk, 2007, p. 4). Hooper-Greenhill (2007) stated that, because museums are free-choice learning environments: "Learning in museums is potentially more open-ended, more individually directed, more unpredictable and more susceptible to multiple diverse responses than in sites of formal education, where what is taught is directed by externally established standards" (pp. 4-5). This understanding of learning is a complete shift from the previously embraced behaviorist approach.

Despite the fact that museums are free-choice learning environments, it is important that there is some sort of guidance available to visitors. Walker (2008) stated that while visitors come to museums intending to learn something, most do not know what they want to learn, and so they look to museums to help structure their visit to some extent. These visitors, Walker says, "desire a mix of structure and freedom" (Walker, 2008, p. 110). Along these lines, Talboys (2000) noted that museums cannot just be a collection of objects but need to also provide interpretation, including "the opportunity to see, touch, hear, and have sensual, emotional and intellectual interaction with and experiences of what is in that place" (p. 5).

The uniqueness of the museum learning environment can prove to be a challenge to museum educators developing learning outcomes for the casual visitor. "A major message is that… many factors must be considered when designing museum-learning experiences… many variables must be accounted for when attempting to understand the learning outcomes that result from these experiences" (Falk, 2007, p. 14). It is noted that the traditional needs assessment used for developing learning outcomes in most educational settings is not appropriate for museums' casual visitors: "It was agreed that this could not take the form of a measurement of what people

knew prior to entering a museum, archive or library. It was also accepted that it would not be appropriate for cultural organizations to 'set standards' that their users had to attain" (Hooper-Greenhill, 2007, p. 45). While museum educators may have a basic plan for the learning goals and outcomes, it is difficult, if not impossible, to know beforehand the exact learning outcomes (Falk, 2007). Therefore museums needed to have the ability to identify and measure learning without the constraints of specific learning outcomes.

The Museum, Libraries, and Archives Council developed a set of Generic Learning Outcomes (GLOs) that can be used to help identify and measure learning in the museum setting without infringing on the free-choice learning of the casual visitor. The Generic Learning Outcomes are: "Knowledge and Understanding; Skills; Enjoyment, Inspiration, and Creativity; Attitudes and Values; Activity, Behavior, and Progression" (Hooper-Greenhill, 2007, p. 10). The Generic Learning Outcomes can be measured both quantitatively and qualitatively. In order to have a deeper understanding of the learning outcomes, however, qualitative methods are needed (Hooper-Greenhill, 2007).

Historical view of UDL. Universal Design for Learning principles were developed by the Center for Applied Special Technology (CAST), which was founded in 1984 (Rose & Meyer, 2002). Though CAST was founded in 1984, the first set of UDL principles was not established until 1998 (CAST, 2012). CAST's original mission explored ways of using new technologies to provide better educational experiences to students with disabilities. In 1989, a series of electronic books was created with built-in options for students with disabilities. The research results from this project found that the books were not helpful only for students with disabilities but for other students as well (Rose & Meyer, 2002). Shortly after, in 1990, the federal Individuals with Disabilities Education Act was passed and integrated classrooms began to emerge (CAST, 2012).

With the findings from the electronic books and the shift to inclusive classrooms, CAST took the approach that "good design for people with disabilities will benefit everyone" (Edyburn, 2005, p. 18). In 2008, UDL Guidelines 1.0 was released, providing clear recommendations for incorporating UDL principles. These guidelines were then re-written in 2011, resulting in UDL Guidelines 2.0. One of the major changes made to the guidelines was the phrasing used, which better represented informal learning institutions such as museums (i.e., the term *student* was changed to *learner* and the term *teacher* was changed to *educator*) (CAST, 2012).

Along with the UDL Guidelines 1.0, CAST launched the UDL Curriculum Self-Check web-based tool. This tool was designed to assist educators in evaluating their curriculum based on UDL principles (CAST, 2012). There has yet to be a second release of the UDL Self-Check based on the updated UDL Guidelines 2.0.

UDL in museums. Museums are no exception when it comes to the importance of inclusion in educational programing. Over the years, many articles have been published emphasizing the need for inclusive museums, not only in regard to physical access but also to intellectual access (Giusti, 2008; Rappolt-Schlichtmann & Daley, 2013; Reich, 2005; Salmen, 1998). Reich (2005) noted:

> Museums have a responsibility to consider how the design of the educational interactives, programs, and exhibits they create prevent against "ableism" and the denial of rights for persons based on physical differentiation, and support learning for all members of the public, including those traditionally labeled as "disabled."(p. 5)

Rappolt-Schlichtmann and Daley (2013) noted that museums play an important role in sparking and cultivating the development of deep interest in topics of personal relevance, which is essential to the success of people with disabilities in learning and in life. They continue on to say

that: “Assuming a common goal for all visitors would be inappropriate, but identifying a range of goals that can be explicitly reflected in the design of exhibits is essential if UDL is to be successfully adapted and applied” (Rappolt-Schlichtmann & Daley, 2013, p. 318).

There have been several studies conducted regarding the application of accessible digital media for museums. Giusti (2008) addressed two tours: the first, an audio tour designed primarily to help those who were blind or experienced low vision (though the general population was able to use the tour); and the second, an American Sign Language tour that was to be used by people who were deaf or hard of hearing. Reich (2005) conducted a study about the use of kiosks to deliver UDL-based interactivity to visitors with a wide range of disabilities.

The audio tour study found that visitors who used the audio tour were better able to follow directions and understand explanations than those who simply read printed labels. Additionally, the study found that users of the audio tour found the exhibition more fascinating than non-users (Giusti, 2008). It was also noted that those visitors who used the audio tour spent more than twice as long at an exhibit, and that their total visit length was up to three times longer. The time typically spent in front of a single exhibit or object is less than 30 seconds (Walker, 2008). As it is commonly agreed upon that 30 seconds is not enough time to facilitate learning, it is significant that the visitors who used the audio guide spent more time in the exhibit and in the museum than those who did not use the audio guide.

The results from the UDL interactivities study were less promising. Reich (2005) stated that: “design features providing access to one audience can lead to improved experiences for other audiences…. However, study results also show that not all design features that help persons who are blind lead to experiences that are better for all learners” (p. 107). It was also acknowledged that the study participants were not provided with the ability to choose the

interactivities or options. Giusti (2008) pointed out that "personal choice and level of control proved to be a central concern" (p. 106). Both the audio tour study and ASL tour study found that visitors wanted control over their experience and generally preferred the technology-based tours due to the level of control and flexibility they provided. Additionally, museums can be made more accessible with the addition of mobile technology:

> Handhelds have the potential to render museums more accessible. Over time, as museums become more welcoming to the general public, they are learning how to seek out and respond to their visitors' needs, both physical and intellectual, regardless of ability. All museum visitors want a personally meaningful, relevant experience over which they feel in control. Incorporating handheld digital technologies into museums has tended to individualize the visitor experience, providing an individual level of control over information flow, thereby rendering it personally relevant. (Giusti, 2008, p. 107)

Though there is the opportunity for mobile guides to make museums more accessible, it is important to note, as Tallon (2008) pointed out, mobile guides "just like any other visitor service, cannot be all things to all people…. It is about creating a variety of different portals through which to engage with an exhibit" (p. xxi). The intent of mobile technology is not to replace docents or other museum offerings, but rather to increase the number of offerings and serving the diverse educational needs of museum visitors.

Mobile devices in museums. While there are a very limited number of studies regarding UDL in museums, research regarding the utilization of mobile devices in museums is a bit greater. Lessons learned from the utilization of mobile devices in museums is applicable, as these studies still provide important insight toward the use of mobile devices with UDL principles.

The use of mobile devices has been long established in the museum setting, since its introduction to the Stedelijk Museum in Amsterdam in 1952. As technology has progressed, however, so too have the types of mobile devices. For approximately 40 years, two companies in the United States held a duopoly on much of the mobile device development; therefore, little research came out during this time. Within the past decade, however, museums started to shift from utilizing guides provided by the big audio tour companies to developing in-house tours that could be accessed using cell phones, MP3 players, and Personal Digital Assistants (PDAs). The majority of research studies that have been conducted used these technologies (Tallon, 2008). Key findings about mobile devices in museums are as follows:

1. Visitor control is essential to the success of the mobile offerings (Tallon, 2008; Walker, 2008).
2. Mobile offerings help visitors develop better understanding through "play, creation, critique and collaboration" (Walker, 2008, p. 112).
3. Mobile offerings help to bridge the gap between learning inside and outside of the museum walls, assisting with learning before and after the museum visit (Arvanitis, 2005; Falk & Dierking, 2008; Rudman, Sharples, Lonsdale, Vavoula, & Meek, 2008).
4. Mobile offerings help to actively engage visitors for longer periods of time (Rudman et al., 2008).
5. Mobile offerings are most successful when limited to a narrow subject or focused on a limited number of objects or exhibits (Walker, 2008).
6. A greater sense of engagement with the museum and increased learning were cited as the most common desired outcomes by museums from their mobile offerings (Tallon, 2013).

7. A lack of dedicated budgets, limited resources, and limited knowledge [regarding mobile development] were the most common reasons why museums do not provide mobile offerings (Tallon, 2013).
8. Bring Your Own Device policies are rapidly being adopted by museums (Johnson et al., 2013; Petrie & Tallon, 2010).

Despite the fact that museums have only recently been able to take advantage of the capabilities of smartphones, tablets, and other modern mobile technology, there is an exponentially strong push to employ this technology in museums (Johnson, Adams, & Witchey, 2011; Johnson, Witchey, Smith, Levine, & Haywood, 2010; Walker, 2008). As mobile technology progresses, research studies need to be conducted in this area in order to develop best practices.

Instructional design and the ADDIE model. Instructional design is a systematic approach to designing, developing, and delivering instructional materials (Instructional Design Central, 2012). There are several theoretical models generally used by instructional designers. ADDIE is a commonly used instructional model comprised of five parts: *Analyze*, *Design*, *Develop*, *Implement*, and *Evaluate* (Branch, 2009). The ADDIE model is an iterative process with an input-process-output pattern that ends each phase with a formative or summative evaluation. The goal is to allow for ample opportunities to modify the project or process for the product's improvement. Following is a description of common procedures for each phase, as outlined by Branch (2009):

Analysis. The analysis consists of identifying the needs of the learner and shortcomings of the current educational offerings. The analysis phase is also where the instructional designer will "determine the instructional goals, confirm the intended audience, identify resources

required to complete the entire ADDIE process, determine potential delivery systems, and compose a project management plan" (p. 17). The results from this phase make up the *Analysis Summary*.

Design. The design phase is used to verify the desired performance and appropriate testing methods. The design phase is also where the instructional designer may "conduct a task inventory, compose performance objectives, generate testing strategies, and calculate return on investment" (pp. 17-18) that will be used to generate a *Design Brief*.

Develop. The development phase is used to generate and validate the instructional materials. Elements that are in this phase include: "generate the content, select supporting media that already exists or develop supporting media… conduct formative revisions, and conduct a pilot test" (p. 18). *Instructional Materials* are the outcome of the development phase.

Implement. The implementation phase starts by preparing the learning environment for both the instructors and learners. Instructional designers typically develop an Implementation Strategy during this phase. After developing the *Implementation Strategy*, the learning materials are disseminated and used by the learners.

Evaluate. The evaluation phase is present throughout the entire ADDIE process. This phase includes the determination of evaluation criteria, the selection or creation of the evaluation tools, and implementation of the evaluations (both formative and summative).

Section 2: Procedures

Outlined in this section are the procedures that were followed by the researcher to accomplish the stated goals of the project. The researcher followed the ADDIE instructional design model (Branch, 2009). The ADDIE model is an iterative process that allows for changes to be made throughout the instructional design process. Changes that were made from the initial proposal are noted at the end of this section. The *Analysis Summary* (see Appendix A) and *Design Brief* (see Appendix B) contain the original proposal information and therefore parts may be inconsistent with this section.

General Statement of the Project

The purpose of this project was to create a mobile learning guide based on Universal Design for Learning (UDL) principles that would help the casual visitor understand and engage with objects or exhibits located in the Toledo Museum of Art's Classic Court. The mobile learning guide had the following specifications:

Intended Audience: Casual visitors, with an emphasis on those 24 – 45 years old. The intended audience was expected to have a basic familiarity with tablets and comfort with the English language.

Platform: Tablet (iPad)

Intended Length of Experience: Visitor-determined

Learning Objectives: Due to the unique nature of the informal learning environment, the learning objectives remained very broad in order to allow for visitor free choice. Thus, this project followed the Generic Learning Outcomes outlined by Hooper-Greenhill (2007), expressed here in italics, followed by corresponding specific learning goals identified by the researcher and Museum educators during the initial stages of the planning process:

1. *Knowledge and Understanding*: Museum visitors would gain a better understanding of the background behind the artwork and the collection as a whole.
2. *Skill:* Museum visitors would cultivate visual literacy skills, improving their ability to interpret artwork in the future.
3. *Activity, Behavior, and Progression:* Museum visitors would engage with objects or exhibits; specifically, Museum visitors would spend longer periods of time interacting with a single object or exhibit using the 30-second average as the base "Dwell Time" (Walker, 2008).
4. *Attitude and Values:* Museum visitors would have the opportunity to connect the exhibit to their attitudes and values through integrated visitor feedback portals.
5. *Enjoyment, Inspiration, and Creativity*: Museum visitors would have a positive Museum experience.

It should be noted that, due to the unique nature of museums that allowed for multiple visits (e.g., no mandatory charted course, exhibits able to be seen as cohesive wholes or as parts of a unit), the intent was to achieve the above goals over time and with multiple experiences.

Components of the Prototype Mobile Learning Guide: After meeting with a Visitor Engagement employee at the Museum, two areas of the collection seemed to fit the objectives of this study particularly well. The first was the Cloister Room, a U-shaped exhibit hall with stained glass and architectural features surrounded by smaller artifacts of a sacred nature. The second area was the Classic Court, an exhibit hall for the ancient artifacts from Egypt, Rome, Ancient Near East, and Greece. The ancient collection best suited the purpose of this study. In conjunction with the Toledo Museum of Art, the researcher created a prototype mobile learning guide based on the Toledo Museum of Art's Classic Court. Referring to the UDL principles, the

guide showcased four artifacts in the gallery alongside specific activities that would help achieve the learning outcomes. The contents of the mobile learning guide included:

- An orientation to the guide and the four artifacts highlighted within
- An introduction to visual literacy
- A chapter for each artifact, containing information organized thematically:
    - A "snapshot"/generic overview of the work
    - Geographical and cultural information
    - A specialized topic
    - A reflective activity

The following were the project objectives:

1. To design a mobile learning guide that fulfilled the learning goals;
2. To develop a mobile learning guide based on UDL principles that focused on providing multiple means of: representation, action and expression, and engagement;
3. To perform a formative evaluation of the mobile guide based on both UDL compliance and the fulfillment of learning outcomes; and
4. To provide suggestions for further research based on study results.

Investigation/Development Procedure

The development of this mobile learning guide followed the ADDIE model for instructional design: *Analyze*, *Design*, *Develop*, *Implement*, and *Evaluate*. The evaluation component of the model is not only evident at the end of the process but throughout as well.

Analysis. The Background and Goals section of this document serves as an overview for the analysis portion of this project. In addition to the analysis provided in the Background and Goals section, the Visitor Engagement staff from Toledo Museum of Art requested that the guide

lend itself to people between the ages of 24 – 45, in order to help promote their young adult initiative. The mobile learning guide was designed in such a way that it lent itself to the Toledo Museum of Art's Bring Your Own Device policy, eliminating the need to lend out devices (see Appendix A for the Analysis Summary).

Design. The mobile learning guide was developed for use on commonly owned mobile devices, limited at this time to the iPad platform. The guide was developed using software that was both relatively inexpensive and easy to use, as Smith (2009) attributed cost and technological complexity to the failure of previous attempts at implementing mobile learning guides. The researcher selected iBook Author, Apple's free interactive e-book software, as the development platform for the guide. This was a low-cost, easy-to-use solution that offered built-in end-user accessibility features and efficient deployment capabilities. It should be noted that one of the downsides to this development platform was that the guide was not supported on tablets other than the iPad (see Appendix B for the Design Brief).

The researcher adhered to all Human Subject Review Board (HSRB) policies and procedures. The project was approved by HSRB prior to implementing the evaluation process and informed consent was obtained from all participants (see Appendix C for HSRB Approval).

Development. During the development phase, the researcher collected instructional content from the Toledo Museum of Art and incorporated it into the mobile learning guide. Using this content as the basis for the guide, an outline/storyboard of the instructional components was created. The researcher then adapted the provided content to meet UDL guidelines and adjusted it to reflect learning goals. In addition, the researcher developed supplemental text, images, renderings, videos, audio, timelines, activities, etc. that were included within the guide. Once the outline/storyboard was completed and additional content had been

created, all of these materials underwent a formative evaluation by the researcher, checking for UDL compliance, using a modified version of the UDL Guidelines – Educator Worksheet – v. 2 (see Appendix D).

After the guide was produced in iBook Author, the researcher tested and debugged the guide. The researcher conducted another formative evaluation in which an individual who was familiar with the Toledo Museum of Art, but not the Classic Court or the contents of the mobile guide, tested the guide and provided feedback. This evaluator was 28 years old and within the targeted 24 – 45 age range. The evaluator was provided with the guide on the iPad and was asked to use and evaluate the guide, with instructions to note any problems with the guide or suggestions for improvement. The evaluation was not conducted in the gallery setting; therefore, feedback was limited to the usability of the guide and suggestions for content changes. As a result of the feedback, several changes were made to both the text and audio.

Implementation. Once the final product was complete, the researcher exported the interactive iBook file and installed it onto iPads, which were then used for the evaluation phase. The researcher also provided the Museum with the iBook Author (editable) files so that the Museum may disseminate the iBook to visitors at its discretion.

Evaluation. Two evaluations were conducted that examined different components of the project. The first evaluator was an educational expert who reviewed the guide based on how well it adhered to UDL principles. The educational expert identified strengths and weaknesses of the guide using a rubric based on the UDL Curriculum Self-Check (CAST, 2011) (see Appendix E). For the second evaluation, the researcher conducted a focus group comprised of seven individuals who used the guide, then shared their user experiences through an exit survey that was adapted from the Museums, Libraries and Archives Council (2008) Exit Survey. This was

followed by a series of directed questions throughout the focus group discussion, which will be expanded upon in further detail throughout the report. The seven focus group members confirmed the attainment of learning and provided insight into how mobile learning guides can be used and improved upon in the future. The following paragraphs provide detailed information about both evaluations.

In the first evaluation, an educational expert, a professor of education, examined the mobile learning guide for UDL compliance. The expert used an adapted version of the CAST UDL Curriculum Self-Check (CAST, 2011) assessment as the rubric for this evaluation. The CAST UDL Curriculum Self-Check is reflective of a formal learning environment because it is based on the UDL Guidelines 1.0; therefore, an adapted version was used that contained phrasing changes and the removal of questions that did not apply to informal learning. This first evaluation helped to determine to what degree the mobile learning guide complies with UDL principles.

The second evaluation focused on the attainment of learning goals and user experience. This evaluation was conducted in a focus group setting that consisted of seven individuals (five female and two male) and represented a variety of age brackets: 18 – 24 (one participant), 25 – 34 (three participants), 45 – 55 (one participant), and 55 – 64 (two participants). Five of the participants were Museum workers and the remaining two were non-Museum workers, one of whom was a non-native English speaker. The five Museum workers represented the following departments: Visitor Services, Visitor Engagement, Graphic Design, Marketing and Communications, and Purchasing. A Visitor Engagement staff member from the Museum recruited these individuals based on their unfamiliarity with the Museum's Classic Court with the exception of one Museum worker who was selected to be a part of the focus group due to his

specialization in the gallery. The researcher, who was assisted by a recorder, led the focus group. The recorder assisted the researcher in two capacities: taking notes of the researcher's comments while in the gallery and transcribing the focus group conversation. The recorder was selected based on strong typing and transcription skills, as well as a familiarity with the mobile guide.

The group was given a brief introduction to both the project and the guide and asked to sign informed consent documents (see Appendix F for informed consent document). After the informed consent documents were collected, the researcher distributed iPads containing the interactive iBook. In order to maximize the unique research opportunity, the researcher instructed one group of two participants to share one iPad, so that the researcher could collect insight into what a shared experience using the guide was like. The participants were given 30 minutes to use the guide in the intended gallery setting. While visitors would ideally be encouraged to use the guide for the duration of their visit, 30 minutes was deemed an appropriate amount of time for the members of the focus group to gain a fundamental understanding of the contents of the guide during the study. Both the researcher and the recorder were present in the gallery for these 30 minutes, and observed the participants as they used the guide. It should be noted that one of the non-Museum workers was unable to participate in the first part of the focus group (i.e., the testing in the gallery and exit survey), but had previewed the guide prior to the session and joined in as the focus group discussion started.

After 30 minutes, the group transitioned to the Museum's conference room where members completed the exit survey (see Appendix G for exit survey questions). After the exit surveys were completed, the researcher then started the focus group discussion (see Appendix H for focus group questions). The focus group discussion lasted for approximately 1 hour. As the researcher asked questions and the participants responded, an individual who served as the group

recorder transcribed the discussion, which was projected onto a screen in front of the group. This allowed participants to view what was being discussed and to reiterate any information that they felt may not have been captured correctly by the recorder. The majority of the group was able to stay until the very end of the discussion, but three of the Museum workers ended up leaving the session 10 – 15 minutes early.

The researcher compiled and analyzed the data within several hours of the completion of the focus group. During the time, the recorder remained available for any necessary clarification regarding notes that were taken during the focus group. Data was organized according to the questions asked and by themes that emerged in the focus group. Discussion points with unanimous responses were noted; in the case that they were not unanimous and various viewpoints were presented, details regarding all viewpoints were addressed.

Timeline

The timeline for the design, development, implementation, and evaluation of this mobile learning guide took place over the course of 5 months. The timeline of activities is as follows:

December	All content provided by the Museum employees collected and given to the researcher
January	Initial meeting with Museum representatives
January – February	The researcher outlined/storyboarded the instructional components and reviewed content for UDL compliance based on the UDL Educator's Worksheet
March	The researcher submitted the Human Subject Review Board application; the researcher started the development of the mobile learning guide and integrating media into iBooks Author
March	Researcher conducted a formative evaluation with one user and made changes accordingly
April	Formative evaluations were conducted; after the educational expert evaluated the mobile guide, the researcher made minor changes before conducting the Museum

	focus group
April	Results, evaluations, and recommendations were compiled and documented
April	Edits to final report were made

Changes From Proposal

The researcher deviated from the original project proposal in several different areas. Some changes were made to improve the project, while others were made in reaction to unforeseen circumstances. The following details changes that were made to the mobile learning guide, the development process, and the evaluation process.

Mobile Learning Guide. A couple of changes were made to the mobile learning guide that digressed from the original proposal. First, the researcher originally intended for the mobile learning guide to be approximately a 10 – 15 minute experience; however, this was changed to be "visitor determined," as some of the reflective activities alone may take longer than the stated 10 – 15 minutes. Second, the guide was originally going to contain information about one to three objects in the gallery but the researcher selected four objects in order to better represent works in the gallery.

Development Process. Two major changes were made to the development process: the timeline and the outline/storyboard approval. The timeline for the design, development, and evaluation phases were originally going to take place from December to March, but actually took place from January to April, due to the availability of the Museum staff workers that participated in the initial planning meeting. This delay had several compound effects, such as the online/storyboard was not approved by the Museum representatives prior to the development of the mobile learning, as was originally intended.

Evaluation Process. Key changes were made to both formative and summative evaluations. The initial field test (formative evaluation), while it did occur, did not take place in the Museum setting due to the Museum being closed and an inability to delay the project further. The largest change that was made to the original proposal was that the Museum Community Advisory Group was unavailable to participate in the focus group (summative evaluation) and was thus made up of Museum employees and individuals recruited by the researcher.

Section 3: Description, Methodology, and Development

The researcher developed the mobile learning guide as outlined in the following three main phases: Planning and Determining Educational Components, Development of Supplemental Activities and Support Media, and Integration into iBooks. Specific steps taken during each phase can be found below. Projects of this type can be replicated by anyone with a basic background in digital media by following widely available iBook Author tutorials.

Planning and Determining Educational Components

The researcher met with a group of staff from the Toledo Museum of Art, who worked in the areas of Visitor Engagement, Museum Education, and Graphic Design, to discuss any components that they wanted to see included in the guide. The Museum provided some content on a CD, which included object label information, audio recordings, videos, and text documents with interpretative content. Other material was gathered from the Museum's website or obtained by the researcher on Museum trips to photograph and note content that was available in the gallery.

With the content collection concluded, the researcher identified and selected four artifacts to highlight in the guide. While three of the works of art were sculptures, all four pieces were three-dimensional and each represented a distinct culture. Based on a combination of the learning goals and available content, themes were identified, and content was organized based on the following themes: *snapshots (overview of artwork), geographic and culture, specialized topics, reflective activities, and visual literacy*. Content was developed or located from other art institutions when gaps in the existing content were present (such as the information about Austin Henry Layard and the sculpting process).

Development of Supplemental Activities and Support Media

The researcher designed four reflective activities (Chisel Your Way, Woman at the Well, Write like an Egyptian, Be an Archeologist) to correspond with each work of art to promote the Universal Learning for Design values in the guide. The reflective activities included a variety of ways to engage including journaling, drawing, digital 3-D modeling, and mini quizzes. Audio recordings of the text were made. Transcriptions were written for all audio and video components, embedding subtitles into the videos when possible using the built in features available within YouTube, to ensure that the guide provided multiple ways to access the same content. Graphical images used for the timelines were created and exported using the Easy Timeline application. Cover art was designed in Adobe Photoshop and InDesign. Graphics for advanced organizers (e.g., floor plans and icons) were created using Adobe Illustrator.

Integration Into iBooks

Using iBooks Author, the researcher integrated all of the content into the guide. In order to enhance features in the mobile guide beyond the offerings of iBooks Author, several online platforms were used including YouTube, Google Maps API, and Bookry.com. The researcher developed and integrated glossary terms, provided textual content for all images in all adaptive content areas, and designed indicative floor plans to ensure ease of navigation during the gallery experience. The researcher graphically structured the book to be visually appealing and user-friendly in both landscape and portrait views.

Section 4: Results, Evaluations, and Recommendations

Results

The purpose of this project, to create a Universal Design for Learning (UDL) based mobile learning guide to help the casual viewer understand and engage with objects or exhibits located in the Toledo Museum's Classic Court, was fulfilled. Two evaluations were conducted to qualify and quantify the success of this mobile learning guide. Both evaluations received positive feedback, including suggestions for refinement and further application.

Evaluations

UDL compliance evaluation. The project was reviewed by an educational expert who evaluated the project using a rubric that was adapted from the UDL Curriculum Self-Check (CAST, 2011) (see Appendix E for the evaluation rubric). The evaluator scored each criterion from one to five points; one (1) indicated that the project *rarely* exhibited the defined point, while five (5) indicated that the project *always* adhered to the defined point.

Strengths. The educational expert identified the following as the strongest points of the mobile learning guide based on a score of four or five. The actual score is provided in parentheses. These points included:

- Multiple varied media are used to present concepts and content (4)
- Materials and media provide equivalents for auditory information and vice versa as needed (4)
- Templates with varying amounts of content provided to support visitors at different levels are offered (4)
- Visitors can access web pages with links to key sites to find the information they seek (4)

- Materials and media are designed to help visitors monitor their own guidance through the exhibit and promote self-reflection (5)
- Materials and media provide visitors with varied levels of challenge and support to address diverse abilities and challenges (4)

Weaknesses. The educational expert identified the following as the weakest point of the mobile learning guide based on a score of one or two. The actual score is provided in parentheses. The educational expert's comment is located beneath the pertinent point.

- Options for diverse linguistic/language abilities are provided in materials and media (2)

"I don't think varied reading levels are accommodated in the text, but since the audio option is available, this is one accommodation. I'm not saying that the guide should be written for multiple reading levels. This would add another layer of complexity that might inhibit the impact of the resource."

Suggestions for improvement. The educational expert would like to see the addition of more images, animation, and interactive components. Furthermore, the expert suggested adjusting the timeline features to make them easier to read. Though this feature was available in the current version of the guide, it was not obvious, thus a more intuitive approach needs to be taken in the future (see Appendix I for the complete evaluation).

Learning goal and user experience evaluation. The purpose of the focus group evaluation was to gain a better understanding of the user experience, confirm the attainment of learning, and better understand how mobile learning guides can be used and improved upon in the future. The consensus of the focus group was that the mobile learning guide was effective

and enjoyable, and the participants of the focus group responded strongly that the guide holds promise for future application.

User experience. All participants agreed that the guide helped enhance their gallery experience. Those who were unfamiliar with the iPad, or with the way that interactive iBooks worked, found the experience more frustrating than those who were comfortable using the technology. Once those who were initially unfamiliar acclimated themselves with both hardware and software, they enjoyed the experience. In particular, the individual who was a non-native English speaker found the experience to be beneficial due to the varied media and activities. All focus group participants felt that this interactive tour was more valuable than an audio tour or a text-based guide. Participants agreed that audio tours felt more isolating, while this experience prompted more social interaction.

Headphones were not provided and thus some participants were uncomfortable using the audio features out of respect for the other visitors in the gallery. The majority of the members found other participants' use of the audio features distracting because headphones were not used. Even though it was recommended by participants that headphones be worn, the researcher acknowledges that this could impact the social interaction between users and thus further research should be conducted regarding the use of headphones and social interaction.

Focus group members, specifically those who were more familiar with art, initially found the experience to be very "heads down," in that they felt pulled out of the gallery experience and tended to look more at the iPad than the art. In contrast, those who were less familiar with art museums felt as though they spent their time oppositely; that is to say, they spent more time looking at the art than the guide. The researcher noted that all participants spent more time looking at the artwork as their time in the gallery progressed. Participants shared that they

thought that headphones would enable a more "heads up" experience, as they would not have to constantly rely on the visual consumption of the text in the iBook. Regardless of how participants perceived their heads up/heads down ratio, the researcher observed that all participants spent significantly longer interacting with the artwork than the commonly cited 30 second "Dwell time" (Walker, 2008). Additionally, when asked if they spent longer than 30 seconds interacting with each work of art they visited, the participants unanimously agreed that they spent significantly longer; estimating that a minimum of 2 minutes was spent focusing specifically on the artwork alone and not on the mobile guide.

The participants responded positively to the error-free experience of the guide, comfortable knowing that they were confined to what the guide had to offer. Participants cited the risk of using a website, where the reader might click out of a window and not know how to return to their previous task or page, in contrast to the consolidation of the guide.

Learning objectives. Visitor feedback clearly indicated that learning occurred through the use of this guide regarding all of the Generic Learning Outcomes outlined by Hooper-Greenhill (2007), expressed here in italics, as well as regarding the more specific learning goals detailed by the researcher and Museum educators in the initial stages of project planning (expressed here in parentheticals): *Knowledge and Understanding* (learning about the background of the artwork), *Skill* (visual literacy and interpretation), *Activity, Behavior, and Progression* (increased "Dwell Time"), *Attitude and Values* (interactive feedback), *Enjoyment, Inspiration, and Creativity* (an enjoyable Museum experience).

All participants in the focus group identified information that they learned through the materials provided in the guide. Some of the highlighted content included historical context of the artwork and the geographical placement of the artwork, particularly when comparing modern

and ancient maps. The most discussed information that the participants learned included historical and geographical context, as well as the sculpting process, which the majority of participants said they had never even considered before. The researcher did see participant/guide interaction across the board, with particular focus on the effectiveness of the specialized content.

All the participants believed that the guide improved their visual literacy skills. It was clear that the elements of art and the principles of design were both well laid out and afforded many opportunities to be applied throughout the guide. Participants noted that engagement activities provided an intuitive format for participants to interpret the art at their own pace.

Participants felt that the guide made them more aware of what to look for in artwork in the future, particularly in the context of visual literacy. An unanticipated result concerning Behavior and Progression was that the participants noted that they would be sure to walk completely around a sculpture to examine it from all sides in the future. Many participants admitted that they would not have thought to walk around the artwork on their own, had they not been prompted by the rotating visuals of the guide, or if they had not been encouraged by the video that specifically directed them to discuss what they noticed on the back of the sculpture. In addition to the focus group discussion, participants completed the Museums, Archives, and Libraries Council Exit Survey, which is designed to help measure learning based on the Generic Learning Outcomes. Participants answered a series of questions with answers ranging from *strongly disagree* (1) to *strongly agree* (5) (see Table 1 for Generic Learning Outcomes Exit Survey Results).

Table 1

Generic Learning Outcomes Exit Survey Results

Evaluation Criteria	**Mean**	**Median**	**Mode**	**Standard Deviation**
I found this experience to be very interesting.	4.67	5	5	.5167
My visit was inspiring!	3.8	4	4	.4472
I discovered some new information.	4.33	4.5	5	.8165
I found out how to do some new things.	3.8	4	4	1.0955
I learned some things that made me change my mind.	3.5	3	3	.8367
My feelings and emotions were engaged.	3.67	4	4	1.0328
Some things were hard to understand.	2.5	2	2	.8367
Some things were disappointing.	2.17	2	2	.7528
The mobile guide was helpful.	4.12	4	4	.4083

In regard to the overall experience, the participants found this experience to be very interesting ($\mu = 4.57$, $s = .5167$) and the mobile guide to be helpful ($\mu = 4.12$, $s = .4083$). In regard to the learning outcomes, the participants agree most with the statement "I discovered some new information" ($\mu = 4.33$, $s = .8165$) and agreed least with the statement "I learned some things that made me change my mind" ($\mu = 3.5$, $s = .8367$). All the participants fulfilled at least one of the generic learning outcomes based on a response of *agree* or *strongly agree* to one or more questions two through six. Additionally, all of the generic learning outcomes were fulfilled by at least one participant using the aforementioned criteria (see Appendix J for a complete overview of the Exit Survey Responses).

Additional feedback. An essential component of Universal Design for Learning is providing varied media, which attributed to the success of this mobile learning guide. Each of the

participants was asked to identify one feature that they found most beneficial to their learning. Participants provided a varied list of features: text, audio, interactivities (e.g., ability to take notes, highlight, drawing component), video, and glossary. One of the aspects that they felt was particularly engaging and interesting was the Google satellite view, where they could explore the Palace of Kalu, the archeological ruins where the Winged Deity artifact was found. The non-native English speaker found that the pictures throughout the guide were very helpful.

The varied media allowed for information to be obtained using the learners' preferred learning method. Despite having unique personal preferences, all participants liked having the option to toggle between different aspects of the guide that promoted alternate learning styles, and they all used a variety of combinations of the features during their experience. Participants liked their ability to start and stop the experience at will, allowing them to control the pace of their experience. The freedom to start and stop the guide at one's own leisure, as well as the ability to jump around within the guide, was thought to be refreshing and very beneficial.

Several participants used both the landscape and portrait views, but others were unaware that the portrait view option was available. The majority of the group was unaware of the glossary, but had favorable reactions once this feature was pointed out and demonstrated to them. A few of the participants noted that they saw the highlighting and note-taking features in the guide but did not use them.

Everyone used the audio and video features and found the subtitles and transcripts to be a beneficial addition to the video, especially as some felt uncomfortable using the audio without headphones. Everyone used the maps, both the static images and the integrated Google map components. Two participants explored the drawing activity, but did not use the accompanying social features, such as those that enabled the user to email the drawing, share the product with

EverNote, etc. Two participants took the mini-quiz and found the immediate feedback to be helpful and validating.

No one tried the journaling activity or the 3-D modeling activity, though the participants were intrigued by the features. The timelines were overlooked, as the visitors were unaware that they could enlarge the overall timeline and swipe through enlarged images of specific events.

User Suggestions. Participants agreed that this guide would be an excellent platform for children, as they felt that children would appreciate the interactive experience more than a linear traditional audio tour. Participants also mentioned that the guide would be a good way to encourage visitors to participate in docent-led tours when they may not feel comfortable exerting themselves otherwise due to shyness. Additionally, participants felt strongly that not only would the guide serve as an in-gallery experience, but that it would also make a valuable pre- and post-Museum visit activity, perhaps available for user download from home.

Participants liked when the content encouraged them to search for specific aspects of the artwork (e.g., "Did you notice—?"), and would have liked to see more instances of this guidance. The focus group members believed that the guide would be enjoyable to use as a group if each member of the group had his or her own iPad, though they agreed that the current platform was not easily shareable. They felt that having such a shared platform amongst a group would spark conversation more than traditional methods that have been used in the past, for example, audio tours or textual guides.

The participants would also like to have had additional direct interaction between the art, the guide, and people, and requested that future guides might include group discussion questions about the artwork. While all participants agreed that the guide helped enhance the gallery

experience, they mentioned that their focus was on the specific art mentioned in the guide, which detracted from their interaction with other works of art in the extensive gallery.

Users of the guide felt like they were constantly swiping through pages, particularly those users who were unaware of the table of contents options. Participants would have liked to have seen a brief tutorial on how to use iBooks for those unfamiliar with the technology. In future versions of the guide, the researcher would include information about these features in the content of the guide.

Recommendations

Project improvement. The following recommendations come from information gathered in focus group, UDL (Educational Expert) evaluation, and researcher's reflections. These recommendations will be integrated into future editions of the mobile learning guide:

1. Include an optional tutorial outlining how to use both the iPad and iBooks for those unfamiliar with this format. The tutorial would include information on how to use:
    - alternate views (e.g., landscape/portrait)
    - table of contents
    - glossary access
    - note-taking features

    Additionally, the tutorial would encourage the use of headphones and provide information on how to obtain them from the Museum.
2. Write content in a way that supports varied levels of linguistic/language comfort and ability, while still encouraging audience interaction with the *artwork* and others in an informal educational setting.

3. Include more interactive components. Participants deemed these activities to be one of the highlights of the mobile guide, and would like to have seen more of these activities.

While this list is by no means comprehensive, these suggestions hold the greatest potential for improving the success of the mobile guide based on the evaluation data.

Suggestions for future development and research. The project showed promising results regarding the application of Universal Design for Learning principles to mobile learning guides. The researcher was able to identify both current best practices and highlight specific areas for further development of best practices and research. Several best practices regarding the development that have been identified are:

1. Allow for user control. Users appreciated having control over the content of the tour, focusing only on the artifacts and content of interest; the order and timeframe in which they obtained content; and the media from which they were getting the content (e.g., audio, video, text, interactivities).
2. Limit guide content. After using the guide, the visitors felt that the guide best served them if it only highlighted several objects (around 4 – 6). They felt that additional content should be provided in the form of additional books rather than additional chapters.
3. Focus on interactive components. The interactive components were well received by the users and it was mentioned several times that they wished there had been more; thus, this seemed to be central to the user experience.

These best practices are limited in scope as this project unveiled a number of areas for further research. The first step regarding further research would be to use this (or a similar) guide in the

gallery with visitors over a period of time to see how well it serves the patrons. Secondly, it is recommended that further research be conducted on the social engagement factor, particularly as it relates to headphone usage. Lastly, while iBooks Author provided a good platform for the development of this mobile learning guide, ideally it would best if a similar platform was found that enabled all tablets or phones to use the guide.

Project Summary

This project fulfilled its purpose to create a Universal Design for Learning (UDL) based mobile learning guide to help the casual viewer understand and engage with objects or exhibits located in the Toledo Museum of Art's Classic Court. The findings from the project revealed a need to have UDL based curriculum in the museum setting, as well as a need for further research on this topic. This study found that users thought the UDL based design features were beneficial and did not take away from their experience. These findings differed from the study conducted by Reich (2005) that showed "not all design features that help persons who are blind lead to experiences that are better for all learners" (p. 107). The positive findings of this study may be due to the free-choice learning environment where users were not forced to use features that they did not want to use.

References

Alexander, E. P., & Alexander, M. (2007). *Museums in motion: An Introduction to the history and functions of museums* (2nd ed.) Lanham, MD: AltaMira Press.

American Alliance of Museums. (2013). Museum facts. Retrieved January 21, 2013, from http://aam-us.org/about-museums/facts

Arvanitis, K. (2005). Museums outside walls: Mobile phones and the museum in the everyday. Presented at the *IADIS International Conference Mobile Learning 2005*. Retrieved from https://www.escholar.manchester.ac.uk/uk-ac-man-scw:118059

Berry, N., & Mayer, S. (1989). *Museum education: History, theory, and practice*. Reston, VA: The National Art Education Association Editors.

Branch, R. M. (2009). *Instructional design: The ADDIE approach*. Boston, MA: Springer-Verlag US.

British Museum. (2003). Accessing enlightenment: An introductory study guide. Retrieved from http://www.britishmuseum.org/pdf/British%20Museum%20Study%20Pack%20Accessing%20Enlightenment.pdf

Center for Applied Special Technology. (2011). UDL Curriculum Self-Check. Retrieved April 21, 2014, from http://udlselfcheck.cast.org/

Center for Applied Special Technology. (2012). About UDL. Retrieved July 20, 2012, from http://www.cast.org/udl/index.html

Christensen, J. R. (2010). Four steps in the history of museum technologies and visitors' digital participation. *MedieKultur: Journal of Media and Communication Research*, *27*(50), 23.

Cornell University. (2010). *Disability statistics: Online resource for U.S. disability statistics*. Retrieved from http://www.disabilitystatistics.org/reports/acs.cfm?statistic=1

Edyburn, D. (2005). Universal design for learning. *Special Education Technology Practice*, *7*(5), 16–22.

Falk, J., & Dierking, L. (2008). Enhancing visitor interaction and learning with mobile technologies. In L. Tallon & K. Walker (Eds.), *Digital technologies and the museum experience: Handheld guides and other media* (pp. 19–33). Lanham, MD: AltaMira Press.

Falk, J. H. (2007). Toward an improved understanding of learning from museums: Filmmaking as a metaphor. In J. Falk, L. Dirking, & S. Foutz (Eds.), *In principle, in practice: Museums as learning institutions* (pp 3–16). Lanham, MD: AltaMira Press.

Giusti, E. (2008). Improving visitor access. In L. Tallon & K. Walker (Eds.), *Digital technologies and the museum experience: Handheld guides and other media* (pp. 97–108). Lanham, MD: AltaMira Press.

Hooper-Greenhill, E. (2007). *Museums and education: Purpose, pedagogy, performance*. London, England: Routledge.

Instructional Design Central. (2012). Retrieved December 10, 2013, from http://www.instructionaldesigncentral.com

Interpretation Canada. (2012). Retrieved February 25, 2012, from http://www.interpcan.ca/new/

Isaacson, A., McGuire, S., Sayre, S., & Wetterlund, K. (2011). *Mobile apps for museums*. Proctor, N. (Ed.). Washington, DC: The AAM Press, American Association of Museums.

Johnson, L., Adams Becker, S., & Freeman, A. (2013). The *NMC horizon report: 2013 museum edition.* Austin, TX: The New Media Consortium.

Johnson, L., Adams, S., & Witchey, H. (2011). *The NMC horizon report: 2011 museum edition*. Austin, TX: The New Media Consortium.

Johnson, L., Witchey, H., Smith, R., Levine, A., & Haywood, K. (2010). *The 2010 horizon*

Report: Museum edition. Austin, TX: The New Media Consortium.

Museums, Libraries and Archives Council. (2008). Exit survey. Retrieved April 21, 2014, from http://www.inspiringlearningforall.gov.uk/export/sites/inspiringlearning/resources/repository/Exit_survey.doc

National Institute of Child and Human Development. (2010, March 24). Learning disabilities. Retrieved July 24, 2012, from http://www.nichd.nih.gov/health/topics/learning_disabilities.cfm

Petrie, M., & Tallon, L. (2010). The iPhone effect? Comparing visitors' and museum professionals' evolving expectations of mobile interpretation tools. In D. Bearman (Ed.), *Museums and the web 2010: Proceedings*. Toronto, Canada: Archives & Museum Informatics. Retrieved from http://www.archimuse.com/mw2010/papers/petrie/petrie.html

Rappolt‐Schlichtmann, G., & Daley, S. G. (2013). Providing access to engagement in learning: The potential of universal design for learning in museum design. *Curator: The Museum Journal, 56*(3), 307–321.

Reich, C. A. (2005). *Universal design of interactives for museum exhibition: Research report*. Boston, MA: Museum of Science, Boston. Accessed December 1, 2013 at http://informalscience.org/reports/0000/0337/2005_Universal_Design_Interactives_Report.pdf

Rose, D. H., & Meyer, A. (2002). *Teaching every student in digital age: Universal design for learning*. Alexandria, VA: Association for Supervision and Curriculum Development.

Rudman, P., Sharples, M., Lonsdale, P., Vavoula, G., & Meek, J. (2008). Cross-context learning. In L. Tallon & K. Walker (Eds.), *Digital technologies and the museum experience:*

Handheld guides and other media (pp. 147–166). Lanham, MD: AltaMira Press.

Salmen, J. P. S. (1998). *Everyone's welcome: The Americans with Disabilities Act and museums.* Takoma Park, MD: Universal Designers & Consultants, Inc.

Sayre, S. (2012). *The NMC perspective series: Ideas that matter.* Retrieved from http://www.youtube.com/watch?v=ESnWW6aZC0A&feature=youtube_gdata_player

Smith, K. (2009). The future of mobile interpretation. In *Museums and the web 2009: Proceedings*. Toronto, Canada: Archives & Museum Informatics. Retrieved from http://www.archimuse.com/mw2009/papers/smith/smith.html

Talboys, G. K. (2000). *Museum educator's handbook*. Brookfield, VT: Gower.

Tallon, L. (2008). Introduction: Mobile, digital, and personal. In L. Tallon & K. Walker (Eds.), *Digital technologies and the museum experience: Handheld guides and other media* (pp. xiii–xxv). Lanham, MD: AltaMira Press.

Tallon, L. (2013). *Museums strategy in 2013: An analysis of the annual museum & mobile survey*. Accessed December 9, 2013 at http://www.museumsmobile.com/wp-content/uploads/2013/07/MMSurvey-2013-report-V2.pdf

Walker, K. (2008). Structuring visitor participation. In L. Tallon & K. Walker (Eds.), *Digital technologies and the museum experience: Handheld guides and other media* (pp. 109–124). Lanham, MD: AltaMira Press.

Woolley, L. (1962). *Ur excavations: The Neo-Babylonian and Persian periods* (Vol. IX). London, England: Charles Skilton.

Appendix A

Analysis Summary

Purpose statement

The purpose of this project was to create a mobile learning guide based on Universal Design for Learning (UDL) principles that would help the casual visitor understand and engage with objects or exhibits located in the Toledo Museum of Art's Classic Court.

Instructional goals

This project will follow the Generic Learning Outcomes outlined by Hooper-Greenhill (2007), expressed here in italics, followed by corresponding specific learning goals identified by the researcher and museum educators:

1. *Knowledge and Understanding*: Museum visitors would gain a better understanding of the background behind the artwork and the collection as a whole
2. *Skill:* Museum visitors would cultivate visual literacy skills, improving their ability to interpret artwork in the future
3. *Activity, Behavior, and Progression:* Museum visitors would engage with objects or exhibits; specifically, museum visitors would spend longer periods of time interacting with a single object or exhibit using the 30-second average as the base "Dwell Time" (Walker, 2008)
4. *Attitude and Values:* Museum visitors would have the opportunity to connect the exhibit to their attitudes and values through integrated visitor feedback portals
5. *Enjoyment, Inspiration, and Creativity*: Museum visitors would have a positive museum experience

It should be noted that, due to the unique nature of museums that allow for multiple visits (e.g., no mandatory charted course, exhibits able to be seen as cohesive wholes or as parts of a unit), the intent is to achieve the above goals over time and with multiple experiences.

Visitor profile

Casual visitors, with emphases on those who are 24 – 45 years old. The intended audience is expected to have a basic familiarity with tablets and be comfortable with the English

language. The majority of Toledo Museum of Art visitors come from northwest Ohio, though its extensive collection draws visitors from all over the world.

Proposed delivery system

The learning materials will be presented in the form of a mobile learning guide. The mobile learning will be developed using iBook Author, Apple's free interactive e-book software. In addition to being a low-cost solution, this software has a relatively easy level of development, built-in end-user accessibility features, efficient deployment capabilities, and there is an increasing number of visitors who own or have access to personal iPads.

Required resources

In order to complete this project, the researcher will provide the computer and software required for the development:

- iBook Author
- Video editing software
- Photo editing software
- Audio recording software
- iBook Author widgets

Additionally, the researcher will provide iPads for the testing of the mobile learning guide and for the focus group.

In order to complete this project, the museum will provide the major content that will be the foundation for the book:

- Interpretive videos and images
- Audio recordings
- Timeline and supplemental images

The Museum has also offered to provide access to a number of museum-owned iPads for the focus group evaluation, if the researcher is unable to provide enough.

Project management plan

The following is a general proposed timeline for the development, implementation, and evaluation of the mobile learning guide:

December	The researcher will submit Human Subject Review Board paperwork
December	Kick-off meeting with the Museum representatives
December	All content will be collected by the Museum and given to the researcher
December – January	The researcher will outline/storyboard the instructional components and review content for UDL compliance based on the UDL Educator's Worksheet
January	The outline/storyboard will be given to the Museum representatives to review. A meeting will be scheduled to meet with the Museum representatives to talk about any necessary changes
January – February	The researcher will make any changes to the outline /storyboard and start the development of the mobile learning guide
March	Initial field test will be completed
March	Changes based on field test will be implemented
March	Formative evaluations will be conducted (both the UDL Expert and Museum Focus Group)
March	Changes based off the formative evaluations will be made, and the product will be delivered to the Museum for implementation
March	Results, evaluations, and recommendations will be recorded
April	Edits to final report will be made
April	Final Project Defense will be completed
April	Final changes to documentation based on defense will be made
April	Error-free copy of report will be completed

Appendix B

Design Brief

Development platform

The researcher will insure that the mobile learning guide is developed so that it may be used on commonly owned mobile devices. To broaden the relevance of this project/study, the learning guide will be developed using iBook Author, Apple's free, interactive e-book software, based on its low cost and intuitive development platform. In addition to being a low-cost solution, this software has a relatively easy level of development, built-in end-user accessibility features, efficient deployment capabilities, and a growing base of museum visitors who own or have access to personal iPads.

Mobile learning guide components

This prototype of a mobile learning guide will focus on one to three of the artifacts located in the Classic Court. It will provide an exemplar set of UDL information that will help achieve the generic museum instructional objectives. While the components of the mobile learning guide, formatted as an iBook, will be further refined in the development phase of the project, the components as currently envisioned include:

- An orientation to the exhibit
- A timeline-based navigation to the exhibit
- An overview of one to three objects
- Details of the object (i.e., a "smart label")

(e.g., What is the origin of the object? When was it created? What was the purpose or function of the object? How was the object likely created? Important stories attached to the object, etc.)

- Exploratory self-selected in-depth information about the artifact. (Note: this is dependent on the Museum's holdings of photos, videos, audio recordings, and what the Museum wants to have shared about the object.) The visitor can select any or all of the following areas (consider these placeholders):
    - Interpretation
    - Archeology
    - Dating an artifact
    - How the artifact was created
    - More about the artist or craftsman

Evaluation plan

The researcher will conduct two evaluations. Each evaluation will examine a different component of the project. In the first evaluation, an educational expert will evaluate the guide for UDL compliance based on the UDL Curriculum Self-Check (CAST, 2011), identifying strengths and weaknesses of the guide. For the second evaluation, the researcher will conduct a focus group of six to eight users who have used the guide in the gallery, who will provide their personalized insight as to how well the guide facilitated learning.

The first evaluation will be completed by an educational expert who will evaluate the mobile learning guide for UDL compliance. The evaluator will use an adapted version of the CAST UDL Curriculum Self-Check (CAST, 2011) assessment as the rubric for the evaluation. The CAST UDL Curriculum Self-Check is reflective of a formal learning environment because it

is based on the UDL Guidelines 1.0. Therefore, an adapted version will be used containing phrasing changes and the removal of questions inapplicable to the informal learning environment. The evaluation will help to determine to what level the mobile learning guide complies with UDL standards.

The second evaluation focuses on the attainment of learning goals. This evaluation will be conducted in a focus group setting that consists of approximately six to eight Museum visitors, comprised of Community Advisory Group members. The Community Advisory Group, made up of community members varying in age, gender, and educational levels, was established by the Museum and meets on a monthly basis with the purpose of experiencing Museum programs and offerings and providing feedback about their experience.

All members will be lent an iPad and a brief introduction to the mobile guide will be provided. Participants will then have 30 minutes to use the guide in the intended gallery setting. After the 30 minutes have passed, the group will reconvene in the Museum's conference room to fill out a brief twelve-question survey and participate in a focus group. The researcher has allotted 1 hour for the focus group. Each question will address one or more of the learning outcomes. A recorder will take notes on the discussion while the principle investigator conducts the focus group. The notes will be projected on the screen, allowing participants to provide feedback and further clarification. Additionally, if all members of the group agree to the use of an audio recording device, the conversation will be recorded. This audio recording will be used as a reference for the researcher if further clarification of the notes is needed at a later time. Using the data collected, the researcher will identify themes from both the survey and focus group and will note these in the final report along with suggestions for improvement or further research.

APPENDIX C

HRSB Determination of Exempt Status Letter

BGSU
BOWLING GREEN STATE UNIVERSITY
Office of Research Compliance

DATE: March 24, 2014

TO: Katie Hatch
FROM: Bowling Green State University Human Subjects Review Board

PROJECT TITLE: [583905-1] Universal Design for Learning in Museums
SUBMISSION TYPE: New Project

ACTION: DETERMINATION OF EXEMPT STATUS
DECISION DATE: March 23, 2014

REVIEW CATEGORY: Exemption category # *[enter category]*

Thank you for your submission of New Project materials for this project. The Bowling Green State University Human Subjects Review Board has determined this project is exempt from IRB review according to federal regulations AND that the proposed research has met the principles outlined in the Belmont Report. You may now begin the research activities.

Suggestion - You may want to edit the sentence about providing results to the Toledo museum of Art to indicate that any results that will be shared will be group, and not individual results/ comments.

Note that an amendment may not be made to exempt research because of the possibility that proposed changes may change the research in such a way that it is no longer meets the criteria for exemption. A new application must be submitted and reviewed prior to modifying the research activity, unless the researcher believes that the change must be made to prevent harm to participants. In these cases, the Office of Research Compliance must be notified as soon as practicable.

We will retain a copy of this correspondence within our records.

If you have any questions, please contact Kristin Hagemyer at 419-372-7716 or khagemy@bgsu.edu. Please include your project title and reference number in all correspondence with this committee.

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within Bowling Green State University Human Subjects Review Board's records.

Appendix D

Adaptation of the UDL Guidelines – Educator Checklist Version 2

I. Provide Multiple Means of Representation:	**Researchers Notes On Guide Adherence**
1. Provide options for perception	
1.1 Offer ways of customizing the display of information	
1.2 Offer alternatives for auditory information	
1.3 Offer alternatives for visual information	
2. Provide options for language, mathematical expressions, and symbols	
2.1 Clarify vocabulary*	
2.4 Promote understanding across language	
2.5 Illustrate through multiple media	
3. Provide options for comprehension	
3.1 Activate or supply background knowledge	
3.2 Highlight patterns, critical features, big ideas, and relationships	
3.3 Guide information processing, visualization, and manipulation	
3.4 Maximize transfer and generalization	
II. Provide Multiple Means for Action and Expression:	**Researchers Notes On Guide Adherence**
4. Provide options for physical action	
4.1 Vary the methods for response and navigation	
4.2 Optimize access to tools and assistive technologies	
5. Provide options for expression and communication	
5.1 Use multiple media for communication	
III. Provide Multiple Means for Engagement:	**Researchers Notes On Guide Adherence**
6. Provide options for recruiting interest	
7.1 Optimize individual choice and autonomy	
7.2 Optimize relevance, value, and authenticity	
7.3 Minimize threats and distractions	
7. Provide options for sustaining effort and persistence	
8.3 Foster collaboration and community	
8.4 Increase mastery-oriented feedback	
8. Provide options for self-regulation	
9.1 Promote expectations and beliefs that optimize motivation	
9.3 Develop self-assessment and reflection	

Original UDL Guidelines – Educator Checklist Version 2 document can be found:
http://www.udlcenter.org/sites/udlcenter.org/files/Guidelines_2.0_Educator_Worksheet_0.doc

Appendix E

Adapted Version of the UDL Curriculum Self-Check

1. Multiple and varied media are used to present concepts and content.
    a. Rate 1-5; 1=Rarely 5=Always
        ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
    b. Comments:

2. Materials and media provide visual equivalents for auditory information and vice versa as needed.
    a. Rate 1-5; 1=Rarely 5=Always
        ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
    b. Comments:

3. Options for diverse linguistic/language abilities are provided in materials and media (Limited to English language by design, but different levels and abilities regarding the English language are taken into consideration).
    a. Rate 1-5; 1=Rarely 5=Always
        ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
    b. Comments:

4. Visual organizers, rubrics, and checklists are available to help visitors to learn.
    a. Rate 1-5; 1=Rarely 5=Always
        ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
    b. Comments:

5. Templates with varying amounts of content provided to support visitors at different levels are offered.
    a. Rate 1-5; 1=Rarely 5=Always
        ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

b. Comments:

6. Visitors can access web pages with links to key sites to find the information they seek.
    a. Rate 1-5; 1=Rarely 5=Always
        ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
    b. Comments:

7. Materials and media are designed to help visitors monitor their own guidance through the exhibit and promote self-reflection.
    a. Rate 1-5; 1=Rarely 5=Always
        ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
    b. Comments:

8. Materials and media provide visitors with varied levels of challenge and support to address diverse abilities and challenges.
    a. Rate 1-5; 1=Rarely 5=Always
        ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
    b. Comments:

9. Guide materials and media are relevant to visitors' lives, helping them make personal connections.
    a. Rate 1-5; 1=Rarely 5=Always
        ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
    b. Comments:

10. Next steps for improving materials
    a. Comments:

11. Additional comments:

APPENDIX F

Focus Group Informed Consent Document

BGSU
BOWLING GREEN STATE UNIVERSITY

Informed Consent for Universal Design for Learning in Museums Study

You are invited to participate in a study on Universal Design for Learning in Museums. This study is being conducted by myself, Katie Hatch, under the supervision of my advisor, Dr. Kathryn Hoff, as a part of my master's project in the Learning Design program at Bowling Green State University.

The purpose of this project is to create a learning guide that is suitable for a broad audience regardless of learning abilities and preferences. The results of this project will help museums improve educational experiences to better meet visitors' needs. You will not receive any direct compensation for your participation in this study, but your feedback will be valuable for future museum endeavors.

As a participant in this study, you will use an interactive mobile guide throughout the museum. You will complete a brief survey and participate in a focus group about your experience. Your participation will take approximately 1.5 hours. The risk of your participation in this study is no greater than that of everyday life.

Your participation in this study is voluntary and you have the right to leave the study at any time. You can refrain from answering any questions without penalty or explanation. Leaving the study will not result in any penalty or loss of benefits to which you may be entitled through the museum (such as parking privileges, etc.). Your participation or non-participation will not have any affect on your relationship with Bowling Green State University or the Toledo Museum of Art.

Although I will take every precaution to maintain confidentiality of the data, the nature of focus groups prevents an absolute guarantee. I will never attach names to information gathered. I may report specific ages or genders if I find a significant and informative correlation between this information and your opinions. Please respect the privacy of fellow participants. Do not repeat what is said in the focus group to others. All data will be stored on my password-protected computer. Only myself and my advisors will have access to this data. The museum may be provided with results upon request.

If you have any questions or comments about this study, you can contact me, Katie Hatch, at (419) 372-2483 (khatch@bgsu.edu), or Dr. Kathryn Hoff, my project advisor, at (419) 372-7557 (khoff@bgsu.edu).

If you have any questions about the conduct of this study or your rights as a research participant, you may contact the Bowling Green State University Chair of the Human Subjects Review Board at (419) 372-7716 (hsrb@bgsu.edu).

After reading through the below paragraph, please sign on the line provided to authorize your consent to be a part of this project. Thank you in advance for your time and any information you might share.

> I have been informed of the purposes, procedures, risks, and benefits of this study. I hereby verify that I am over 18 years of age. I have had the opportunity to have all my questions answered and I have been informed that my participation is completely voluntary. I agree to participate in this research.

Signature: _____ Date: _____

With the express permission of each member, the focus group will be audio recorded. As with participation in the focus group, you will not be penalized for withholding consent to an audio recording of the session.

Do you give permission for the focus group to be recorded? Please circle: YES NO

Appendix G

Universal Design for Learning in Museums – Exit Survey

Instructions: Based on your experience with the mobile learning guide, please answer the following questions to the best of your ability. Please feel free to expand on your answers in the focus group.

		Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
1	I found this experience to be very interesting.	☐1	☐2	☐3	☐4	☐5
2	My visit was inspiring!	☐1	☐2	☐3	☐4	☐5
3	I discovered some new information.	☐1	☐2	☐3	☐4	☐5
4	I found out how to do some new things.	☐1	☐2	☐3	☐4	☐5
5	I learned some things that made me change my mind.	☐1	☐2	☐3	☐4	☐5
6	My feelings and emotions were engaged.	☐1	☐2	☐3	☐4	☐5
7	Some things were hard to understand.	☐1	☐2	☐3	☐4	☐5
8	Some things were disappointing.	☐1	☐2	☐3	☐4	☐5
9	The mobile guide was helpful.	☐1	☐2	☐3	☐4	☐5

What did you learn from your visit?

You are: Male ☐ Female ☐

To which age group do you belong?

18 – 24 25 – 34 35 – 44 45 – 54 55 – 64 over 65

Adapted from Museums, Archives, and Libraries Council Exit Survey
(http://www.inspiringlearningforall.gov.uk/export/sites/inspiringlearning/resources/repository/Exit_survey.doc)

Appendix H

Evaluation questions for the focus group:

Question Set 1

Please share with the group your experience using the mobile guide.

- Would you describe your experience as positive or negative? Please explain your answer.
- Were you comfortable using the guide in the gallery? Please explain your answer.

Question Set 2

Can you share with the group a few details about what you learned while in the gallery today? How much of a role did the mobile guide play in your learning?

Question Set 3

While in the gallery, how would you describe your level of engagement with the artwork? Did the guide help or hinder your engagement with the artwork?

- Do you believe that you spent more time engaging with the artwork because you used the guide than you would have if the guide had been unavailable to you?

Question Set 4

How has this experience influenced the methods you will use to view and interpret artwork in the future?

- To what extent has the guide increased your comfort level when interpreting artwork?
- Do you believe that this experience has helped improve your visual literacy skills? If so, in what way(s)?

Question Set 5

How did your experience with the guide compare with other educational offerings at the museum?

Question Set 6

Which features did you use? Which features did you not use?

(Provide participant with a list of features available in the guide.)

Are there any features that you were unaware existed? If so, what were these features?

Question Set 7

Which features did you like? Which features did you not like?

(One participant left the focus group at this time)

Question Set 8

Do you think that the guide enhanced or detracted from your experience in the gallery today? Please explain your answer.

(Two participants left the focus group at this time)

Question Set 9

What suggestions do you have for improving the guide?

Appendix I

Summary of Results: Adapted Version of the UDL Curriculum Self-Check

Multiple and varied media are used to present concepts and content.

a. Rate 1-5; 1=Rarely 5=Always

☐ 1 ☐ 2 ☐ 3 ☐ **4** ☐ 5

b. Comments: Audio option for most text, videos sprinkled throughout the guide, multiple angles for viewing artifacts.

2. Materials and media provide visual equivalents for auditory information and vice versa as needed.

a. Rate 1-5; 1=Rarely 5=Always

☐ 1 ☐ 2 ☐ 3 ☐ **4** ☐ 5

b. Comments:

3. Options for diverse linguistic/language abilities are provided in materials and media (Limited to English language by design, but different levels and abilities regarding the English language are taken into consideration).

a. Rate 1-5; 1=Rarely 5=Always

☐ 1 ☐ **2** ☐ 3 ☐ 4 ☐ 5

b. Comments: I don't think varied reading levels are accommodated in the text, but since the audio option is available, this is one accommodation. I'm not saying that the guide should be written for multiple reading levels. This would add another layer of complexity that might inhibit the impact of the resource.

4. Visual organizers, rubrics, and checklists are available to help visitors to learn.

a. Rate 1-5; 1=Rarely 5=Always

☐ 1 ☐ 2 ☐ **3** ☐ 4 ☐ 5

b. Comments: The table of contents, floorplan and the timeline are included as organizers. Adding user checklists or quick quiz/response areas could aid visitors in tracking their own learning/understanding. (metacognition)

5. Templates with varying amounts of content provided to support visitors at different levels are offered.
   a. Rate 1-5; 1=Rarely 5=Always
      ☐ 1 ☐ 2 ☐ 3 ☐ **4** ☐ 5

   b. Comments: I think is accomplished by beginning with a basic presentation of information, with choices to dig deeper (clicking on words/images for more detailed information from glossary, maps, etc.)

6. Visitors can access web pages with links to key sites to find the information they seek.
   a. Rate 1-5; 1=Rarely 5=Always
      ☐ 1 ☐ 2 ☐ 3 ☐ **4** ☐ 5

   b. Comments: The web provides a plethora of options for inclusion, but the fact that you are trying to engage the visitor in the museum experience makes it less necessary to bring in multiple web resources at the time of viewing. Possibly providing a link for visitors as they leave the museum to explore ideas/items of interest would be more beneficial. Maybe a QR code that could be scanned or saved to direct them to other information later.

7. Materials and media are designed to help visitors monitor their own guidance through the exhibit and promote self-reflection.
   a. Rate 1-5; 1=Rarely 5=Always
      ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ **5**

   b. Comments: I think the resource does this very well. The floor plan, visuals, and interactive activities encourage autonomy and reflection.

8. Materials and media provide visitors with varied levels of challenge and support to address diverse abilities and challenges.
    a. Rate 1-5; 1=Rarely 5=Always
    ☐ 1 ☐ 2 ☐ 3 ☐ **4** ☐ 5

    b. Comments: Of course, if a visitor is visually-impaired, a more tactile experience would be optimal, but this isn't the focus of the guide…or a visit to an art museum in general. The adult audience targeted is sufficiently supported and challenged by the resource in its current form.

9. Guide materials and media are relevant to visitors' lives, helping them make personal connections.
    a. Rate 1-5; 1=Rarely 5=Always
    ☐ 1 ☐ 2 ☐ **3** ☐ 4 ☐ 5

    b. Comments: Good activities such as "Write Like an Egyptian" allows for experiential and social learning and sharing.

10. Next steps for improving materials
    a. Proof read very carefully. Still some typos or missing words. For example, on page iii under Audio Recordings, as word is missing after "main." The text on the Tanwetanmani sculpture image needs an "s" added to the subtext "Swipe image to view more angle."
    b. Timeline difficult to read as the print is very small. Couldn't seem to stretch to magnify image and text. (pg. 3)
    c. Either adding text titles under included images or highlighting/hyperlinking text from the body that relates to the margin images would connect them more directly.
    d. Is there a way to make the timeline hyperlinked/interactive? To click on a specific area and have it be magnified for easier viewing?

e. Could add animation to hieroglyphs visuals…arrow moves with images…possibly translate
f. Room to add icons or other visuals (or videos) to highlight key concepts. For example, on page 19 provide media to enhance the "Women in Ancient Greece" ideas of household duties, women and men, courtesans, etc.

11. Additional comments: What do you plan to add in the "Katie Hatch" area? A way for users to connect with you. This would be a nice way to track if the resource is being used and how it is being used. Good "beta test," if you will.

APPENDIX J

Summary of Results: Universal Design for Learning in Museums – Exit Survey

		Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
1	I found this experience to be very interesting.	**4**	**2**	-	-	-
2	My visit was inspiring!	-	**4**	**1**	-	-
3	I discovered some new information.	**3**	**2**	**1**	-	-
4	I found out how to do some new things.	**1**	**3**	**-**	1	-
5	I learned some things that made me change my mind.	**1**	**1**	**4**	-	-
6	My feelings and emotions were engaged.	**1**	**3**	**1**	**1**	-
7	Some things were hard to understand.	-	**1**	**1**	**4**	-
8	Some things were disappointing.	-	-	**2**	**3**	**1**
9	The mobile guide was helpful.	**1**	**5**	-	-	-

What did you learn from your visit?

"The tools and techniques used to create the 'Young Man in Armor' statue."

"I need to purchase an iPad!"

"The best thing about the iBook was seeing new ways to engage an audience."

"It is fun to use a mobile guide, it helped me learn about the facts behind the art."

You are: Male **2** | Female **4**

To which age group do you belong?

18 – 24 (1) **25 – 34 (3)** 35 – 44 (-) 45 – 54 (-) **55 – 64 (2)** over 65 (-)

Adapted from Museums, Archives, and Libraries Council Exit Survey

(http://www.inspiringlearningforall.gov.uk/export/sites/inspiringlearning/resources/repository/Exit_survey.doc)