

Understanding Technology Integration on Single-Visit Field Trips:  
A Study of Three Field Trip Programs Utilizing Technology

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### **Abstract**

In a climate of an increased focus on education standards, testing and a general decrease in time and funding for schools to take field trips, museums must look critically at their field trip program offerings to maximize impacts, potentially rethinking how these programs operate. This research studies the integration of technology into the single-visit field trip, one way in which these programs are being rethought. Three case studies are examined: *Play the Past* at the Minnesota History Center, *Zoo Scene Investigators* at the Columbus Zoo and Aquarium, and *Surgical Suite: Total Knee Replacement* at COSI. Observations and staff interviews provided insight into the following questions: how and why are museums integrating technology and what are the perceived benefits of technology integration? Findings suggest there is no single reason these institutions chose to integrate technology into their programs. Emergent themes include: fulfilling curricular goals, reaching elusive audiences and a view of students as digital natives. Perceived benefits were closely linked to motivations, but also included a perception that technology is a way to deeply engage students and a link between teacher and student benefits

exists. Finally, though there is variation in the ways museums are integrating technology – for example, two cases are mobile games and one an interactive video conferencing experience – there were similarities in the processes these sites went through to integrate technology. These findings begin a conversation around the ways technology can be utilized in single-visit field trips.

## Table of Contents

<b>Chapter One: Introduction and Discussion of the problem</b>	<b>8</b>
Introduction	8
State of the Field	9
Purpose and Research Questions	10
Implications	11
<b>Chapter 2: Review of the Literature</b>	<b>12</b>
<i>Introduction</i>	12
Field Trip Literature	12
Technology in Museums	18
Technology in Museum Field Trip Programming	20
State of the Literature	21
<b>Chapter 3: Methods</b>	<b>23</b>
Sampling	23
Program Descriptions	24
Methods	25
Limitations	27
<b>Chapter 4: Results and Discussion</b>	<b>28</b>
<i>Case Study Descriptions</i>	28
Play the Past at the Minnesota History Center	28
ZooScene Investigators at the Columbus Zoo and Aquarium	31
Surgical Suite Live: Total Knee Replacement at the Center of Science and Industry	33
<i>Research Question 1:</i>	35
<i>Institutional Reasons for Integrating Technology into Single-Visit Field Trips</i>	35
Curricular Connections	36
Technology is effective for content delivery and engagement	37
A Reason for Teachers to Come to the Museum	39
Elusive Audiences	40
Technology Relevance for Digital Natives	41
Motivations linked to funding sources	41
<i>Research Question 2:</i>	43
<i>Perceived Benefits of Technology Integration</i>	43
Benefits Associated with Motivations	43
Students: Deeper and Focused Experience	44
Teachers: Benefits related to student experiences	45
<i>Research Question 3:</i>	46
<i>How Museums Integrate Technology</i>	46
Collaboration with Outside Partners	47
User Testing	49
Teacher Involvement	50
Challenges and Program Sustainability	52
<b>Chapter 5: Conclusions and Implications</b>	<b>55</b>
Conclusions	56
Implications	59
<i>Concluding Thoughts</i>	60
<b>APPENDECIES</b>	<b>64</b>

<i>Appendix A: Observation Worksheet</i>	64
Observation Worksheet	64
<i>Appendix B: Interview Guide</i>	66
Interview Guide	66
<i>Appendix C: Emergent Coding Example</i>	68

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## **Chapter One: Introduction and Discussion of the problem**

### ***Introduction***

Field trips are ubiquitous in museum practice; they are arguably an integral component to the educational mission of museums and institutions of informal learning, bringing students into the physical space of the museum for encounters with authentic objects. Field trip programming exists as an array of tours, hands-on activities, learning labs, interactive, and immersive experiences. The landscape of field trip programming is diverse and in flux. Similarly, technology continues to reach into every aspect of daily life and society, there has been extensive consideration of the role technology will and should play in education. With an increasing number of technological tools to integrate into educational on the rise, it is useful to look at field trip programming and technology together.

Over the years, a body of best practices in museum field trips has been established (Griffin, 2004; DeWitt & Storksdieck, 2008; Dahl & Stuedahl, 2012). However, reflecting our knowledge of how people learn, new ways of thinking about field trip programming have emerged. A shift from passive tours delivered by docents to interactive programs has occurred over the past several decades. Museums have also begun to look to alternative methods to reach schools including long-term partnerships and collaborations with individual schools, museum trunks, and other outreach programs, such as “virtual field trips” and travelling educators.

In the report “Museums and the American Economy in 2011,” a survey by AAM found that the majority of museums had maintained or increased their program offerings for K-12 schools (AAM, 2012). Even as these new programs have appeared, the single-visit field trip—a bus of students arriving in the morning for a day at the museum—has remained. Single-visit field



trips are more specifically defined as onsite educational programming designed for a school-aged audience at a museum or institution of informal learning. Single-visit field trips fulfill both the educational mission of museums and for many museums act as a revenue generator.

A major pressure on the single-visit field trip program exists in the form of financial strain on school districts and the emergence of tight accountability standards on teachers. Field trip attendance has been declining over the past decade. The American Association of School Administrators reported in 2010-2011 that 51% of schools eliminated field trips (Ellerson, 2010). Statistics such as this are illustrative of a general, anecdotal sense that exists across the field that teachers simply are not able to take their students on field trips as often. With the dual role of museum field trips as a revenue builder and a key component to providing educational opportunities for the school audience, museums should examine and rethink how their single-visit field trips might operate in the 21<sup>st</sup> century.

### ***State of the Field***

Research has shown that field trips do have value for student learning in many ways, particularly in the area of social, affective and cognitive development (Falk & Dierking, 2008; DeWitt & Storksdieck, 2008). Questions remain about how best to capitalize on the unique qualities of museums and informal learning institutions to best serve student learning, though there are some overarching characteristics that are acknowledged to define a quality, impactful field trip experience. These qualities include student agency, limited choice, and relevance, among others (Griffin, 2004). Additional research has begun to delve into teachers' needs in field trip programming, as well as their experience, motivations and agendas while on field trips (Kisiel, 2005). Current field trip practice has grown out of this established body of research; best practices will continue to evolve, as will field trip program design. A recent conversation has

begun about ways field trips may look in the future and one proposed area for consideration and investigation is the role technology will play (DeWitt & Storksdieck, 2008; AAM, 2014).

With the rise of the awareness of 21<sup>st</sup> century skills, defined as a set of goals and learning outcomes that have been developed to prepare students to successfully navigate and operate in the 21<sup>st</sup> century, the integration of technology into education is on the rise (ISTE, et. al., 2007). Ranging from computers to handheld devices to smart board technology, integration of these tools in formal education settings has manifested in many ways. In a report prepared by the International Society for Technology in Education (ISTE), the Partnership for 21<sup>st</sup> Century Skills (P21), and the State Educational Technology Directors Association (SETDA), technology is framed as a pivotal tool in fulfilling 21<sup>st</sup> century learning goals (2007). In addition to the growing role of technology use in formal education, informal learning institutions are integrating technology in many ways to educate audiences. In a recent report from the Center for the Future of Museums, “Building the Future of Education: Museums and the Learning Ecosystem,” the “proliferation of education-related technology and its impact on teaching and learning” (p. 51) is identified as an important change agent (AAM, 2014). Though technology can refer to a wheel or a robot, for this study, technology refers to digital tools that facilitate communication and learning. The growth of technology integration in the wider educational landscape, as well as the conversation surrounding technology use in field trip programming, frames this research study.

### ***Purpose and Research Questions***

Given these questions of program sustainability, the importance of the single-visit field trip for museums, and the desire to create positive impacts for students and teachers during a single encounter, it is valuable to consider the ways technology might provide tools to improve field trip programming.

The purpose of this research study is to understand the ways museums are rethinking single-visit field trip program design, specifically through use of technology. This study will be informed by the following research questions:

1. Why are museums integrating technology into single-visit field trip programming?
2. What are the perceived benefits of technology integration into single-visit field trip programs for various stakeholders?
3. How are museums integrating technology into their single-visit field trips?

### ***Implications***

The results of this study will shed light on the ways technology can be used to enrich single-visit field trip programming at similar informal learning institutions. This study will give insight into the ways some institutions are dealing with the issues surrounding the single-visit field trip and offer a new way of thinking about the potential role single-visit field trips can play in student learning. Most importantly, this study seeks to contribute an understanding of how and why institutions are utilizing technology in single-visit field trip programs and offer a resource to similar institutions looking to tackle the challenge of rethinking their own single-visit field trip programs.

## **Chapter 2: Review of the Literature**

### **Introduction**

In order to best frame the topic of technology in single-visit museum field trips, several bodies of literature must be considered. The most foundational body of literature for this study is that of field trips. Extensive work has been done to establish best practices in program design and an understanding of how students learn on field trips. The first section of this literature review will delve into this literature, particularly in the area of best practices and learning theory. An equally important, though far newer, body of literature exists around the use of technology in museums and in education. Section two will introduce the ways technology has been used in each setting, respectively, as well as what is known and not known concerning the implications of technology use in museums. Section three will bring these two bodies of literature together to discuss the integration of technology into field trips.

### ***Field Trip Literature***

#### ***Learning and Field Trips***

Historically, museums are institutions devoted to the collection of objects and the education of the public. Over the years, museums have deeply embraced the role they can play in education, especially of young people. Taking on a mission to be institutions of informal learning to buttress formal education, a significant way museums strive to impact learning has been the school field trip. Experiential learning has especially impacted the theoretical underpinnings of field trips; more recently, museums have made moves to integrate their programming more closely to school goals and the larger educational community (Storksdeik, et. al., 2007). This

section will briefly discuss several of the many contact points between educational theory and museum field trips.

The resources of museums are most appropriately utilized for learning through hands on experience and encounters with the authentic. We see this from the earliest advocates of museum education, including John Dana Cotton, John Dewey, and Louise Connally (Hein, 2004). These advocates of a progressive pedagogy in the early twentieth century argued early on for museums to play a particular role in education (Hein, 2004). In an article titled “John Dewey and Museums,” George Hein discusses a school and pedagogic model proposed by Dewey in a series of lectures titled *The School and Society* (2004). The school proposed by Dewey called for integration between students’ in-school and out-of-school experiences, envisioning the “ideal school as an institution that includes libraries and museums in an organic whole in which life-experiences and specialized experiences such as reading and museum visits are unified” (Hein, 2004, p.418). Dewey’s affinity for alignment between students’ learning of subject matter and students’ broader experiences in the world is evident in his work *The Curriculum and the Child* (1937). While this work is primarily interested in describing the tension between two schools of thought in education, *The Curriculum and the Child* (1937) is helpful in understanding how field trips might be designed to make material relevant to the life experiences of the child (p. 24).

Field trip program design has long striven to capitalize on a museum’s ability to offer experiences with authentic objects. Falk and Dierking (1997) carried out a study examining museums’ long term learning impacts for students. This study, titled “School Field Trips: Assessing Their Long-Term Impact,” involved interviews with students who had visited a museum for a school field trip sometime in the last one to twenty years. Results showed that the majority of participants could recall a specific learning event from their field trip experience,

making a strong case for field trips' long-term impacts on learning (Falk & Dierking, 1997, p. 215).

### *Best Practices*

Over the past 30 years, extensive research seeking to describe, understand, and argue for the educational value of field trips has been performed (Falk & Dierking, 1997; Griffin, 2004; DeWitt & Storksdieck, 2008). Out of this substantial body of research has emerged an understanding of best practices in field trip design, the types of learning for which field trips are most suited, and implications for future practice (Griffin, 2004; Storksdieck, Robbins & Kreisman, 2007; DeWitt & Storksdieck, 2008; Greene, Kisida, & Bowen, 2013). As noted above, Falk and Dierking (1997) have shown that field trips have long-term impacts; more recently, Greene, Kisida and Bowen (2013) completed a study at the Crystal Bridges Museum of American Art suggesting that students on field trips to art museums “experience improvements in their knowledge of and ability to think critically about art, display stronger historical empathy, develop higher tolerance, and are more likely to visit such cultural institutions” in the future (p. 86).

Falk and Dierking's (2008) Contextual Model of Learning is foundational in understanding visitor experiences in general and is highly relevant to how students learn on field trips. This model of learning takes into account three contexts—personal, physical, and sociocultural—intersecting in each individual (Falk & Dierking, 2008). This model is important to consider for field trip program design because the field trip audience includes a complex combination of teachers and students, bringing the specific context of the classroom as well as each individual's persona, physical, and sociocultural contexts into the museum (Griffin, 2004).

Key types of learning that have been linked to field trip experiences include social, affective and cognitive, all influenced deeply by the personal, physical, and sociocultural context

that each student and teacher brings to the experience (Falk & Dierking, 2008; DeWitt & Storksdieck, 2008). Falk and Dierking delve into the long-term impacts of field trips for these kinds of learning through an examination of respondents' memories of field trips (Falk & Dierking, 1997). Results showed that field trips “result in highly salient and indelible memories” (p. 216) particularly in the realm of social and emotional learning, though evidence of cognitive learning was also found (Falk & Dierking, 1997). Cognitive gains, particularly in the area of content, from field trips tend to be more limited than other kinds of learning, “given the one-off nature of most school trips” (DeWitt & Storksdieck, 2008). Attention to maximizing the cognitive, social, and affective learning inherent to field trip experiences is of critical importance for those involved in designing field trip experiences (Griffin, 2003; Kisiel, 2005; DeWitt & Storksdieck, 2008).

The most recent study seeking to understand the kinds of learning taking place during field trip experiences and explain the value of field trips, mentioned above, is the study conducted at the Crystal Bridges Museum of American Art (Greene, Kisida and Bowen, 2013). This study randomly assigned field trips to groups after creating matched pairs, leading to a “control group” and a “treatment group.” Ultimately, the study collected survey responses from “10,912 students and 489 teachers at 123 different schools three weeks, on average, after the treatment group received its tour” (Greene, Kisida and Bowen, 2013, p. 80). Results showed five areas of impact related to field trip experiences (Greene, Kisida and Bowen, 2013). These five areas were: (1) recalling tour detail, (2) critical thinking, (3) historical empathy, (4) tolerance, and (5) interest in art museums (Greene, Kisida and Bowen, 2013). Additionally, the authors suggest that impacts in these areas related field trip experiences are “generally much larger for students from less-advantaged backgrounds” (Greene, Kisida and Bowen, 2013, p. 85). The

Crystal Bridges study has brought increased attention to the role field trips may play in the larger educational system, for museum practitioners, formal educators, and policy makers alike.

In addition to this established and growing body of research showing the value of field trips for various types of learning, including social, affective and cognitive, a range of studies have been completed to determine the characteristics of successful field trips (DeWitt & Storksdieck, 2008). These studies, taken together, can paint a picture of a “quality” field trip. One major study that sought to understand to the fullest extent possible the characteristics of a quality field trip was undertaken in Cleveland by University Circle, Inc. (Storksdieck, Robbins, & Kreisman, 2007). Through an assessment of the LEAD (Linking Education and Discovery) program, UCI was able to identify “criteria for quality field trips based on local stakeholder perspectives” (Storksdieck, Robbins, & Kreisman, 2007, p. 2). These criteria included alignment between field trip content and school curriculum, a smooth experience in terms of planning and logistics, hands-on and authentic experiences (Storksdieck, Robbins, & Kreisman, 2007). This Cleveland study is reflective of other studies that have shown similar characteristics to define quality field trips (Coughlin, 2010; Griffin, 2004; DeWitt & Storksdieck, 2008).

The above characteristics of quality field trips speak to the concerns of teachers and museum educators, the individuals who facilitate field trip experiences. Research seeking to understand the impact of teachers’ and museum educators’ agendas and desires on field trip experiences is a relatively recent area of interest (Anderson & Zhang, 2003; Griffin, 2004; Kisiel, 2005). Kisiel (2005) utilized surveys and observations to identify teachers’ strategies during field trip experiences. Results identified broad characteristics of strategies utilized by teachers during the visit for a successful visit. These strategies were grouped as “structured student engagement, unstructured student engagement, supervision, and event documentation”



(p. 439) and increased understanding of how teachers are involved with creating student experiences on field trips (Kisiel, 2005). Similar studies attest to the role of teacher agendas in constructing field trip experiences (Anderson & Zhang, 2003; Davidson, Passmore & Anderson, 2010).

Complementing this interest in teachers and educators is a body of research that seeks to understand characteristics of impactful field trips from the student perspective (Griffin, 2004; DeWitt & Storksdieck, 2008; Dahl & Stuedahl, 2012). Characteristics that define a positive experience for students on field trips, based on these studies, include student agency in the experience, understanding of students' prior knowledge and experiences, and relevance (Griffin, 2004). Field trip program structure, it has been shown, is most effective when students are given limited choice. It seems that a certain amount of structure and guidance paired with choice and control create an environment with scaffolding that supports exploration and learning (DeWitt & Storksdieck, 2008).

With three decades of research around field trip experiences, the literature around best practices is deep; looking to the future, several researchers have pointed to the role technology could and should play as an area for further exploration (Storksdieck, Robbins, & Kreisman, 2007; DeWitt & Storksdieck, 2008). In their review of school field trips, DeWitt and Storksdieck (2008) propose a research agenda for the future. One question for further study they specifically put forward is how technology can be "best used to support teachers bringing students on visits" (p. 192). In the following sections, the role of technology in museums will be discussed, along with current examples of how technology has been incorporated into field trips.

## ***Technology in Museums***

### *History of Technology in Museums*

According to Loïc Tallon (2008) in the introduction of *Digital Technology and the Museum Experience: Handheld Guides and Other Media*, one of the most comprehensive look at the use of technology in museum spaces to date, “the first visitor technology used in a museum was handheld” (p.xii). Museums first utilized hand held technologies in the form of short-wave radios delivering audio guides in the 1950s (Tallon, 2008). Through the 1970s, museums continued to refine the use of audio guides, creating more specific tour experiences for their audiences, creating a climate where, “until the Internet, handheld technologies—and specifically audio guides—were the only visitor technology to have been universally adopted by museums” (Tallon, 2008, p. xiv). With the rise of the Internet and advances in both hardware and software, a range of technologies has become available for museums to utilize in interpretation (Tallon, 2008).

Incorporating technology into visitor experiences in museums has revolved around three characteristics: “mobile, digital, and personal” (Tallon, 2008, p. xviii). Through these characteristics, technologies utilized by museums aim to fulfill a sense of “personal relevance and interpretations, interactivity and easy access and control of content” for the visitor (Tallon, 2008, p. xiv). Examples of this kind of technology include hand-held guides on smart phones, multi-media podcasts, and cellphone tours. Technology allows museums to deliver multimedia content in a way that is immediately accessible, more flexible, and more personal than other channels for content delivery, such as text panels (Filippin-Fantoni & Bowen, 2008).

### *Current Best Practices of Using Technology in Museums*

Successful integration of mobile technology into a museum setting depends on understanding how visitors utilize existing systems that is, mobile and technological structures with which visitors are already familiar, such as an interface, social network, or messaging system (Gammon & Burch, 2008). This includes adapting existing mobile structures for visitor use, for example, a mobile phone platform or elements of social media sites (Gammon & Burch, 2008). In their discussion of how to design mobile digital experiences for visitors, Gammon and Burch (2008) describe six characteristics that should be present for successful mobile digital technology experiences:

1. Identify a single audience rather than attempting to be all things to all visitors
2. Mobile technology should behave (or appear to behave) like other forms of technology visitors are familiar with
3. Should make visitors aware that they are in control of the experience
4. Information and experiences provided by mobile technology should match real-life experiences
5. Content and hardware should be designed for social interaction
6. Mobile technology experiences should be prototyped and tested

An influential idea linked the use of mobile technologies in museums is that of visitor constructed trails (Walker, 2010). Mobile technology, based on the six characteristics listed above, should support a visitor's experience and provide content and connections based on the choices made by that visitor in the physical space as they engage in meaning-making while moving through the museum (Walker, 2010). The idea of visitor-constructed trails synthesizes the many factors that go into a visitor's experience and attempts to capture, and possibly

anticipate, the resultant path (Walker, 2010). Ideally, mobile technology supports these trails and facilitates a highly personalized experience in the museum space.

### ***Technology in Museum Field Trip Programming***

#### ***Program Example***

Though museums have a long history with technology use, the integration of technology in many aspects of the museum setting has steadily increased (Screven, 1975; Tallon, 2008). Over the past decade, several museums have carried out pilot programs integrating technology into single-visit, onsite museum field trips, documenting the experience. These programs have been few and far between. One example of such a program is the Myartspace experience in the UK. A detailed description of this evaluation is included to illustrate one way a program integrating technology specifically for a field trip audience can be understood.

#### **Myartspace**

One of the most thoroughly evaluated programs integrating technology in field trip programming across the broadest sample was conducted for Myartspace (Vavoula, et. al., 2009). This program is “a mobile service that supports learning in the museum and connects it with learning in the classroom” (p. 287) designed around inquiry learning (Vavoula, et. al., 2009). Myartspace, via software on a mobile phone, aimed to combine interactions in three distinct “spaces,” physically in the museum and classroom, a personal digital space created by students on phones and computers, and a virtual space with collected artifacts and objects online (Vavoula, et. al., 2009). Implemented at three UK museums, Myartspace included three stages: first, a pre-visit lesson, facilitated in the classroom by the teacher to introduce the idea of collecting and establish inquiry questions for students; second, students investigate the inquiry question by exploring the museum and collecting “relevant evidence and information” (p. 288)

on their mobile phones; third, students interacted with online collections “stores” curated by the museum and teachers, finally collected and presented by students (Vavoula, et. al., 2009).

The evaluation of Myartspace took place over one year and included 3,000 students who engaged with the program, with the primary purpose “to evaluate the potential and effectiveness of the Myartspace service to enhance learning between classrooms and museums” (Vavoula, et. al, 2009, p. 289). The evaluation took place throughout the “lifecycle” of the program, through development process and culminating with the observation a final trial group (Vavoula, et. al., 2009). The evaluation found that:

the Myartspace experience can successfully bridge the museum-classroom gap by facilitating the teacher’s design of pre- and post-visit lessons, enabling students to create artefacts in the museum and have them readily available for further work in the classroom, and extending the museum context into the classroom through personal and museum collections (Vavoula, et. al., 2009, p. 298).

Findings from this evaluation provide one example of a museum field trip program with deeply integrated technology.

### ***State of the Literature***

Up to this point, literature concerning the integration of technology in museum field trips consists primarily of stand-alone program evaluations. These evaluations, though they contribute considerably to the field, focus on participant experiences in pilot programs. For example, the Myartspace experience has since become an open source mobile experience for all visitors, called OOKL. A broader look across the field at multiple examples of technology integration, from the institutional point of view, does not yet exist.

### ***This Study***

The purpose of this study, to understand why museums are integrating technology into single-visit field trip programs, seeks to fill this gap. By taking a cross-case study approach, this study explores institutional experiences in planning and implementing field trip programming utilizing technology during their on-site, single-visit field trips. This study is also interested in institutional reasoning for integrating technology, including the intended impacts of those programs for students and teachers. Out of this study, a picture of technology integration in single-visit museum field trips will begin to emerge.

### Chapter 3: Methods

This study was designed to understand the ways museums are rethinking single-visit field trip programs, specifically through the integration of technology. This is a case study utilizing two data sources – interviews and observations – to deeply understand three cases of field trip programming integrating technology. To this end, the following four research questions were established:

1. Why are museums integrating technology into single-visit field trip programming?
2. What are the intended impacts of integrating technology into single-visit field trip programs?
3. How are museums integrating technology into their single-visit field trips?

This chapter describes a) the research context; b) the methods used for collecting and analyzing data; c) the study samples and sampling procedures; and d) the limitations of the study.

#### *Sampling*

Three single-visit field trip programs at three separate museums were selected as case studies for this research:

1. *Play the Past*, Minnesota History Center (MHC)
2. *Zoo Scene Investigators or Treasure Quest Handheld Computer Program*, Columbus Zoo and Aquarium (CZA)
3. *Surgical Suite: Total Knee Replacement*, Center of Science and Industry (COSI)

Programs were identified through web-based searches. These searches were focused on locating single-visit field trip programs that visibly utilized technology. Programs that specifically

identified technology as a component of the field trip experience in the program description were considered. That is, programs had to promote the use of technology in the field trip program in the description of the program and students interact with the technology on-site during a single-visit.

### ***Program Descriptions***

Brief descriptions of the case study program are provided here in order to provide context for the methods used. More detailed program descriptions will be provided later based on data gathered during observations in order to inform and answer the question of how museums are integrating technology in single-visit field trip programs.

#### *Play the Past, MHC*

Offered as an add-on to field trips to the exhibit *Then Now Wow*, this program equips students with iPod Touches at the beginning of their visit. Using the iPod Touch and pre-loaded software, students explore the exhibit, “enter historical situations and, through critical thinking and collaboration, earn badges and collect digital items for later use” (MHC, *Play the Past* website). Through the collection of digital items students construct a “digital backpack” that teachers are able to access later, extending the experience of the field trip (MHC, *Play the Past* website).

#### *Zoo Scene Investigators or Treasure Quest Handheld Computer Program, CZA*

In this program, classroom groups are confronted with a situation such as a break-in to the zoo or a lost treasure. Through the use of handheld computers, hands-on activities, and interactions with exhibit elements, groups complete the scenario while moving through the zoo.

#### *Surgical Suite: Total Knee, COSI*

This program is an interactive video conferencing program, described by COSI as “a powerful learning experience for students and adults that lets you ask questions and interact via



videoconference with surgeons and medical personnel in a real hospital operating room” (COSI). *Total Knee* is offered both as an outreach program and as an on-site, single-visit field trip. The on-site version of the experience takes place in a theatre at COSI and is the program that was investigated for this study.

## ***Methods***

To answer the research questions, two methods were used in a case study approach, informed by Yin (2009). Utilizing two methods provided multiple data sources in order to gain a complete understanding of these programs. First, focused observations of program facilitators were completed. Second, interviews with several museum staff members involved in varying ways with field trip programming were conducted. Both of these methods are described below.

Methods were selected in order to create a rich, multi-layered understanding of the case study programs. In order to create as complete an understanding as possible of the program, focused observations were completed. The observations were designed to give the researcher first-hand experiential knowledge of the program and the way the technology operated within the program structure. Interviews with program staff, including the program facilitator and at least one individual involved in the design of the program, were chosen in order to address questions of design motivations and intended program impacts. Interviews were designed to have some flexibility to include information gathered by the researcher during observations.

### ***Focused Observations***

Utilizing an observation worksheet (See Appendix A), the researcher collected information about the facilitation of the field trip program, with particular attention paid to the language used and actions taken concerning the technological component of the program by the staff member facilitating the program. Observations also sought to capture information about the

logistical flow of the programs and what the technology looked like “in action.” Data collected utilizing these observations is presented as highly detailed descriptions of the programs, beginning to answer the question of how these institutions are integrating technology into their single-visit field trip programs.

### *Staff Interviews*

Staff interviews were conducted with three individuals at the Minnesota History Center (MHC), two individuals at the Columbus Zoo and Aquarium (CZA), and four individuals at COSI. Interviews were conducted utilizing an interview guide (See Appendix B). These individuals were selected through site contacts based on their involvement with program design and facilitation. At the Minnesota History Center, interviewees included the *Play the Past* Program Manager, the teacher liaison and group lead for *Play the Past* implementation, and the schedule and tech lead for *Play the Past*. At the Columbus Zoo and Aquarium, interviewees included the Education Manager and the Instructor for the Battelle Quest Handheld Computer Program. COSI interviewees included the Director of Community and School Partnerships, the Surgical Suite program manager, and outreach educators who participate in facilitation of the program. All individuals were informed that participation in these interviews was voluntary (See Appendix A and B for consent language used). Interviews lasted between a 30-45 of minutes and involved a series of open-ended questions aimed to address questions of perceived benefits and broader institutional decision-making in program design, particularly why and how a technological component was integrated into single-visit field trip offerings. Interviews were recorded digitally and transcribed.

### *Analysis*

Answers to each question were grouped according to the larger research question to which they relate in order to establish commonalities and differences between programs and

answer the research questions (See Appendix C). For example, instrument questions asking interviewees to reflect on the benefits of technology integration for various stakeholders were grouped under the larger research question of perceived benefits. Responses to these questions were read closely for similar language and themes (Patton, 2002). Salient, illustrative quotes were pulled and grouped according to theme, such as “deeper/more focused experience” as a benefit for students. This series of steps was completed for each research question.

### ***Limitations***

Limitations in this study exist primarily in the area of scheduling. Prior to the site visit, the school group that had reserved the handheld computer program at CZA cancelled. A site visit did occur and the observer was able to walk through the game with the program manager, however, there were no students present. Similarly, during the site visit at COSI, interviews were conducted with multiple staff members at once in order to accommodate daily work schedules. Additional limitations lie in the fact that these institutions do not reflect all museum types and are all located in the Midwest.

## Chapter 4: Results and Discussion

This chapter describes the results of this research study. Results are organized by research question. First, a context for the study will be given through detailed descriptions of the case study programs. These descriptions are based on observations and interview responses, creating a rich understanding of each program and site. In addition to providing context for the study, these descriptions begin to answer the question of how museums are integrating technology into their single-visit field trips. Following this contextual section, results of the study will be presented by thoroughly answering each key research question through themes that emerged from staff interviews.

### Case Study Descriptions

#### *Play the Past at the Minnesota History Center*

This program consists of a mobile game played on an iPod Touch in the *Then, Now, Wow* exhibit at the Minnesota History Center (MHC). The Minnesota History Center is run by the Minnesota Historical Society and *Then, Now, Wow* is one of their most recent exhibits and opened in the fall of 2012. *Then, Now, Wow* was designed with the school field trip audience in mind and *Play the Past* capitalizes on this design, seeking to directly connect students with the physical exhibit elements. Broadly, the game utilizes a mobile app to engage students in grades 4-6 with exhibit elements via QR codes. One MHC staff member describes it as “...a field trip that uses mobile technology as another experiential tool in a museum setting.” The app was built through the ARIS platform in partnership with the Games Learning Society at the University of Wisconsin – Madison.

The program includes a single mobile device for each student. Students create a personalized account on their device via a QR code they are given in an introductory presentation. This introductory presentation includes a video, an overview of the game, and a detailed description of how students will log into the game. Program facilitators also direct chaperones and teachers to guide the students in a “hands-off” way. Students are each handed an iPod, directed to place the lanyard attached to the device around their neck, and login by scanning a QR code, taking their picture, and typing their names. This links all of the activities completed by the student through the course of the program to a personalized account that is passed on to the teacher at the conclusion of the game.

Once students have logged in, they are invited to “explore” the exhibit. Three “hubs” are included in the game: the Iron Mine, the Sod House, and the Fur Trading Post. At each hub, students scan QR codes that are embedded in the exhibit, either on the floor or on exhibit elements. By scanning a QR code, a student initiates a particular “quest.” These quests include activities such as helping a pioneer family plow a field or successfully navigating the fur trade system. Upon completing a quest, a student earns a star. There are a total of nine stars that can be earned by students over the course of the game, three at each hub. Various quests encourage interaction and collaboration between student participants as well as with chaperones. For example, in the Fur Trading Post, students are assigned a role as “hunter” or “clerk.” Based on the assigned role, a student must make decisions about trade. Hunters scan QR codes to collect furs and clerks scan QR codes to build an inventory of goods. Once a collection of furs or goods has been established, a student pairs with another student who is available to trade. Each student attempts to leave the encounter having gained something more valuable than when the deal began. In other quests, students must check in with their chaperone and answer a question in

order to move forward with the game. Students are encouraged by the facilitator to explore the exhibit space freely, though they must maintain contact with their small group chaperone throughout the hour. Additionally, because the game focuses on three hubs in the exhibit, students are concentrated in those areas of the larger *Then Now Wow* exhibit.

Teachers schedule the *Play the Past* game as an hour-long addition to their planned field trip. Planned field trips to the Minnesota History Center include guided paper-based activities in the exhibits. *Play the Past* is scheduled for school groups during their time at the museum and can begin at any point during their visit to the museum, depending on scheduling. Students are gathered in a presentation area to begin their hour-long experience with the game. Because this program is the product of an IMLS grant, teachers can choose to participate in evaluation when they register for the program, receiving the *Play the Past* experience for free. Of that hour, approximately 10 minutes is used as an introduction. Each group that participates is approximately 30 students. Each student is given a device; teachers and chaperones do not receive devices. The facilitator encourages chaperones and teachers to engage in a “hands-off” approach to the activity, allowing students to explore and figure out the game on their own. Chaperones are given a short guide that includes some discussion questions that are linked to certain quests the students are completing. Teachers are not given material to engage with during the program and float between student groups.

During the game, in addition to completing quests, students are encouraged to collect objects for their “digital backpack.” These objects are collected via QR code and are linked to each student’s profile. Teachers are given instructions of how to access these digital backpacks after the field trip. The backpacks include links and descriptions prepared and “curated” by the Minnesota History Center. The *Play the Past* website includes a list of ideas of how teachers

might engage with these resources in the classroom post field trip. One potential post-visit activity found on the *Play the Past* website encourages students to create a piece of historical fiction in graphic novel format by utilizing objects and images collected during the game.

The field trip comes to an end when students receive an alert on their device to return to the distribution area. Alerts are sent out by program staff through a function of the app five minutes before the program is scheduled to end. Students are encouraged to begin bringing their devices back when they reach a stopping point within those five minutes. Devices are collected and returned to the tech cart and prepared for the next group. Multiple school groups can play the game at the same time, though start groups are staggered by 30 minutes.

### ***ZooScene Investigators at the Columbus Zoo and Aquarium***

This field trip program is also a mobile game played on Samsung touchscreen mobile devices. *ZooScene Investigators* is one of three mobile games offered by the Columbus Zoo and Aquarium (CZA). These mobile games are offered as a stand-alone field trip program and were offered by the CZA beginning in 2007. *ZooScene Investigators* was built through the Taleblazers platform developed by the Massachusetts Institute of Technology (MIT). The handheld computer field trip program at CZA, of which *ZooScene Investigators* is a part, is described by one staff member as "...a field trip to get...middle school students to come to the zoo with a purpose in mind of having an educational experience."

During this particular game, a facilitator introduces students to the storyline and the devices through a PowerPoint presentation in the education center. Students are then divided into chaperone groups comprised ideally of one chaperone and six students. Each group is given three devices and one clipboard with a program worksheet. Unlike *Play the Past*, where students are given individual devices, *ZooScene Investigators*, has pairs of students share a single device. A

clipboard is given to the chaperone, which acts as a guide for the game. Based on the device a pair of students is given, they are assigned a distinct role to play in the game. Student pairs can be given the jobs of Spy, Secret Agent, or Police Officer. Groups are guided out of the education building to the grounds and walk through the first task of the game with the facilitator.

The game begins when all groups utilize their camera to engage with the exhibit, through augmented reality. The augmented reality function of this game comes through the camera; when students reach a particular geo-tagged location and point their camera at the physical environment around them, for example, at a statue, animal enclosure, or landscaped area, an “object” appears on the screen. Students then touch the object on the screen and follow any directions that are given. Directions are generally given in the form of video. For the first task, a statue describes the situation to the students through a video: last night, someone broke into the zoo and attempted to steal objects. It is the group’s job to discover who this thief is, what he took, and help zoo security apprehend him.

After the large group completes the first task of finding a digital cardboard box, reading a clue, and discussing the meaning of that clue with each other and collaborating via the hand held devices, groups are set on one of three distinct paths. Groups move from task to task by walking towards shapes on a GPS map that appears on their screens. Throughout the game, students solve clues, meet characters, and learn about the illegal wildlife trade through the story of the thief John Doe. In order solve the clues and collect information, student pairs complete tasks specific to the role they were given at the outset of the game. For example, the pair of Police Officers will activate a video about the illegal wildlife trade and listen to the content. When the video is complete, the students will be prompted to share the information with their group members in



order to move forward with the game. Unlike *Play the Past*, this game utilizes the physical space of the zoo but does not attempt to physically connect student participants with exhibit elements.

The game takes approximately two hours to complete. Up to 50 students can participate in the program at one time. Once the game has been completed, devices are returned to the education staff. *ZooScene Investigators* is one of three mobile games offered by the zoo, in addition to the games *Treasure Quest* and *Race Against Time*. Each game takes place in a different part of the zoo and has a distinct storyline. *Treasure Quest* takes place in the aquarium portion of the CZA and includes “hands-on” activities. *Race Against Time* takes place in the Polar area of the zoo and is completed by pairs of high school students working without a chaperone. Games are scheduled as stand alone field trip programs.

### ***Surgical Suite Live: Total Knee Replacement at the Center of Science and Industry***

*Surgical Suite: Total Knee* is very different than the two mobile games described above. This field trip program is an extension of the Center of Science and Industry’s (COSI) interactive video conferencing outreach program. COSI, located in Columbus, Ohio, hosts a group of students in their Galaxy Theatre to take part in a live viewing of a total knee replacement surgery occurring at Mount Carmel Hospital – East, also in Columbus, Ohio. For this program, there are three audiences involved: schools that are streaming the surgery live without the capability to ask questions, schools linked to COSI to watch the surgery with the ability to interact with the surgeon, and the audience at COSI participating from the Galaxy theatre. The field trip group attending the onsite viewing of the surgery is able to ask questions of the surgeon in the operating room through out the course of the operation. The link between COSI and Mount Carmel Hospital – East is a physical and direct videoconference bridge. A camera placed in the

operating room and shows various views of the procedure, though the view is primarily directly above the patient's knee.

Broadly, a staff member in the studio, where all video conferencing technology is housed, monitors the video and audio connections and facilitates the program. For the audience in the Galaxy Theatre an additional COSI staff member is present as a secondary facilitator. The program begins with an introductory video describing the preparation procedure for a total knee replacement as well as the staff member in the studio describing the round robin question process that will occur during the surgery. Opportunities to ask questions of the surgeon rotate between the schools signed up for the “premium interactive” experience and the audience at COSI. Students are also given instructions of how to ask questions via Twitter, using #COSIknee.

Once the surgery begins, the facilitator of the program becomes, in a large part, the surgeon. The doctor narrates what he is doing as he does it, answering questions as they are asked. The facilitator in the studio checks in with each live site (premium interactive schools and the onsite audience) when there are lulls in the surgeon's narration, to see if there are any questions. Premium interactive students' questions are asked through an adult representative; students in the Galaxy Theatre are given a microphone to ask their question directly to the surgeon. The surgeon cannot see his audiences, but he can hear all of the questions. The COSI facilitator in the studio asks questions submitted through Twitter. Students in the Galaxy Theatre are given the opportunity to examine and explore a set of surgical tools that are in the theatre. These objects can be engaged with at any point, however, on the date of the observation, they were available for students to look at after the surgery concluded. Whereas *Play the Past* and *ZooScene Investigators* utilize technology in the exhibits of their respective museums, *Surgical Suite: Total Knee* is designed to take students to a place they could not otherwise go: the surgical

room at a hospital. While the onsite version of *Surgical Suite: Total Knee* offers students and teachers an opportunity to explore the exhibits at COSI, it is not the primary focus of the program design.

Teachers are provided with pre-and-post visit materials when they reserve this program. One specific resource referenced during the program is the Student Workbook that program participants are encouraged to fill out during the program. When the surgery is complete, students at COSI are given the opportunity to explore the galleries. The program is approximately 75 minutes long. Field trip groups generally have around 30 students, though the theatre can hold a much larger onsite audience. Additionally, audiences for this program are in classrooms across the country, participating through asking questions or viewing/listening to the surgery.

### **Research Question 1:**

#### **Institutional Reasons for Integrating Technology into Single-Visit Field Trips**

Motivations for integrating technology into field trip program offerings varied by institution, however, several specific themes emerged across all three sites as reasons their institutions chose to pursue field trip programs utilizing technology. These themes included specific attention to various curricular standards, a view of technology as the most effective vehicle for content delivery and engagement for that program, and the relevance of technology for teachers.

Additionally, several themes emerged between two of the sites, though not the third, specifically a perception of students as “digital natives,” connections to the classroom, and funding related motivations at MHC and CZA. COSI and CZA also cited bringing in specific,

elusive audiences as a reason for offering single-visit field trip programs with integrated technology, while MHC did not mention this motivation.

### ***Curricular Connections***

One of the most striking themes to emerge across the three case studies was the institutional motivation to integrate technology in order to target specific curricular outcomes. Broadly, the most often cited reason for integrating technology was attention to 21<sup>st</sup> Century Skills. At least one individual at each site mentioned the 21<sup>st</sup> Century Skills as a motivation for technology integration. For example, one interviewee at the Minnesota History Center said, one of “...our goals [is] to integrate 21st Century Learning into the field trip experience.” Of the 21<sup>st</sup> Century Skills, the staff member at MHC mentioned that “the ones we're focused on are critical thinking and problem solving, and the number two is collaboration.” The focus on collaboration and critical thinking was echoed at the Columbus Zoo and Aquarium. One respondent at CZA described their mobile game as “all about that collaboration and working with the chaperone and we really tried to figure out how we could get that whole group to kind of work together.” COSI also linked their integrated technological component to 21<sup>st</sup> Century Skills through career exploration. As described by a staff member at COSI, “...the career aspect has really been emphasized through how important it is for these 21st century skills that have been identified.” Something that should be noted is that it is not clear through these responses whether the programs were designed to incorporate 21<sup>st</sup> century skills separately from the technology or if the technology was used to incorporate 21<sup>st</sup> century skills

In addition to citing 21<sup>st</sup> Century Skills as a reason to integrate technology in their single-visit field trips, each institution referenced their state specific standards. One respondent at the MHC explained that “...we try to connect to the Minnesota state standards...” one interviewee at

CZA explained that, "This particular field trip program is very much focused on school standards." Links to state standards were clear in the motivation for COSI as well, as one interviewee explained that one goal of the Total Knee Replacement field trip is "...tying into standards that they're already learning, through Ohio Standards or if they're coming here, it's definitely Ohio Standards."

Another specific skill mentioned as a motivation for the integration of technology was linked to STEM learning goals. At CZA, where a mobile game has been offered as a stand alone field trip program since 2007, one respondent explained that exposure to technology has been a reason for the field trip. As she pointed out, "...clearly it allows us to introduce kids to technology that they might not necessarily use." Of the sites, respondents at CZA were the only ones who noted the use of technology by program participants as a motivator in and of itself, though as will be seen in following sections, each site saw the particular technological component they have integrated as being the best way to deliver the content of the program, thus achieving the curricular goals..

### ***Technology is effective for content delivery and engagement***

Each site perceived of the integration of technology to be an effective tool for content delivery and participant engagement in the physical environment or subject matter of the particular program. This perspective of technology as an effective tool to deliver the information was discussed by interviewees at each site as a reason to integrate technology in a very deliberate way. One *Play the Past* staff member explained that the integration of a mobile game was because, "It adds an additional tool to explore the exhibits. And to learn. An additional learning tool." At CZA this stance that the technology is a tool to explore was stronger and the deliberate nature of integrating technology was very clear, showing that for this institution, the decision to

integrate technology was first and foremost as a stand-alone program. This is illustrated in one staff member's comments: "It's the entire program. We don't - we very much have a philosophy that we don't just do technology for technology's sake. So, in our mind, in this program, that is the best way to deliver all of the content..." Her comment suggests that this content, information about the illegal wildlife trade, can be powerfully communicated through the narrative created within the game.

Similarly, COSI perceives technology as not only helping students engage deeply in the content, but interviewees saw it as the only way to deliver the content. One respondent pointed out, "...you couldn't do, let's take the technology out of it. Then there's no field trip. You know, you could show some pictures, but that's not going to do it." Another staff member at COSI explained why the content of *Surgical Suite* is most effectively delivered through technology when he said, "there's no way you'd be able to do that. Even if you had all the students in one spot, you're not going to have, you know, like a hundred people crowded around the body like you can see from the camera." It can be seen from these comments that the interactive video conferencing technology is the only way to create the experience of witnessing a knee surgery, one program facilitator noted that a goal of the program is "...to be able to share something with [students] that they might not be able to see otherwise and get a really intimate look at some of the internal structures of their body."

In addition to seeing technology as the most effective method for content delivery, these institutions also perceived technology as offering a unique way to engage students with the physical space. This theme was most marked at MHC and CZA, where interaction with exhibit elements is facilitated through the technology. At MHC, one interviewee described the mobile game as "an easy way for us to tell those stories that aren't being told...you kind of just learn

about individuals in Minnesota that experienced life in certain time periods..." *Play the Past*, in addition to telling these stories, has elements that allow for direct links with exhibit content. One interviewee stated that through the program, "We want [students] to like history more, we want them to be more engaged in the exhibit, in the content of the exhibit." Engaging program participants deeply in content was a reason for technology integration at CZA as well, where one interviewee said, "...we were really looking for a unique way to engage the kids in content other than the traditional methods that have been out there." While MHC and CZA most clearly communicate connections to the physical environment as a reason to integrate technology, it was suggested by one interviewee that attending the program at COSI, they are able to encounter something authentic objects, when she said, "While they're here at COSI, in the theatre they're also seeing some of the different instruments that are used during the procedure." An understanding of technology as an effective tool for engaging with content more deeply is one reason mentioned by each institution.

### ***A Reason for Teachers to Come to the Museum***

Integrating technology into field trip program offerings is not singularly focused on curriculum and content; technology integration is seen as offering an additional reason for teachers to bring their students to the museum. As a major stakeholder group for field trips, this motivation makes sense. The idea that technology is relevant to teachers, and thus a reason for institutions to integrate technology into field trips, can be seen when *Play the Past's* program manager said that the "Number one goal was just to remain relevant to teachers, just because we knew that the standardized testing and the limited funds for busing just made field trips less of an option for teachers." For CZA, a motivation of the handheld computer program is "...to provide those educational opportunities that teachers, you know, need to have for them to come to the

zoo." Reflective of this idea of technology relevance for teachers, one interviewee at COSI mentioned: "I think classrooms teachers are motivated by robotics and some of those fields in STEM, so robotics, the surgeries, the medical field, I think they are motivated and maybe it increases our amount of people that come here through it because it has a technology piece to it." Linked to this idea that these programs provide a reason for teachers to schedule a field trip is a cluster of responses that suggest a hope that as technology draws in teachers, it will bring in elusive or hard to reach student groups.

### ***Elusive Audiences***

Both CZA and COSI mentioned audiences that they find difficult to bring in through their traditional field trip programs and the integration of technology as one way they are working to bring these audiences to the museum. For CZA, this audience is middle school students. Both interviewees at the zoo specifically pointed to the middle school audience and a perception that field trips to the zoo are only relevant to younger audiences, in the words of one interviewee, "People see the zoo as a field trip for kindergarteners." One respondent expanded on this, saying that because "typically our audiences are normally elementary school students, one of our goals was definitely to figure out some kind of way to engage the middle school high school audience."

At COSI, high school students are the target audience of the onsite viewing of Total Knee Replacement. When making the decision to include an onsite version of the program, one respondent stated: "We thought it would bring in a lot more high school groups too to COSI. That was important. And it does, it brings more people in at the high school age level." Reaching these audiences was a goal and motivation for these two institutions to integrate technology into their single-visit field trip programs. At MHC, a particular audience was identified as the target



for *Play the Past*, illustrated by one interviewee when she described the program as “a mobile game interactive for students in fourth through sixth grade...” however, this age-group was not identified as an elusive audience for the History Center.

### ***Technology Relevance for Digital Natives***

Though the Minnesota History Center does not think of the audience for play the past as elusive, as noted above, this institution does see the current generation of students as an audience with very specific needs that can be served through the integration of technology into field trip programming. These students are described as “digital natives” or “21<sup>st</sup> Century Learners” by staff at MHC and *Play the Past* is relevant because “...we know that students, obviously have a lot more usage with technology, iPods, iPads, computers, just all that stuff so I think one of the major things was just knowing that they have this interest...” The relevance of technology to current school-aged kids is noted by CZA as well: “The thing that I like about it is I feel like it really speaks to their language. You know, it's something that they're excited about and that they're used to doing, so for them it's a great method of communication.” Interviewees at COSI did not make note of “digital natives” as a reason for integrating technology into their field trip, however, this could be due to the different technological components utilized (live videoconferencing v. mobile gaming).

### ***Motivations linked to funding sources***

Another common motivation shared by CZA and MHC that was not shared by COSI, and thus potentially linked to the differences between technological components, was that of associated funding sources. At MHC, one respondent described their motivation for integrating a mobile game into a single-visit field trip as an “institutional mandate, we applied for a grant, we received a grant so we have some accountability that we have to actually show our results.” The

grant received by MHC was through IMLS. At CZA technology development and integration, the connection to a funding source was also strong. One interviewee at CZA described the process of deciding to integrate technology into their single-visit field trip program in the following way:

Well the big thing, truthfully, was money. We received an endowment from Battelle that allowed us to have a giant budget for that program. And so when we had all this money, their caveat was they wanted this to be on ground field trips that were dealing with STEM...

The fact that the two mobile games both mentioned funding sources as motivations for choosing to integrate technology into their field trip programs may suggest that these programs are expensive and require this very practical catalyst.

Looking broadly across these themes, there is no single reason these institutions chose to integrate technology into their single-visit field trip programs. However, considering some of these themes, particularly the motivations linked to connecting to curriculum and content delivery, the question of why use technology and not another program method, such as a worksheet, emerges. Implicit in responses to questions related to why these institutions had integrated technology was an understanding that technology integration is not a silver bullet for field trip program design. These institutions offer these programs with technological components *in addition to* their other field trip programs. Technology integration is seen as an important entry point for certain audiences and the most appropriate way to deliver the content of the *specific* program that has been designed to utilize the technology.

## **Research Question 2:**

### **Perceived Benefits of Technology Integration**

These three sites were, broadly speaking, motivated to integrate technology into their single-visit field trip programs for similar reasons. Just as there were commonalities across the reasons institutions chose to integrate technology, there were some clear, overarching themes when they spoke about the perceived benefits technology integration has for various stakeholders. Many of the things mentioned by sites as motivations for integrating technology into their field trip offerings manifested as perceived benefits. In particular, links to standards, relevancy to “digital natives,” and maintaining a sustainable audience emerged as themes. In addition to these benefits that closely mirrored the motivations expressed by institutions, two distinct benefits were articulated for students and teachers: deeper engagement for students and benefits for teachers related to student experiences. This section will explore these themes as they relate to three stakeholder groups: students, teachers, and museums, though with a primary focus on the two benefits that emerged as distinct from motivations.

#### ***Benefits Associated with Motivations***

Three themes that emerged when respondents were asked what the benefits of integrating technology for various stakeholders were closely associated with responses given as motivations for integrating technology into single-visit field trip programs. Because these themes are so similar to issues discussed in relation to the question of why museums are integrating technology into single-visit field trips, they will be addressed here briefly before introducing two new themes that emerged as benefits.

First, all three sites discussed the identity of students as “digital natives” and comfort with technology, though as perceived a benefit of technology integration for the students. For

example, MHC and CZA framed this benefit as technology speaking students' language. Describing the benefits of technology integration for students, one staff member at MHC said, "The benefits for students is, one, we've really been looking at digital natives and I just think that is a language that they speak, is video games and technology." COSI discussed technology as offering an "easier barrier for entry" for students to engage with the program. The second theme that surfaced as both a motivation and benefit was that of curricular and classroom connections, particularly in the form of 21<sup>st</sup> Century Skills and STEM. At MHC, for example, this was framed as "giving tools to teachers to teach in new ways and to integrating 21st Century Skills." Finally, these sites saw the ability to engage elusive audiences as a motivation and a benefit of technology integration. Again, COSI and CZA saw their programs bringing in older school groups and MHC felt that *Play the Past* helps maintain their school group audience. In addition to these three benefits that can be mapped to reasons these institutions integrated technology, two new themes emerged as perceived benefits. The links between motivations and perceived benefits are suggestive of a complex interplay between why these institutions chose to integrate technology and benefits that reinforce those motivations.

### ***Students: Deeper and Focused Experience***

Stemming from an understanding of students as digital natives, all three sites perceived technology as playing a role in creating deep, rich, and focused experiences while at the museums. This was stated quite plainly by one interviewee at MHC: "The technology really helps them be more engaged and really focus in." More specifically, this interviewee noted, the technology creates an opportunity for students "to really delve deeper into the things that are in the exhibit and they can learn more about historic characters..." As an avenue to deep connections with field trip content, respondents at COSI see their Total Knee Replacement

program as “an opportunity to see things that they're not able to see cause they can't travel there. So it's not like they're going to go inside of a hospital or a surgical room and sit in the surgical room and sit there watching.” The ability for technology to connect students deeply with an experience, for these institutions, echoes one of the reasons for integrating technology: that technology is the most effective tool for content delivery in this context.

While MHC and COSI respondents focused on the ways technology could create experiences with greater experiential depth for their student participants, one CZA interviewee made note of a perceived benefit for content retention. She described her experiences with student participants after they had completed the game Zoo Scene Investigators:

So you know, [we] always joke about when you get done playing ZSI with those kids, they can tell you any detail from that game, I mean, they can tell you the most minutiae things where, if you're talking about doing like an auditorium presentation, I don't think they retain as much of it.

This response links the perception of “deeper” engagement with content retention.

These responses suggest that the benefits of technology integration perceived by staff members involved in these projects are primarily informed by a vision of this generation of students as an audience deeply connected to and comfortable with technology. Turning to the next group of stakeholders, teachers, benefits continue to be informed by this concept, though from a different angle.

### ***Teachers: Benefits related to student experiences***

One respondent at COSI, when asked about the benefits of integrating technology into field trips for teachers, said, “Well, obviously all the things that are beneficial for the students are good for the teacher too...” While this response was said with laughter, it illustrates a theme that

emerged across all three case study sites: that the benefits for students—deeper levels of engagement and comfort with technology—were naturally benefits for teachers as well. As one interviewee at MHC pointed out "I think it's exciting for teachers to see their students engaged with each other and collaborate in different ways." Similarly, at CZA, one staff member viewed benefits for teachers from the perspective of student experience: "They see how excited their kids get about it, and especially in schools that don't have a lot of technology I think that they really see the benefit of having that opportunity to have that exposure." And at COSI, an interviewee expanded on the assertion that what's good for students is good for teachers too: "the benefits of bringing the kids here...is to be able to get them in a space that they're involved with too. They see the questions the students are asking, they see their reactions."

In particular, this perceived benefit is indicative of an interesting idea surrounding the teacher audience held by these institutions. While this is presented as a benefit as specifically for teachers, it is still through the lens of student benefits, rather than as a group with distinct needs beyond their students. Responses such as these suggest that perhaps teachers could be looked at more carefully as a group and the benefits—or lack of benefit—of technology integration for the teachers targeted more specifically.

### **Research Question 3:**

#### **How Museums Integrate Technology**

As illustrated by the program descriptions at the outset of the chapter, technology integration manifests in different ways across these case studies. Technology integration at two sites, MHC and CZA is in the form of mobile games played on devices provided by the institutions. At COSI, videoconferencing technology is utilized to allow school groups visiting the museum to watch a surgery in real time. Additionally, *Surgical Suite: Total Knee*

*Replacement* is an extension of COSI's outreach programming. For CZA and COSI, these programs are offered as standalone experiences; at MHC, *Play the Past* is currently offered as an add-on experience.

This section looks more closely at the processes these museums have gone through to implement and maintain single-visit field trip programs with an integrated technological component. Major themes that emerged in the processes of integrating technology across all three sites include collaboration with outside organizations and varying degrees of teacher involvement. In terms of sustaining these programs, several themes emerged as sites spoke of the challenges they deal with in order to maintain these programs as core offerings for visiting school groups. Challenges for sites clustered primarily around issues of the technology itself and funding concerns.

### ***Collaboration with Outside Partners***

Each of these programs engaged in collaborations with outside organizations in order to implement their technology based field trips. More specifically, each of these institutions partnered with universities. MHC worked with the Games, Learning and Society Group, based out of the University of Wisconsin-Madison. CZA worked with MIT through their TaleBlazers project. COSI has an established partnership with Mount Carmel Hospital in Columbus for *Total Knee Replacement*.

For MHC, the process of building a partnership with the Games, Learning, and Society Group came after they had "formally evaluated...about 10 different tools and platforms. We decided to choose ARIS and...at that point we decided to write a grant and get funding to implement. So we were really lucky to receive an IMLS grant." MHC chose to work with the ARIS platform "for the specific reason that you could make changes very quickly," a sentiment

echoed by all of the interviewees. As mentioned previously, CZA also partnered with a university group to create their mobile gaming experience. Their partnership with MIT and the TaleBlazers project was catalyzed when, as one interviewee described it:

[W]e just happened to go to a session where MIT was there presenting and we were like, "Can we do this? We have this crazy thought, we have these trail bags, like, how can we change this into something that's like a technology based and use some kind of instrument for that?" And they said, "We could do this. We're already kind of doing this, we can work something out together." And so we partnered up and we ended up really figuring out how that would work in a field trip setting.

Additionally, CZA specifically mentioned flexibility and change as a characteristic that informed their decision to work with MIT and TaleBlazers to create their program. This is illustrated by one interviewee who said, "The big thing that we liked about their software was that we could change things...we also liked the idea that once we had the software, we could develop our own games without them, if we wanted to." This idea of fluid, "iterative design" was very important for the mobile gaming sites, suggesting was key to the development of both games.

COSI's interactive video conferencing is a direct and on-going partnership with Mount Carmel Hospital. The collaboration between COSI and Mount Carmel started in 2000, when the *Surgical Suite* program was first introduced. The first program was an open-heart surgery observation. Then, in the words of one respondent, a doctor at Mount Carmel:

actually approached COSI saying that he thought a knee replacement surgery would be the perfect thing for video conference because you could really see the anatomy and it's like, you know a shorter time period than the open heart surgery so it was kind of him approaching us to start out that relationship.



This partnership, in addition to providing the focal point of the program, the surgical procedure, was utilized during the larger program development process. According to one interviewee, "I think it was a collaboration between the former director, the outreach team that was here, and then...Dr. Politi designed how it looked, what the kit would look like, the components."

### ***User Testing***

At each site, an element of user testing was utilized when the program was in development. MHC, which has been building their game for the past three years, said about the process of building the game, "So we tested with over 1500 kids in development...we just basically had kids play it, they say something like "Do I have to keep doing this?" And you're like "Nope, we're going to remake that into something more exciting!" User testing is part of the established process of game building at CZA as well, particularly at the beginning of the development process, as one interviewee explained, "So we get together with [MIT], we came up with a couple different story lines, tested them out with some of our student groups and somewhere between, generally we come up with between 3-4 storylines. Test them out then say, 'Ok, what do we like, what don't we like?'" The user testing utilized by these programs is linked to the choices they made concerning the platforms they chose to build their games, that is, to the flexibility to make rapid changes based on the feedback they received from users.

At COSI, because *Total Knee Replacement* is a program that has been in place for over a decade, the staff members interviewed did not have first hand knowledge of how the program was implemented. However, one interviewee mentioned that "when they first did Surgical Suite, the original one was Open Heart Surgery, before they did the knee replacement and I think with that they actually tested it with field trip groups first here at COSI."

### ***Teacher Involvement***

Closely related to user testing, teacher involvement was present in the development process of each of these programs. MHC and CZA built their games with similar degrees of teacher involvement, primarily through user testing as the games were built. At MHC, teacher involvement took two different forms. One staff member described the process in its entirety:

I work with teachers, so that's part of my job, so we also did focus groups with teachers, we had four partner school teachers that were, kinda that signed up actually to help us once every year for two years, so they'd bring their kids to the exhibit, try the game, and then we'd go back to their classroom two weeks later and watch what they did with the backpack, if they did something with the backpack, and we could learn what worked and what didn't work on that end too because that's a big component. A year ago in June we also did a teacher "camp" where we had 8 teachers who we invited and paid an honorarium to come for I think it was two days, as a fresh eye, because we realized that our partner schools, by the end of two years, really knew the program and at that point were so vested, which was great, but they couldn't step back and see with a fresh eye. And we certainly couldn't. So we had eight teachers, we really tried to find teachers from different environments whether it was urban or rural, private or public, we tried to make sure we had a mash of different environments that teachers taught in to try to give us a different perspective and could give us feedback.

Through this detailed description, it is clear that MHC put a system in place to include teachers in the creation of this program, though it is not as clear exactly what aspects of program design they were a part of (interpretive strategies, content development, app design, etc.).

This level of teacher involvement in the development process was not as apparent at CZA though respondents did describe a systematic process involving “a lot of pilot testing. Where we would tell people, come, we'll give you a free field trip. Come and try it so we can see how it works with the kids. And then we just kept revising it, and fixing it, and talking to teachers, and trying again, and it got better every time.” According to one interviewee, this is the process they used when developing each new game, “Until we really got to the point where we like, OK. Now we know what formula works.” Again, as with MHC, it is clear that CZA perceives teacher involvement as part of a system for program development though it is not clear which aspects of the program teacher feedback impacts.

Though the interviewees at COSI were not part of the staff that created and implemented *Total Knee Replacement*, they believed the program was evaluated through their Teacher Advisory Board. Described by one respondent, “I know the former director, she had a group of teachers that she worked with really closely whenever a program was developed, she would test some of the activities with them, like I know for knee they took those actual hands on activities and tested them in the classroom with the teacher.” Following this statement, another respondent agreed, saying, “Yeah, I'm not sure how much, I don't think they really helped with the content design of it or the technology side of it.” Though these comments seem to suggest that teacher involvement was a secondary process to developing this program, because these interviewees did not have a role in the initial program creation this is not known.

This discussion of teacher involvement is linked to both the motivation of technology integration as giving teachers a reason to come to the museum and the perception of how technology integration benefits teachers. As was mentioned during those discussions, giving teachers a reason to come to the museum lent access to different student audiences and teacher

benefits were primarily understood to be in the realm of curricular connections and through the experiences students were having, rather than through the eyes of a teacher audience.

### ***Challenges and Program Sustainability***

When asked about the greatest challenges to creating and maintaining a field trip program with an integrated technological component, respondents from all sites referred to challenges related specifically to the technology itself and funding issues. For all three sites, the rapid changes that take place in technology development were a concern. MHC and CZA touched on this particularly surrounding the devices they use to deliver their programs. The staff member responsible for maintaining the iPods at MHC described the challenge as:

Also the technology, making sure it's up to date. And who knows, maybe in a few years, QR codes are never going to be seen again. And it's a scary thing, but keeping up with technology and knowing, Apple is going to be changing their devices... It's something you have to move along with. And if you don't, the program, or anything will cease to exist almost.

At CZA, one interviewee discussed the challenge in the following way, saying, "Technology changes all the time. We get devices...almost every two years I get a new device, just because technology changes, you want to be able to change with it, which means that everything else has to change...with every device, for us at least, new problems always appear." The theme of technological obsolescence was mentioned as a challenge for COSI as well, though in relation to the technology utilized by the schools that participate from offsite, "Just the fact that things change all the time too, is, even just with video conferencing and like the couple years that I've done it, things are totally different."

Additionally, COSI voiced challenges related to the uncertainty of technology, that “any time you have technology, there's a chance that something can go wrong.” For COSI, this manifests as a concern that the link between the museum and the hospital might be disrupted, because “our connection to Mount Carmel, it's a direct line and it's a physical line, so if anything goes wrong with that, we can't have our program.” CZA also framed logistics of using technology as a challenge, illustrated when one respondent said, “I think, technology, whenever you use technology, any of our programming that uses technology there's always going to be problems with it.” MHC, though they referred to the challenge of keeping up with technology, did not directly mention the hiccups that come when utilizing technology on a daily basis.

Finally, each organization referred to the issue of cost—in terms of institutional resources and funding—when creating a field trip program with integrated technology. This was the challenge that was most linked to program sustainability. Organizational costs such as staff resources were mentioned by each site, for example, one respondent at MHC said, “the sustainability of the staff is huge” when reflecting on challenges associated with the program. Similarly, at CZA one interviewee noted that, “the other part truthfully is having instructors who are really comfortable with it...so I think that's part of it too, having consistency in the staff.” At COSI, the costs associated with staff were the most specific challenges to sustainability mentioned. As one interviewee put it, “Staffing is tough, for sustaining, I mean you have to make sure you have the appropriate staffing in Galaxy theatre, you're pretty much watching them making sure everyone is ok, and making sure the technology is, the feed is ok,...so staffing is another thing at our end that's a challenge.”

MHC and CZA, in addition to citing funding as a motivation for integrating technology into their single-visit field trip programs, described funding sources as a potential challenge to

sustaining their programs. As one interviewee from MHC points out, “Funding is a big problem to keep it going; so we got this big grant, so how are we going to sustain it? We have like 10 years of ideas to implement. So as an institution we're looking at that. We are planning to upcharge, but, and we're also looking to see what are our costs long term?” At CZA, where an endowment provides financial support for the handheld computer program, the longevity of cost is not as great a concern, however, one respondent voiced a larger concern that, “Trying to maintain and have the money to be able to constantly [update technology] is hard. You know, she's fortunate, she [the program manager] has an endowment so she always has those funds. But for our other programs that have technology that would be a major stumbling block.” Each site pointedly described the challenges associated with technology integration. However, these programs have been successfully implemented, proving that the challenges can be addressed and programs can be maintained.

## **Chapter 5: Conclusions and Implications**

This research study sought to understand how and why three case study museums have integrated technological components into their single-visit field trips and the perceived benefits of technology integration for various stakeholders. By looking closely at these three programs, results suggest preliminary hypotheses about the institutional motivations behind technology integration, perceived benefits for various stakeholders, and how museums implement and begin to sustain these programs.

Findings from this research begin to answer a call in the literature to consider the ways technology can be utilized in museum field trips. A recent report published by the American Alliance of Museums highlights technology as a major player in transforming museum education in the coming years (AAM, 2014). With the publication of the Crystal Bridges study, field trips have been receiving increased attention as important learning experience for students (Greene, Kisida and Bowen, 2013). Literature has established best practices in the field of museum education, speaking to the needs of students and, to an extent, teachers (DeWitt & Storksdieck, 2008). Literature surrounding the use of technology in museums, particularly in the form of mobile gaming is just beginning to grow, though it has been shown that designing for a particular audience, building on technology forms that audiences are familiar with, and providing opportunities for decision making are important characteristics of quality mobile experiences (Gammon & Burch, 2008). Linking these two bodies of literature, there has been an attempt to evaluate field trip programs integrating technology on a case-by-case basis; the most complete of these evaluations being the program Myartspace, a pilot field trip experience that was

discontinued as the mobile software has been disseminated for broader use in the form of OOKL. As the Myartpace evaluation suggests, technology integration on field trips has not been addressed field wide or for sustained programs designed as field trip specific experiences. Findings from this study suggest themes regarding institutional motivations for integrating technology, perceived benefits of technology integration, and most importantly, a deep understanding of how three institutions have integrated technology for a field trip audience and sustained those programs.

### ***Conclusions***

Looking closely at the forms these programs take begins to answer the question of how museums are integrating technology. Two of these programs, *Play the Past* and *Zoo Scene Investigators* (and CZA's larger handheld computer program), are mobile games designed to engage participants with exhibit elements in new ways, foster collaboration, and encourage critical thinking. The other program, *Surgical Suite: Total Knee Replacement*, is an interactive videoconference that allows a group of onsite students to experience a surgical procedure in real time, interacting with the surgeon, with COSI facilitators, and with COSI exhibits after the program has ended. Similarly, two of these programs are offered as stand alone field trip programs while one is offered as an additional activity for a larger field trip package.

There was no single reason these institutions chose to integrate technology into their field trip program offerings. However, findings suggest they see these field trip programs as addressing 21<sup>st</sup> century skills and STEM learning in unique ways, thus offering a compelling reason for teachers to visit the museum. Findings also suggest that a motivation for and perceived benefit of technology integration is that these programs will bring in elusive audience groups, particularly older elementary aged to high school groups. Each site also mentioned that



they integrated technology into these programs because they believed that the particular form of technology was the most appropriate vehicle for content delivery, not just for technology's sake. It should be noted, however, that these programs are part of larger on-site field trip programs that are offered by each of these museums and are not seen as the only way for students to learn in museums. This brings to light a certain lack of clarity of why these sites chose to integrate technology rather than pursuing program development through some other media, such as worksheets.

An image of students as “digital natives” was also pointed to as a reason to integrate technology into field trip programs; it is a medium that students are increasingly comfortable and familiar with and these institutions hope to capitalize on this phenomenon. Future research and better understanding of how “digital natives” learn and interact with technology could be used to better inform any future field trip programming integrating technology. In this vein, all three of these sites saw their programs as offering an opportunity for students to have a deeper, more focused experience. Each program contains characteristics indicated by the literature that are important for positive student experiences on field trips. The mobile games attempt to create this for students by creating moments of direct connection to physical exhibit elements and other participants. Each game requires students to make decisions and complete tasks, characteristics that have been shown by researchers to define positive experiences on field trips (Griffin, 2004). Additionally, the videoconference program offers an experience of the authentic by allowing students to observe a surgical procedure in real time, paired with potentially linked experiences in the galleries. Authentic experiences are described as researchers as important for student learning on field trips (Storksdieck, Robbins, & Kreisman, 2007).

Another interesting benefit that emerged from this data is that institutions perceive benefits for teachers as being closely linked to student benefits. Experiencing their students' comfort with or excitement about technology is perceived to be as much a benefit for teachers as something more concrete, such as supporting state standards or 21<sup>st</sup> century learning. The realm of teacher benefits, perceived or actual, is a particular area that could benefit from further exploration in relation to the integration of technology. By perceiving teacher benefits as inherently linked to their students' experiences, it suggests that teachers might be seen as extensions of the student audience, rather than a separate audience. Each of these programs utilized or continues to utilize teacher involvement in the design process, however, none of the case study sites referred to specific program components about which teachers made suggestions, changes, or voiced support. This is an area where further exploration and study would be beneficial.

Finally, this study explored issues of program sustainability for these programs that have integrated technology. One program has been in operation since 2000, the second since 2007, and the third just completed pilot testing in 2013 and is now offered broadly to field trip groups. Even across programs that have been offered for a range of years spanning more than a decade, similar challenges and concerns emerged. Each site referred to challenges associated with cost, either in terms of funding or staff resources. More directly related to the sustainability of technology integration, however, were concerns surrounding the speed with which technology changes and the uncertainty of depending on a technological component to function properly for a program's success. These particular challenges, perhaps, are partially responsible for these institutions maintaining a wide range of field trip offerings, rather than seeking to integrate technological components in to each and every single-visit field trip program.

## ***Implications***

This research illuminates the most significant gap in the literature surrounding technology integration on field trips: an attempt to understand multiple established programs. Findings suggest several potential implications for future research and practice.

By describing how three different institutions have approached integrating technology into their single-visit field trips, this research might provide insights to practitioners considering similar programming. One challenge voiced by a member of the team that implemented the newest program, *Play the Past*, was that “there were no previous examples of doing the types of things that we want to do.” These case studies show that museums are integrating technology in various ways and serve as examples in the field that other institutions can draw upon in order to avoid reinventing the wheel. Additionally, by considering the challenges associated with integrating technology and describing the perceived benefits for various stakeholders, practitioners might be in a better position to fully conceptualize what a field trip program integrating technology might look like at their particular institution.

For researchers, themes that emerged around the perceived benefits prompt the most interesting questions. These case studies voiced benefits that closely mirrored their motivations for integrating technology; future studies might look more closely at the interplay between these benefits and perceived motivations, teasing out and assessing more nuanced distinctions between the reasons institutions choose to integrate technology on field trips and the benefits that come from technology integration. This question could be addressed particularly in the area of benefits for teachers. As technology becomes increasingly integrated in to all facets of museum practice, more generalizable studies for the field trip audience could be important. One perceived benefit for students, that technology can provide a deeper, more focused experience, could be looked at

more specifically. This could be in the form of an exploration of the theoretical or pedagogical frame works underpinning these programs.

When reflecting on the phenomenon of technology integration on field trips more generally, one interviewee at the Columbus Zoo and Aquarium wondered if perhaps technology should be utilized to help get “back to basics” rather than working to constantly keep up with trends. This idea of creatively using technology to enhance various programs rather than as experiences bounded to the technology itself holds promise for researchers and practitioners alike.

### **Concluding Thoughts**

It is my hope that this research provides a more complete and multi-faceted understanding of the ways and reasons for technology integration on single-visit field trips has been employed by these three institutions. In and of themselves, these programs are exciting examples of how technology can be utilized to enrich field trip experiences; more broadly, these programs indicate that technology is one method that could be employed across the field to address the issues associated with field trips. Themes that emerged from this study suggest that conversation between institutions could lead to an increase in such programs; these programs emerged out of interesting collaborations with outside organizations, by extending these collaborations to like institutions, perhaps tools such as mobile gaming platforms or videoconferencing technology can be more widely integrated in to field trip programming. As the field moves forward in an environment of rapid technological development and the emergence of new tools, I hope this study can offer a jumping off point for the conversations that are sure to follow.

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## APPENDECIES

### Appendix A: Observation Worksheet

#### *Observation Worksheet*

#### **Technology Integration in Single-Visit Field Trip Programs**

University of Washington

Researcher: Clare Tally-Foos, atallyf@gmail.com

Thesis Advisor: Jessica Luke

Phone: 206.685.3496. Email: jjluke@uw.edu.

Consent form to be delivered verbally:

I am asking you to participate in an observation that is part of my Master's Thesis work at the University of Washington. The purpose of this study is to understand the ways museums are rethinking single-visit field trip programs through the integration and use of technology. Your participation is voluntary, refusal to participate will involve no penalty or loss of benefits, and you may discontinue participation at any time. If you have any questions now or in the future, you may contact me, or my advisor, through the numbers on the top of this form. Do you have any questions? Do you agree to participate in this observation?

1. Describe the beginning of the program (minutes 0-15) by observing and taking notes on the following:
  - a. How is the technological component introduced?
    - i. What kind of information does the facilitator provide about the technological component?
    - ii. How does the facilitator instruct participants to use the technology?
  - b. Listen to and describe the kind of language the facilitator uses to introduce the program.



- c. Observe and describe the way the facilitator distributes the technological component.
2. Describe links between the technology and the museum setting by observing and taking notes to answer the following questions:
  - a. In what ways is the technology utilized to connect with objects and exhibit elements?
  - b. What is the predominant role of the technology during the course of the program (observer circle one)?
    - i. Primary component
    - ii. Secondary component
3. Describe the end of the program by observing the actions of the facilitator:
  - a. How does the program end?
    - i. Abruptly
    - ii. Group debrief
    - iii. Small group debrief
    - iv. Initiated by a museum staff member
    - v. Initiated by the teacher
    - vi. Gradually
  - b. Is there opportunity for the technological element for use post-visit?
4. Quantitative information to be gathered at the beginning and end of the program:
  - a. How long was the program total (minutes)?
  - b. How many participants were in the program?
  - c. How many pieces of technology were available?
  - d. At what time did the facilitator distribute the technology?
  - e. At what time did the facilitator collect the technology?
5. Final thoughts and impressions from observer about the program facilitation along the lines of research questions (must be recorded by the observer within one half-hour of the end of the program).

## **Appendix B: Interview Guide**

### ***Interview Guide***

#### **Technology Integration in Single-Visit Field Trip Programs**

University of Washington

Researcher: Clare Tally-Foos, atallyf@gmail.com

Thesis Advisor: Jessica Luke

Phone: 206.685.3496. Email: jjluke@uw.edu.

Consent delivered verbally:

I am asking you to participate in an interview that is part of my Master's Thesis work at the University of Washington. The purpose of this study is to understand the ways museums are rethinking single-visit field trip programs through the integration and use of technology. Your participation is voluntary, refusal to participate will involve no penalty or loss of benefits, and you may discontinue participation at any time. If you have any questions now or in the future, you may contact me, or my advisor, through the numbers on the top of this form. Do you have any questions? Do you agree to participate in this interview?

The interview is going to take place in two broad sections, the first concerned with the background of the program, the design and the goals of the program, and the process of integrating technology into the field trip. The second section asks questions about the intended impacts of the program, how the technology informed those impacts, and the phenomenon of technology integration in single-visit field trips in general.

#### **Section 1: Background**

1. How would you describe this field trip program?
2. Would you consider this field trip to fall under the umbrella of a "traditional field trip program" or novel in some way? Why?
3. What are the goals for this field trip program?
4. Have those goals for this field trip changed in the past 3 years or have they remained the same?
5. Has technology always been a part of this field trip program?
6. What factors motivated you (your staff, institution) to integrate technology into this field trip program?

7. Take me through the process of integrating technology into this field trip program.
  - a. How was the technology designed and implemented? (Teacher involvement?)
  - b. What was the biggest challenge to integrating technology into this program and how did you overcome it?

## Section 2: Integration of Technology

1. What are the benefits of integrating technology into a field trip program?
  - a. For students?
  - b. For teachers?
  - c. For museums?
2. How important is the integration of technology in achieving the benefits of this field trip program?
3. What are the major challenges of implementing and sustaining a field trip program that has an integrated technological component?
4. What does the technology add to this field trip experience?
5. Could you reflect on the whole phenomenon of using technology in rethinking single visit field trips?

### Appendix C: Emergent Coding Example

