

**21st Century Skills, Museum Literacy, and Enjoyment in Museums:
An exploratory summative evaluation of *PHEON* at the Smithsonian
American Art Museum**



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Contents

Executive Summary.....	3
Key findings.....	4
Recommendations.....	5
Introduction.....	7
Background.....	7
Methods.....	8
Findings & Discussion.....	10
21 st Century Skills.....	10
Museum literacy.....	13
Usability.....	17
Conclusion & Recommendations.....	21
References.....	23
Appendix A: Instruments.....	25
Appendix B: Game Description.....	32

Executive Summary

The Luce Foundation Center (LFC) of the Smithsonian American Art Museum (hereafter, American Art or the Museum) ran an alternate reality game (ARG) titled *PHEON* (<http://pheon.org/>, <http://apps.facebook.com/playpheon/register/>) from September 2010 through August 2011. The game built upon the success of the Museum's previous ARG, *Ghosts of a Chance* (*GOAC*; <http://ghostsofchance.com/>; Goodlander, 2009), and was intended to increase familiarity with the Museum's collections, programs, and resources; highlight connections between the Museum and its collections with peoples' lives; and attract new audiences. There were two versions of the game. One version could be played online through a Facebook application. The other was an adaptation of the Facebook game for use in the Museum as a multimedia scavenger hunt. This report focuses on the in-museum version of the game. To play *PHEON* in the Museum, visitors arrived on selected days throughout the year or set up a private appointment. Players received a game card of clues and used a text messaging system with their personal mobile devices to complete the missions throughout the Museum.

Despite an established audience of *GOAC* players, *PHEON* struggled to attract participants. The in-museum game enjoyed reasonable attendance, with 802 people participating in 29 events over the year (this number includes public events and private events by appointment up through the months of the evaluation). These numbers were significantly lower than the ones seen during *GOAC*, which boasted 2,760 participants over two years and 1,444 players in the first twelve months of the game.

This report presents findings from an exploratory summative evaluation of the in-museum version of *PHEON* conducted from May to August 2011 (please see the report titled, "Alternate Reality games in casual gaming environments: Exploratory summative evaluation of the *PHEON* game on Facebook" for details of the evaluation for the online game). This study used a combination of qualitative observations and follow-up interviews (k=15 groups) in the Museum along with a web-based questionnaire (n=36) for individuals who played the game prior to the evaluation period.

Participants reported and were observed exhibiting a number of positive outcomes including 21st century skills, museum literacy, and overall satisfaction and enjoyment. Table 1 highlights the three major categories, and themes within each category, which emerged from the observations, interviews, and open-ended survey questions. These themes are described in detail within the body of the report along with direct quotes from the players. Within the category of usability, two themes emerged that pointed to areas in which the Museum could improve for future games. These were usability issues with respect to the game card and mission instructions, as well as a need to strengthen the game's fictional narrative. Study participants mentioned that *GOAC* did a better job of connecting the narrative to the museum environment and game clue than *PHEON* did.

Table 1: Emergent themes related to positive outcomes for *PHEON* players

Major category	Themes
21 st century skills	Technology literacy Trial and error Team work through division of labor Talking to strangers to advance through the game Group and intergenerational learning Re-reading and re-considering evidence
Museum literacy	Engaging with staff Connecting with art Connecting with the museum as space Accessing creature comforts Label reading Using museum vocabulary Advanced organizing Spatial navigation and orientation
Usability	Satisfaction and enjoyment Usability issues Narrative

Key findings

Listed below is a summary of the key findings from this study. They are described in more detail within the body of the report.

- *PHEON* encouraged visitors to stay in the Museum for a long time. Players frequently stayed over two hours to complete an average of three missions.
- In order to complete missions, teams found themselves accessing and practicing myriad critical thinking and problem solving skills through trial and error, team work, intergenerational learning, and more.
- Participants exhibited and practiced museum literacy by applying advanced organization skills (e.g. planning their trip ahead of time using the website and other tools), engaging with staff, connecting with art, connecting with the Museum as a space, establishing a sense of ease in the environment (e.g. accessing benches, coffee, and other comforts), refining spatial navigation and orientation skills, and using museum terminology.
- The interaction between the game clues and the artwork created a memorable experience. Even participants who played the game a year ago were able to remember artwork and galleries that they encountered by playing the game.
- Survey participants who indicated that they were extremely satisfied with their game play experience were also significantly more likely to report that *PHEON* was a more exciting way to engage with art and objects compared to other museum experiences; that *PHEON* allowed them to see objects they never would have found in the art museum on their own; and that it made them feel more comfortable visiting an art museum.
- Usability errors occurred with the text messaging system, the game card, and the Museum map. These issues affected the overall visitor experience by reducing efficiency of game play and

increasing user frustrations. Despite these challenges, overall satisfaction for the game remained high. Navigating the game with the Museum map was a major challenge for all groups because the game card emphasized hidden stairwells and room numbers, while the map emphasized gallery names and collections that were not always apparent in the physical space.

- The game's narrative appeared to have the greatest room for improvement. Qualitative responses in all three data collection methods showed that the narrative needed to be more cohesive between the missions and better connected to the Museum and its collections.

Recommendations

Based on these findings the research team proposes a number of recommendations and lessons learned to share with the museum community:

- **Narrative:** At first it seemed the complex narrative might have been an issue affecting players' experiences, the results showed, however, that visitors did want a complex narrative; they just wanted it to be integrated better into the game. In order for a complex narrative to succeed, it needs to connect to each clue and artwork in the game and do so in a way that progresses the story and its plot. Narratives that relate explicitly to a museum context like *GOAC's* did might be more ideal than something more fantastical or science-fiction oriented like *PHEON's* narrative.
- **21st century skills:** The gaming elements of *PHEON* supported 21st century skills. The use of a mission- or clue-based game card required participants to access critical thinking and problem solving skills. The level of difficulty of the missions was ideal for groups, and the integration of technology through the text messaging system supported intergenerational learning. All of these elements contributed to the success of the game for groups that played it and are recommended elements to include in a future game.
- **Museum literacy:** Terms that are common in a museum setting are often foreign to visitors. Examples from this study included "kiosk", "Luce Center", "accession number", and directional labels like "2N". The results showed that the game helped participants learn these concepts and reuse them again later in the game, but the initial learning curve often negatively affected game play. If new terms are used, consider providing a glossary along with the game card to support both game play and museum literacy. The team tested the game cards with other staff and volunteers. Prototype testing the game card with visitors early on will help to identify what terms need defining.

The study also showed that players engaged with museum staff at different points throughout the game. Because staff members have expertise and knowledge that can support a positive museum experience for visitors, increased comfort talking to museum staff is a desirable outcome. Incorporating staff directly into the narrative was a successful strategy for supporting this outcome and is recommended in future games.

Most importantly, the game encouraged visitors to connect with art through the missions themselves and also serendipitously as visitors moved through spaces they had never seen before, or had not intended to visit. They also connected with the space of the Museum, admiring architectural features and gaining comfort in the environment. These are mission

critical goals for many arts institutions and the use of an immersive game to achieve these ends was very successful.

- **Usability:** The difficulty of a game should be determined by the complexity of the storyline and the challenging nature of the clues and not by factors related to interpreting the game card or figuring out how to use the text messaging system. Structural elements of the game should fade into the background so that players can immerse themselves in the storyline and with the art. This study uncovered usability issues with the game card and text messaging system that might have been mitigated through remedial user-testing earlier in the game's implementation. Such planned, iterative testing is highly recommended for the development of future games.

The Museum map also posed substantial usability challenges to the players. Every single group that played the game struggled with the map. The decision to use an existing tool like the map was resourceful, but the needs of the game did not align well enough with the map's layout and labeled features. *PHEON* required players to move vertically through the museum, accessing stairwells, elevators, doors and even galleries that were not always labeled explicitly on the Museum's map. The Museum's map is designed for a traditional visitor experience which is fairly horizontal and assumes a visitor will walk around the galleries on each floor rather than move quickly between them. Adapting or augmenting the Museum map is recommended for future games and incorporating the game's narrative into the map may help with the cohesiveness and continuity of the storyline.

Overall, the findings suggested that the format of *PHEON* was a good model for in-museum game play to encourage 21st century skills and museum literacy. The findings did not provide conclusive evidence for why the game was not better attended in the Museum, but it did point to possible areas for improvement related to the narrative and usability, which may have had an impact on word-of-mouth marketing from visitors who played the game, though that is speculation.

Introduction

The Smithsonian American Art Museum (hereafter, American Art or the Museum) contracted User Experience Research Consulting, Inc. (UXR) to conduct an exploratory summative evaluation of *PHEON* during the summer of 2011. The Museum wanted to evaluate the strengths, weaknesses, opportunities, and challenges of *PHEON* in both its forms (in-museum and online through Facebook) with an eye toward uncovering lessons learned and best practices to share with the broader museum community and to inform future programs. UXR worked closely with Museum staff during the evaluation period, relying on staff members' extensive knowledge and experience in game-based learning in museums. Museum staff, interns, and volunteers assisted UXR with observations and interviews in the Museum, survey dissemination, qualitative data coding, and literature review efforts.

There were two versions of the game. One version could be played online through a Facebook application. The other was an adaptation of the Facebook game for use in the Museum as a multimedia scavenger hunt. This report focuses on the in-museum version of the game. To play *PHEON* in the Museum, visitors arrived on selected days throughout the year or set up a private appointment for a group. Players received a game card of clues and used a text-messaging system with their personal mobile devices to complete the missions throughout the Museum.

The research protocol was approved by the Smithsonian Institution Human Subjects Institutional Review Board (#HS11032) prior to beginning the investigation.

Background

American Art and the National Portrait Gallery—two museums that tell America's stories through art, history and biography—share a National Historic Landmark building in downtown Washington, D.C. The first floor is split down the middle and visitors can enter either museum from the main entrances and can easily move from one set of collections to another without realizing they have entered a different museum.

American Art's Luce Foundation Center for American Art (LFC or Luce Center) is the first visible art storage and study center in Washington, D.C. This innovative public space has its own staff to manage programs and events providing new ways for visitors to experience American art. The LFC displays more than 3,300 works from the permanent collection in 64 secure glass cases. To help visitors navigate these cases, computer kiosks complete with a searchable database of what is on display are available among the cases.

The Luce Center staff implemented *PHEON* (<http://pheon.org/>, <http://apps.facebook.com/playpheon/register/>), an alternate reality or transmedia game (ARG), in September 2010 following the success of their first ARG, *Ghosts of a Chance* (*GOAC*; <http://ghostsofchance.com/>), which began in 2008. They contracted with CityMystery, the same external game designer they worked with for *GOAC*, to develop the game. *PHEON* received partial funding from a central Smithsonian "innovation fund". The version of the game that visitors played in the Museum (beginning and ending in the Luce Center) occurred once a month on Saturdays or Sundays from September 2010 to August 2011, and was available for groups by appointment through December 2011. During this time, 802 visitors played the in-museum game.

PHEON incorporated a story that involved a secret world, called Terra Tectus, which existed at the heart of our world and was inhabited by clairvoyants, or seers. In this world, seers had existed in all facets of life throughout history. With the power to predict the future, they controlled it. Some chose to remain quiet participants while others surged toward power and conflict. The premise of the game was that a battle was raging between two warring factions of seers: the Staves and the Knaves. Staves were idealistic conservators and protectors of the planet. At best, they were stewards, and at worst, they were unyielding. They favored the simplicity of monks and shepherds. Knaves were pragmatic, self-interested seekers of wealth. At best, they were epicures and connoisseurs, and at worst, they were sociopaths. The narrative incorporated characters from history. For example, Hans Christian Ørsted, the 18th-century Danish physicist and father of electromagnetism, was the mentor of one of the story's main characters.

Visitors to the Museum competed as either Staves or Knaves. At the start of the game, Luce staff asked visitors a short series of multiple-choice personality questions to determine whether the group aligned with the Staves or the Knaves. The outcome of each group's game play was supposed to determine who controlled the fate of Terra Tectus. Appendix B includes the personality quiz used to determine the factions, a description of the game procedures, and a description of each clue.

Methods

Observations and Interviews

UXR developed observation and interview instruments, which were pilot tested by Museum staff during the *PHEON* game held in the Museum in July 2011. Minor adjustments were made to the formatting of the instruments and then deployed during the *PHEON* event held in the Museum in August 2011.

Three researchers collected data during the July event and five researchers collected data during the August event (the last planned public game that played in the Museum). A total of 3 of the 6 teams that played in July and 12 of the 18 groups who played the game in August were observed and/or interviewed (there were a few instances when a group could not be observed but was able to be interviewed and vice versa).

Groups played as either Staves or Knaves (with one group playing as both), and completed an average of three missions in a single museum visit (ranging from 1 completed mission to 6 completed missions for the group that played as both Staves and Knaves). Each mission took approximately 45 minutes to complete (ranging from 35 to 70 minutes).

Two researchers conducted thematic analysis (Braun and Clarke, 2006) of the data using an iterative, grounded theory approach (Charmaz, 2006). Each researcher developed themes in parallel, then merged the codes, determined proto-themes, and re-coded for consistency. Once all coding was completed, the dataset was then re-evaluated by each researcher and consensus was reached for the application of each theme to the associated data.

Web-based Questionnaire

In addition to the observations and interviews, which only captured the experiences of players during the July and August months, a web-based questionnaire was sent to individuals who provided their email contact after playing the in-museum game between the months of September 2010 and August

2011. It was also broadcast via Facebook and Twitter. A total of n=36 individuals responded to the web-based questionnaire which was comprised of five open-ended questions, eleven Likert-type scaled items, two multiple choice questions, and demographic and psychographic questions (see Appendix A). Respondents represented in-museum experiences ranging across all of the months that the game was offered except June 2011.

The survey sample was comprised of roughly equal numbers of females and males (female: n=14, male: n=11, missing data, n=11). The average age of the respondents was 27 years old (SD=10 years, ranging from 16 to 48 years old). The majority of respondents resided in the state of Maryland (n=13) and Washington, D.C. (n=6), with additional representation from Virginia, New Jersey, New York, Georgia, Ohio, California, and Washington (n=1 each, missing data: n=10). Eleven of the respondents worked in a cultural heritage institution or studied in an arts and cultural heritage related field. See Table 2 for additional demographic characteristics of the sample.

Table 2. Demographic and psychographic characteristics of the survey sample (N=36)

Characteristics	Survey Participants % (#)
<i>Gender</i>	
Female	39% (14)
Male	31% (11)
Missing data	31% (11)
<i>Works or Studies in the Arts or Cultural Heritage</i>	
No	42% (15)
Yes	31% (11)
Missing data	28% (10)
<i>State</i>	
Maryland	36% (13)
Washington, D.C.	17% (6)
Other: VA, NJ, NY, GA, OH, CA, WA	19% (7)
Missing data	28% (10)
<i>Visited an art museum in the last 12 months (including for the PHEON game)</i>	
1-2 times	28% (10)
3-4 times	14% (5)
5-6 times	14% (5)
7+	22% (8)
Missing data	28% (10)
<i>Had heard of the Luce Center Foundation before playing</i>	
No	53% (19)
Yes	47% (17)
<i>Played PHEON as a...</i>	
I'm not sure	31% (11)
Stave	28% (10)
Knave	28% (10)
Both	14% (5)
<i>Knowledge of Facebook PHEON</i>	
Aware that there was a FB version of	50% (18)

<i>PHEON</i>	
Played the FB version of <i>PHEON</i>	33% of n=18
<i>Self-reported "gamer"</i>	
Yes	28% (10)
No	22% (8)
I'm not sure	19% (7)
Sort of	3% (1)
Missing data	28% (10)

Limitations

Due to the use of convenience sampling, the results from this study cannot be generalized to museum visitors in general or to game players more broadly. The findings highlight a specific set of experiences that represent a range of ages, group types, and interactions among people who have played *PHEON*. The findings do however point to lessons learned and potential best practices that may be transferable across institutions and in other game settings.

Findings & Discussion

The results from the observations, interviews, and open-ended survey questions were illuminating. Though the game did not have a predetermined list of intended attitudinal or behavioral outcomes associated with it during its development, evidence for a number of meaningful outcomes emerged from the data. Sub-themes emerged under major categories of 21st century skills, museum literacy, and usability (including satisfaction and enjoyment). Challenges or areas for improvement for the game emerged related to spatial orientation in the Museum, usability issues with the text messaging system and the game card, and a lack of cohesive narrative to the game. In the section that follows, I describe each major theme briefly within the context of the existing literature and then describe its sub-themes along with examples from each of the datasets (observation, interview, and survey) where appropriate.

21st Century Skills

Skills-related outcomes associated with “21st century skills” (IMLS, 2009) emerged as a direct result of game play and group learning experiences. Technology literacy was exhibited through use of cell phones and also through a learned use of the kiosks in the Museum. Game play strategies highlighted the critical thinking and problem-solving skills of the groups. Similar to strategies used in other types of mission-based games like *WolfQuest* (Schaller, et al., 2009) or *World of Warcraft* (Steinkuhler & Duncan, 2008), groups applied trial and error, read or re-considered evidence, worked in teams (division of labor), and talked to strangers (other game players) as strategies to solve the clues as a group. These share commonalities to the categories proposed by Bonsignore and colleagues (2011) in their framework for 21st century literacies and ARGs, which included *gather, make sense, manage, solve, create, respect, and collaborate*. Unlike *WolfQuest* and *World of Warcraft*, however, this did not happen in front of a computer screen – the main interface for *PHEON* was the Museum and its collections.

In the paragraphs that follow, I describe each 21st century skill that emerged during the study and provide examples for how they manifested themselves during *PHEON* game play. Many of the game play strategies manifested themselves in broader examples of group and intergenerational learning.

Technology literacy

Technology or digital literacy is an increasingly important skill for 21st century learners in general, and game play in a museum is one more way to support individuals in this competency. *PHEON* required players to find and use the computer kiosks in the Museum early on. The kiosks provided a digital catalogue of works in the Luce Center with text, audio, and video interpretation. This experience early in the game enabled them to access this literacy strategically at other points in the game. For example, a group of players went to one of the visible storage units in the Luce Center (Case 28b) as part of the clue and looked for the “Preserve Jar” (*Preserve Jar with Bilateral Lug Handles*, 20th century, John McLuhan, Smithsonian American Art Museum, Gift of Herbert Waide Hemphill, Jr. and Museum purchase made possible by Ralph Cross Johnson, 1986.65.41). After several minutes they decided to use the kiosk and its associated search function to look up extra information about the jar and were then able to solve the clue immediately [Group 3 observation, 2 adults, Knave Quest 1]. Players also demonstrated comfort using cell phones and text messaging in a museum setting, staying focused on the task at hand. No players were observed using their phones for anything other than the game, which should defray any concerns that cell phone based games might detract from the museum experience or interrupt other visitors when deployed properly. One visitor noted that the game had just the right amount of technology in it when asked what she liked most about playing *PHEON* in the Museum that day:

“The interactiveness with the phone, but also how the game wasn’t just texting. The game didn’t rely too heavily on the phone, but instead included art and other clues.” [Group E interview, 2 adults]

Trial and error

Trial and error was the most common form of problem solving engaged in by players. It also generally required the lowest level of critical thinking of the strategies we saw. This finding mirrors the findings from the Haley Goldman et al. (2009) summative evaluation report of critical thinking skills and scientific habits of mind in *WolfQuest*, a game developed by EduWeb in collaboration with the Minnesota Zoo. In an analysis of data from the gaming forum, this skill was seen in nearly half of the interactions (44%, n=94). Though we used thematic analysis (a qualitative analysis) rather than quantitative content analysis as in the Haley Goldman, et al. study, we saw examples of trial and error used in nearly every group observation. This strategy was most often used within the context of the technologies that were part of the game’s interface, i.e. the text messaging system or the computer kiosks in the Luce Center or elsewhere in American Art (sometimes even in the National Portrait Gallery). If an initial clue typed in to the system returned an error, players would continually think up other variations of their response and keep typing answers until they got it right or until they tried another strategy. For example, one group was observed doing the following, which was typical of this skill practice (M=Adult Male):

M2: This doesn’t make any sense.

M1: I think I can actually picture [the painting] they are talking about.

M2: We could text them [a random guess] and see what comes back.

They try a random text which fails and they both laugh.

M2: Random text guess. [shakes head and laughs]

[Group 3 observation, 2 adults, Knave Quest 3]

Re-reading and re-considering

Once trial and error strategies were exhausted, groups would typically advance to other types of problem-solving strategies; a common one was re-reading or re-considering the clue or information available. Groups would retrace their steps, re-read the clue or the label of the artwork and then re-

consider what to do next. One group spent time in the *American Experience* gallery looking through every painting. More than once they thought they had found the correct one, but realized they were wrong. They then reread the clue and realized they needed to go to the *Folk Art* gallery instead [Group 4, 1 adult, 2 young people ages 12-17, Knave Quest 2].

Team work (division of labor)

Team work, in the form of division of labor, was a common strategy deployed by groups when the clue suggested that a specific artwork in a gallery be found. Groups split up in a gallery space and examined object labels for something related to the clue. For example, a group entered the Lincoln Gallery and once there, they split up. They were thorough, looking at all of the labels associated with artwork in one area before moving on to the next. For another clue, they read the clue as a group, then split up to find an artwork that featured rockets [*San Francisco to New York*, 1969, Alexander A. Maldonado, Smithsonian American Art Museum, Gift of Herbert Waide Hemphill, Jr. and Museum purchase made possible by Ralph Cross Johnson, 1986.65.126]. They covered the whole Folk Art section and finally found the painting near the spot where they had originally begun their search. [Group 1 Observation, 1 adult, 2 kids 11 and under, Stave Quest 2].

Talking to strangers

Talking to strangers in art museums is a rare event. In most cases, groups or individuals come to art museums and interact silently with the artwork, or quietly with their group members; they rarely come to an exhibit to connect with other people they do not know unless the affordances are made in an exhibit or program for such interaction. *PHEON* proved to be a bridge for “stranger-to-stranger interaction” (Simon, 2010, p. 98) as some groups found themselves looking to other game players, who were easily identifiable by their *PHEON* buttons and *PHEON* related disguises, for help when it came to solving some of the clues.

For the few groups who used talking to strangers as a strategy, it was often a last resort. If more than one group was at a clue at one time, a player from one group might ask a player from another group for help or double check an answer with that individual. Many examples of this occurred at the “License Plate” clue (*Preamble*, 1987, Mike Wilkins, Smithsonian American Art Museum, Gift of Nissan Motor Corporation in U.S.A., 1988.39) because it required some amount of time to solve and was located far from the Luce Center where help could typically be sought from Museum staff. One group asked another group for a hint as they worked through decoding the elements in the artwork [Group 10, 1 adult, 1 kid under 11 years old, Knave Quest 3]. Stranger-to-stranger interactions also occurred indirectly when groups saw other players wearing the fake mustache or tie that was an element of the game, identifying the group as either Staves or Knaves. Two groups bumped into each other in the elevator and joked about how small the elevator was, but how grateful they were to not have to take the steps again [Group 5 observation, 2 adults, Knave Quest 3].

Group and intergenerational learning

People often visit museums in groups. Packer and Ballantyne’s study (2005) showed that while there is no learning advantage to visiting in a group versus visiting alone, group visits afford certain opportunities, like the sharing of ideas. Museums have the chance to capitalize on the unique dynamics of group learning, particularly intergenerational, sometimes referred to as “family” learning experiences, for their visitors through unique interpretive strategies and programs. *PHEON* was deliberately designed in a way that working as a group would be more beneficial than working alone. Evidence of *group and intergenerational learning* was displayed in several ways. Some of the strategies described above (e.g.

trial and error and team division of labor) were examples of ways that group learning occurred. In other scenarios, groups were seen staying together the whole time and truly working together to solve each clue. Though older individuals would often take a leadership role, younger players were relied upon too for help with the text messaging and contributed equally to mission completion. In all examples, every member of the group found themselves enjoying the successful completion of different clues.

For example, in one group the adult male photographed the adult female and young girl working together. The adult female texted the next clue, then listened to the recording and started laughing. The young girl worked with her to send the text again and then the adult female responded to the clue's request to sing a song. The adult male laughed and both he and the young girl demanded that she sing the song again. They continued to the next quest still laughing [Group 12 observation, 2 adults, 1 kid 11 and under, Knave Quest 3]. In another example, one group member found the correct sculpture, called the others over, and they quickly solved the clue together [Group 1 Observation, 1 adult, 2 kids 11 and under, Stave Quest 2]. In a final example, one group mentioned in their interview that one of the best things about their experience playing *PHEON* in the Museum that day was in fact "working together" [Group C, 2 adults].

Museum literacy

"Museum literacy" is a concept that emerged in the 1980s and parallels other popular literacy concepts such as "computer literacy" or "library literacy" (Stapp, 1984). Literacy is a competence in understanding the language of a system and a familiarity with the system's environment. The concept has evolved to include reading the world around us, not just text (Hull, et al. 2003). Museum literacy, therefore, is a competence in understanding the language of objects and collections through labels and other interpretive devices (e.g. public programs, games, computer kiosks, museum staff, etc.) as well as the space itself. Literacy, as Stapp points out, results from "education and practice" and not simply from access and passive observation. It is not surprising then that an immersive and engaging mission-based game like *PHEON* resulted in extensive examples of museum literacy. Museum literacy emerged from the observations, interviews, and survey in eight distinct ways: visitors exhibited behaviors or described experiences of advanced organizing, engaging with staff, connecting with art, connecting with the Museum as a space, establishing a sense of ease in the environment by accessing creature comforts, spatial navigation and orientation, and terminology. I will now describe each museum literacy skills that emerged during the study and an example or two for how they manifested themselves during *PHEON* game play.

Advanced organizing

Visitors often engage in museum literacy before they even step into a museum through a process of advanced organizing. Participants self-reported *advanced organizing* activities such as reading about the game online and other pre-arrival activities to prepare for their visit and their game play. Several had played the Museum's previous ARG, *Ghosts of a Chance*. One such group had been waiting to play *PHEON* (based on their positive experiences with *GOAC*) as a present for their daughter's birthday, which happened to occur on the August date of data collection. In another group, one participant had already played *PHEON* as a Stave and brought his brother back to play the Knave version with him. They enjoyed the experience so much that they played all three Knave quests and then all three Stave quests in succession [Group 3 observation, 2 adults]. Another group felt they "needed to get out of the house" and so went on the Museum's website and looked at the calendar to see what was on offer. One of the younger females in the group had played the online game through her mother's Facebook account and

was excited about the prospect of playing in the Museum [Group H interview, 1 adult, 1 young person 12-17, 2 young people 11 and under].

Engaging with staff

Similar to talking to strangers in museums (see 21st century skills above), visitors may avoid engaging with museum staff proactively during their visit. This phenomenon is observed even in living history museums, where the interaction between visitor and staff member (interpreter) is deliberate. Visitor participation often requires active engagement by the interpreter for the visitor to react to, which elicits responses from the visitor (Association for State and Local History, et al., 2009, p. 62). *Engaging with staff* in *PHEON* took the form of game players asking for help not only from Luce Center staff members, but also security guards and information desk attendants located throughout the Museum. One activity within the game required participants to make a funny face at the Museum staff member in order to advance through the game.

Outside of the narrative, several groups engaged with Luce Center staff by asking where they could find the kiosks [Group 4 observation, 1 adult, 2 young people 12-17, Knave Quest 1; Group 7, 2 adults, Knave Quest 1; and Group 9, 2 adults, 1 young person 12-17, 1 kid 11 and under, Stave Quest 1; among others]. Other players asked security officers for help finding their way around when Luce Center staff were physically farther away [e.g. Group 8, 4 adults, Stave Quest 1]. Some groups even engaged staff in the clues and a discussion about the artwork. For example, one group showed a security officer the text message for the clue. The security officer directed the group to the driftwood horse in the Lincoln Gallery and read the label with them. While the group built their foil sculpture to look like the sculpture, the adult male in the group discussed some of the interesting things his group had seen in the Gallery to the security officer [Group 9, 2 adults, 1 young person 12-17, 1 kid 11 and under, Stave Quest 1].

Connecting with art

Connecting with art was a major literacy observed by researchers and reported by visitors in interviews and surveys. Players noticed new artworks, engaged with pieces deliberately through the game, connected art to other life experiences, described learning something new, recalled objects and galleries after the fact, and from time to time, let the art overshadow the game play. Specific clues required participants to engage with art directly. Two examples, which participants particularly enjoyed, involved one clue that required players to find a specific sculpture in the Lincoln Gallery and reproduce it using a piece of foil [Stave Quest 1] and another clue required players to “read” the sheet music on a painting and then call the cell phone system and sing their own rendition of the song.

In addition to explicit calls for participation by the game, players engaged with art serendipitously. Individuals were observed breaking from their group to investigate an artwork or installation more closely [Group 10, 1 Adults and 1 kid 11 or under, Knave Quest 1]. Another group had solved a clue, but rather than rushing towards the Bierstadt painting (*Among the Sierra Nevada, California, 1868, Albert Bierstadt, Smithsonian American Art Museum, Bequest of Helen Huntington Hull, granddaughter of William Brown Dinsmore, who acquired the painting in 1873 for "The Locusts," the family estate in Dutchess County, New York, 1977.107.1*) which was the next location in the game, they took their time looking at art along the way [Group 2, 1 adult, 1 young person 12-17, Knave Quest 1].

In interviews, when participants were asked what the most interesting thing they saw in the Museum was, they were able to recall gallery names and specific paintings and describe new things they had learned. For example, one participant exclaimed, “The horse! [It was] hard to find. We walked passed it.

[We] never would have known it was bronze” (*Monekana*, 2001, Deborah Butterfield, Smithsonian American Art Museum, Gift of the American Art Forum, Mr. and Mrs. Frank O. Rushing, Shelby and Frederick Gans and Museum purchase © 2001, Deborah Butterfield, 2002.3) [Group B interview, 2 adults, 2 young people, Staves Quests]. Another said, “Lots of interesting pieces. Liked the Folk Art throne (*The Throne of the Third Heaven of the Nation’s Millennium General Assembly*, ca. 1950-1964, James Hampton, Smithsonian American Art Museum, Gift of anonymous donors, 1970.353.1) and the Hockney piece, (*Snails Space with Vari-Lites, “Painting as Performance”*, 1995-1996, David Hockney, Smithsonian American Art Museum, Gift of Nan Tucker McEvoy, © 1995-96, David Hockney, 2003.31A-X), even though they weren’t part of the game” [Group C interview, 2 adults, Staves]. Another individual commented that he did not know that Samuel F. B. Morse (of Morse code) used to be an artist and said that was the most interesting thing he had learned [Group G Interview, 1 adult, Stave Quests].

Participants in the web-based survey were also asked to recall the most interesting thing that they saw while they visited the Museum to playing *PHEON*. The vast majority of respondents (83%, n=30) were able to recall an artwork, gallery, or event by name or through description. Even participants who played the game nearly a year ago remembered artwork related to the clues, especially *the Monekana* (Deborah Butterfield) (n=6), the Roszak (*Recording Sound*, 1932, Theodore Roszak, Smithsonian American Art, Museum, Museum purchase, 1989.25) (n=1), Mrs. Adams (*Mrs. John Quincy Adams*, ca. 1824, Charles Bird King, Smithsonian American Art Museum Adams-Clement Collection, gift of Mary Louisa Adams Clement in memory of her mother, Louisa Catherine Adams Clement, 1950.6.5) (n=1), and the Folk Art gallery in general (n=3), as shown in the examples below:

“the cool metal dinosaur sculpture in the modern art area. Got a neat photo of our group by that”
[survey participant, played *PHEON* in September 2010]

“I loved walking through the Folk Art section” [survey participant, played *PHEON* in September 2010]

“recording sound by Roszak” [survey participant, played *PHEON* in January 2011]

“Mrs. John Quincy Adams painting” [survey participant, played *PHEON* in August 2011]

Other participants recalled the belly dancers (n=4) in the courtyard that were active during the opening day of the game. Still others mentioned things that were not directly connected to the game, such as: “they had a painting exhibit of insects” referencing the exhibit “*Alex Rockman: A Fable for Tomorrow*” [survey participant, played *PHEON* in May 2011]; “The sculpture installations took me a little off guard since everything else seemed mostly traditional, but after passing by them a few times I became more interested” [survey participant, played *PHEON* in October 2010]; and “there was jewelry I hadn’t seen before” [survey participant, played *PHEON* in September 2010]. A couple other comments related to the experience more broadly. These two comments highlight the range of prior knowledge individuals walked in with and how that affected their experiences:

“I already have a fair bit of art-historical knowledge and specific knowledge about many pieces in the Museum, so it was fun to draw on that knowledge in a whimsical competition with some really smart college students.” [survey participant, played *PHEON* in April 2011]

“Some of the clues felt very engaging and it was fun to know that others in the Museum shared my inexperience with the subject matter rather than feeling intimidated by the artwork or those who understood it better than we did.” [survey participant, played PHEON in October 2010]

Connecting with museum as space

Not only did participants connect with art explicitly through the game and through other serendipitous encounters, but they connected with the Museum as a space too. Players were observed by researchers and self-reported as seeing parts of the Museum they never would have seen before or had not expected to see; experiencing the art museum in a new way; and finding something they had been looking forward to seeing. Several groups were observed walking through the Robert and Arlene Kogod Courtyard and pointing at the ceiling or admiring the space [Group 3 observation, 2 adults, Knave Quest 3]. One girl mentioned in the follow-up interview, “Some of it was silly. It was an excuse to be silly in a museum” [Group H interview, 1 adult, 1 young person 12-17, 2 kids 11 and under]. Another participant said that it was enjoyable to have “Exposure to new parts of the Museum—parts [he’d] never paid attention to [before]” [Group D interview, 1 adult, 1 young person 12-17].

Some survey participants listed experiencing the space as the thing they most enjoyed about *PHEON*. A few representative examples include:

“How it got me around to different parts of the Museum that I may not have seen before.” [survey, played PHEON in May 2011]

“Discovering parts of the Museum that we would not have explored” [survey, played Phone in April 2011]

Accessing creature comforts

Accessing benches, coffee, and other comforts is a useful component of museum literacy because it displays a level of comfort with the space and it may help reduce museum fatigue, which can cut museum visits short or lead to feelings of dissatisfaction following a visit (Davey, 2005). Game players typically completed three missions, each averaging 45 minutes in length. In order to maintain stamina, players were observed accessing benches, chairs, elevators, and the free coffee provided in the Luce Center, helping them complete the game and stay for over two hours per visit, on average.

Label reading

Label reading is also an important skill, particularly in art museums, because it is the primary language or interpretive medium used to convey information about an artwork. Studies have shown that visitors have difficulty attending to both objects and labels simultaneously and may skim or skip reading many labels (for example, see Bitgood, 1993 and 2000). In addition, we know that learners construct new meaning (Eakle & Brooke, 2008) when learning through reading and interpreting texts and other sources, such as objects. As an explicit component of playing *PHEON*, players had to look closely at labels to solve clues, in many cases re-reading labels to ensure they had not missed anything. In some instances, as described above, participants would read the labels of nearly every painting in a gallery hoping to solve a clue, inadvertently practicing an important piece of museum literacy.

Terminology

As a by-product of label reading (described directly above) and technology literacy (previously described in the 21st century skills section), participants also demonstrated a range of understanding about

different types of terminology or concepts. While many players knew where the Luce Center was located and knew how to find a “kiosk”, others were less aware of these concepts. One mission in particular helped players learn how case numbers are used (Stave Quest 3), which is an important element of understanding an open storage facility like the Luce Center.

Spatial navigation and orientation

Orientation to museums is important, and aids visitors in better understanding the objects and the museum itself (Wolf, 1986). *PHEON* players had both negative and positive experiences with *spatial navigation and orientation*. The American Art Museum shares a building with the National Portrait Gallery, though the division between the two in the physical space is intentionally not pronounced to the casual visitor (though it is more apparent on the map). Many players spent time going through the National Portrait Gallery (NPG) without realizing that they were in a space that would not contain any clues to the game. This is an ongoing challenge for the two museums, however, a game like *PHEON* affords the opportunity to help reduce this confusion by making distinctions to players within the game’s narrative. For example, perhaps the NPG portions of the building could have represented some “bad” location within the Terra Tectus world and if players wished to successfully complete their missions they would need to carefully avoid that area.

Players had difficulty interpreting the American Art Museum map within the context of the game. *PHEON* requires that individuals find stairwells, which are not clearly marked on the map, and move between floors constantly (one of the least favorite components of the game described by survey participants, n=6). The map has a horizontal layout that disconnects with the alternate reality created by the game. A map designed specifically for the game, which highlighted the less-traveled spaces of the Museum would have removed this obstacle without detracting from game play.

Throughout the game, some participants were able to get “lost” and used the experience to learn new things or see new spaces, which they were then able to recognize again later in the game. One survey participant recalled, “By the end, I knew where most things were in the Museum and I knew something about all of the pieces that I had looked for.” Another group got off on the wrong foot with their quest, but enjoyed getting lost: “I like that we went off looking in the totally opposite direction. (laughing)” [Group 2 observation, 1 adult, 1 young person 12-17, Knave Quest 1]. Many others were not so well oriented in the space and repeated the same mistakes over and over again, resulting in a frustrating and aggravating experience for players. One member of a group commented loudly and with frustration, “This map sucks!” [Group 6, 2 adults, Stave Quests]. Another woman threw up her hands in the air two times when in the Great Hall, because she felt like she was going in circles [Group 7, 2 adults, Knave Quests]. A third group had the following conversation:

M: This museum is really confusing me.

F: This isn’t right.

M: I don’t think so either, but it said ‘leave the Luce Center’.

[Group 12 observation, 2 adults, 1 kid 11 and under]

Usability

Usability is concerned with the learnability of systems (how quickly users learn the system); efficiency of use (how quickly a user who knows the system can use it); memorability (how easy the system is to remember the next time it is encountered); error frequency and severity (how often do users make

errors and how serious are they); and overall user satisfaction (U.S. Dept. of Health & Human Services, usability.gov, N.D.). Usability errors occurred with the text messaging system, the game card, and the Museum map, affecting all of these components of usability. Despite these challenges, overall satisfaction for the game remained high. The game's narrative showed the greatest room for improvement.

Usability errors

Usability issues emerged related to the text messaging system, the game card, and the Museum map. At times, issues with one or more elements conflated each other and were hard to separate. In one example, the team was able to find the painting of interest right away, but was confused about how to solve the clue. They texted the answer at first instead of completing the interim step of singing the clue into the phone [Group 1 Observation, 1 adult, 2 kids under 11, Stave Quest 2]. Another group was not sure about which components of the clue to answer using the text messaging system. Instead of typing "nations", which would have been the correct answer to the clue, they typed "waters=nations" [Group 10, 1 adult, 1 young person 12-17 years old]. Though they had successfully solved the clue, usability issues related to instructions and understanding the game system prevented them from advancing through the game several times.

Game card clues used abbreviations and gallery labels that were not always easy to decipher since they were not labeled on the map, and once inside the Museum, the north, east, south, and west orientations became difficult to maintain mentally. In addition, one clue referred to "2N" which confused several people because the previous clues used a slightly different notation (e.g. E252, representing the direction first, then the floor, and then the room number). One group recalled how the cases were labeled and at first thought "2N" referred to a case number in the visible storage area in the Luce Center [Group 13, 2 adults, Knave Quest 3].

Satisfaction and Enjoyment

Beyond all other goals, the Museum wanted *PHEON* to be a fun and engaging experience for visitors. Players demonstrated a great deal of satisfaction and enjoyment with the game through behaviors such as jumping up and down, pointing excitedly at an artwork, exclaiming when they solved a clue, enjoying the game within the space/context of a museum, and self-reporting that it was challenging and stimulating. In the follow-up interview, one group said they would play additional versions or levels of the game if they were made available, "Because it [was] fun, challenging, stimulating, but not overwhelmingly so" [Group B interview, 2 adults, 2 children 11 and under].

Additional evidence for enjoyment with the game was highlighted by the game play behaviors of participants. Players stayed longer in the Museum in order to finish the game, often playing multiple levels and solving all of the clues. Players were motivated and made more determined by the prospect of prizes like the fake mustaches and stamps that they received on their game cards.

Survey respondents rated their satisfaction with the game 8.2 out of 10 on average (see Table 3 below). Participants also indicated that they were likely to recommend the game to a friend with an average rating of 5.8 out of 7.

Table 3: Survey participants' rated satisfaction and likelihood to recommend *PHEON*(n=35)

Overall satisfaction	Mean	SD
<i>Scale 1-10, 1=not very satisfied, 10=extremely satisfied</i>		
How satisfied are you with your experience playing the <i>PHEON</i> game, overall? (scale 1-10)	8.20	1.30
<i>Scale 1-7, 1=not very likely, 7=extremely likely</i>		
How likely are you to <u>recommend</u> the <i>PHEON</i> game to a friend or family member to play?	5.83	1.50

Survey respondents also rated a series of additional scaled items related to their perceptions of the game. Overall the game was reported to be an exciting way to engage with art ($M=5.94$ out of 7) and made people want to play additional versions of levels ($M=5.67$ out of 7) (see Table 4). Respondents also reported that it was challenging ($M=5.86$ out 7) and enjoyable ($M=5.80$ out 7).

Table 4: Survey participants' ratings for scaled items in survey (N=36)

Attitudes towards <i>PHEON</i> (scale 1-7)	Mean	SD
<i>Scale 1-7, 1=strongly disagree, 7=strongly agree</i>		
<i>PHEON</i> was a more exciting way to engage with art and cultural objects compared to other art museum experiences I've had.	5.94	1.26
If there were additional versions or levels of <i>PHEON</i> to play in the Museum, how likely would you be to play them?	5.67	1.41
<i>PHEON</i> allowed me to see objects I never would have found in the Smithsonian American Art Museum on my own.	5.50	1.59
Playing <i>PHEON</i> made me feel more comfortable visiting an art museum than other art museum experiences I've had.	4.92	1.66
I felt strange playing a game like this in an art museum setting compared to other art museum experiences I've had.	3.44	1.70
<i>Scale 1-7, 1=not very and 7=extremely</i>		
How <u>appropriate</u> did you feel an art museum was for playing a game like this?	5.86	1.33
How <u>enjoyable</u> did you find the game?	5.80	0.87
How <u>challenging</u> did you find the game?	4.37	1.50
How <u>complicated</u> did you find the story line?	4.40	1.74

Due to the small sample size, nonparametric statistics were used to analyze the quantitative survey data to determine if there were group differences. No statistically significant differences were found based on whether respondents had ever visited the Luce Center before playing the game, nor based on whether they held a job or studied arts and cultural heritage-related topics.

Participants who were extremely satisfied were more likely to say that *PHEON* was a more exciting way to engage with art and objects compared to other museum experiences ($r(35)=0.71, p<0.01$); to say that

PHEON allowed them to see objects they never would have found in the art museum on their own ($r(35)=0.39, p<0.05$); to say that playing *PHEON* made them feel more comfortable visiting an art museum ($r(35)=0.50, p<0.01$); to find the game enjoyable ($r(35)=0.68, p<0.01$); and to be likely to recommend *PHEON* to a friend or family member ($r(35)=0.66, p<0.01$).

Participants who played both as Staves and Knaves (6 missions instead of 3), were more likely to rate the game as challenging compared to individuals who played as only one type or who could not remember for which team they played ($\chi^2(3)=7.832, p<0.05$).

Males were more likely to indicate that it felt strange to play a game like *PHEON* in an art museum setting compared to other museum experiences they have had ($U=33.50, p<0.05, r=0.49$). Further, people who did not feel that the Museum was an appropriate place for a game like *PHEON* ($n=X$) also indicated that they felt strange playing a game like *PHEON* in an art museum ($r(35)=-0.35, p<0.05$). Their perceived role of art museums and patron behaviors may have clouded their ability to feel comfortable playing the game in the Museum.

Significant positive correlations were found between age and reported interest in playing additional levels of *PHEON*, if they were offered ($r(25)=0.41, p<0.05$), and reported likelihood to recommend the game to a friend or family member ($r(25)=0.52, p<0.01$).

Spatial navigation challenges

The only negative experiences players seemed to have were related to the usability frustrations described above causing some people to feel embarrassed. For example, one group had the following conversation (F=adult female, b=young male):

F: I feel like an idiot right now.

b: How long has it been?

F: an hour.

b: an hour!

F: I'm embarrassed. I don't want to ask [for help], but I'm ready to quit. I'm not asking. You have to ask. I'm too embarrassed.

[Group 10, 1 adult, 1 young person 12-17 years old, Knave Quest 1]

Narrative

Another major challenge in the game was that participants were unsure of the purpose of the narrative or simply lost the narrative shortly after starting the game. Even though the game was intended to be a multimedia scavenger hunt rather than a full-fledged ARG, participants seemed to hold other expectations. One group described the following:

F: I liked the story better in Ghosts of a Chance. It stayed with the narrative better. [PHEON] lost the narrative.

M: Yeah it mentioned [Terra Tectus] a few times in the beginning but then it just dropped off.

[Group 12 interview, 2 adults, 1 kid 11 and under]

Another group had no idea whether they played as Staves or Knaves when approached during their third Knave Quest for an observation, indicating a lack of “sticking power” for the narrative. During a follow-

up interview the Adult Female mentioned that she was not sure she understood the story behind the game [Group 13 observation and interview, 2 adults, Knave Quests].

The need for a stronger, more cohesive narrative also emerged from the open-ended survey question, “If you rated your satisfaction with the game a 9 or lower, what would have made the experience a ‘10’?” Participants gave a range of responses represented by the following:

“A more intriguing plotline, more realistic situations that makes the story believable.” [survey participant, played PHEON in April 2011]

“More of a connection between the game play and the back story re: Terra Tectus and the two worlds” [survey participant, played PHEON in September 2010]

“Ghosts of a Chance was good because you could believe the Museum was haunted, but maybe PHEON was too much of a stretch and we all just acted silly instead, including the staff. If it's supposed to be a family game, might as well make the storyline a bit more family-friendly as well (I don't think people on my team cared much about it anyway).” [survey participant, played PHEON in October 2010]

“...More pervasive narrative instead of one paragraph of mythology at the start that had almost nothing to do with playing the game. Feeling like our actions were heroic or important to something (e.g. the preservation of the Museum).” [survey participant, played PHEON in May 2011]

“More challenge, more story” [survey participant, played PHEON in May 2011]

These qualitative findings correspond to the quantitative analysis as well. Participants who rated the storyline complicated also reported that the game was enjoyable ($r(35)=0.43, p<0.01$) and challenging ($r(35)=0.54, p<0.01$), further supporting the potential benefits of a more cohesive and complex storyline.

Conclusion & Recommendations

“every museum staff member should take a tour of their museum collections with game designers. ...seeing your galleries through the eyes of a game designer can be incredibly illuminating. ...we often become too familiar with our own museum and do not see the potential for gaming hidden in every artwork, stairwell, or plant pot!”

[Email correspondence between Georgina and Alex Moseley for Museums at Play]

This report describes the results of an exploratory evaluation study that used observations and interviews in the Museum as well as a web-based survey of PHEON players conducted in the summer of 2011 to learn more about the experience of playing PHEON in the Museum. The in-museum game seems to have achieved the right balance of technology, game play, and connections to art to support a series of outcomes related to 21st century skills and museum literacy while also supporting enjoyable experiences for visitors of all ages. The game’s narrative showed the strongest room for improvement and future games should consider better integrating the storyline into the missions as visitors move through the museum. Based on these findings the research team proposes a number of recommendations and lessons learned to share with the museum community:

- **Narrative:** At first it seemed the complex narrative might have been an issue affecting players' experiences, the results showed, however, that visitors did want a complex narrative; they just wanted it to be integrated better into the game. In order for a complex narrative to succeed, it needs to connect to each clue and artwork in the game and do so in a way that progresses the story and its plot. Narratives that relate explicitly to a museum context like *GOAC*'s did might be more ideal than something more fantastical or science-fiction oriented like *PHEON*'s narrative.
- **21st century skills:** The gaming elements of *PHEON* supported 21st century skills. The use of a mission- or clue-based game card required participants to access critical thinking and problem solving skills. The level of difficulty of the missions was ideal for groups, and the integration of technology through the text messaging system supported intergenerational learning. All of these elements contributed to the success of the game for groups that played it and are recommended elements to include in a future game.
- **Museum literacy:** Terms that are common in a museum setting are often foreign to visitors. Examples from this study included "kiosk", "Luce Center", "accession number", and directional labels like "2N". The results showed that the game helped participants learn these concepts and reuse them again later in the game, but the initial learning curve often negatively affected game play. If new terms are used, consider providing a glossary along with the game card to support both game play and museum literacy. The team tested the game cards with other staff and volunteers. Prototype testing the game card with visitors early on will help to identify what terms need defining.

The study also showed that players engaged with museum staff at different points throughout the game. Because staff members have expertise and knowledge that can support a positive museum experience for visitors, increased comfort talking to museum staff is a desirable outcome. Incorporating staff directly into the narrative was a successful strategy for supporting this outcome and is recommended in future games.

Most importantly, the game encouraged visitors to connect with art through the missions themselves and also serendipitously as visitors moved through spaces they had never seen before, or had not intended to visit. They also connected with the space of the Museum, admiring architectural features and gaining comfort in the environment. These are mission critical goals for many arts institutions and the use of an immersive game to achieve these ends was very successful.

- **Usability:** The difficulty of a game should be determined by the complexity of the storyline and the challenging nature of the clues and not by factors related to interpreting the game card or figuring out how to use the text messaging system. Structural elements of the game should fade into the background so that players can immerse themselves in the storyline and with the art. This study uncovered usability issues with the game card and text messaging system that might have been mitigated through remedial user-testing earlier in the game's implementation. Such planned, iterative testing is highly recommended for the development of future games.

The Museum map also posed substantial usability challenges to the players. Every single group

that played the game struggled with the map. The decision to use an existing tool like the map was resourceful, but the needs of the game did not align well enough with the map's layout and labeled features. *PHEON* required players to move vertically through the museum, accessing stairwells, elevators, doors and even galleries that were not always labeled explicitly on the Museum's map. The Museum's map is designed for a traditional visitor experience which is fairly horizontal and assumes a visitor will walk around the galleries on each floor rather than move quickly between them. Adapting or augmenting the Museum map is recommended for future games and incorporating the game's narrative into the map may help with the cohesiveness and continuity of the storyline.

Overall, the findings suggested that the format of *PHEON* was a good model for in-museum game play to encourage 21st century skills and museum literacy. The findings did not provide conclusive evidence for why the game was not better attended in the Museum, but it did point to possible areas for improvement related to the narrative and usability, which may have had an impact on word-of-mouth marketing from visitors who played the game, though that is speculation.

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Appendix A: Instruments

In-Museum Observation

Researcher Name:

Today's Date:

Time Start observation:

Time End observation:

Which quests or activities did the group complete?

What was the composition of the group?

_____ # adults (18+)

_____ # young people ages 12-17

_____ # kids (11 and younger)

Describe any difficulty that the group had with the game/quests? Where did the difficulty occur? (where in the museum, which portion of the activity) How did the group overcome it? (e.g. team effort, asked Luce staff, etc.)

	Description of difficulty	Location where difficulty occurred	How group overcame difficulty
1			
2			
3			

What comments did you overhear, or behaviors did you observe, from the group while they were trying to work it out? (use quotation marks when the quote is exact, use brackets for quotes or portions of quotes that are summarized, indicate gender and approx. age of individual making the statement if possible)

Describe any enjoyable experiences that the group appears to have with the game/quests? Where did these enjoyable experiences occur? (where in the museum, which portion of the activity)

	Description of enjoyment	Location where enjoyment occurred
1		
2		

3		

What comments did you overhear, or behaviors did you observe, from the group while they were expressing enjoyment/happiness?

Any additional notes or observations:

Once the observation is complete, ask them to answer a few questions (see interview protocol).

Follow-up in-Museum Interview

Age of interviewee:

Gender of interviewee:

Role in group:

What was your primary reason for visiting the Luce Center today? (Probe: What made you and your group want to come to the Luce Center/SAAM instead of going to a movie, sports game, or other museum in DC?)

How did you hear about Pheon? (Probe: How did you know that you could come to the museum and play the game? Where and when did you first hear about it?)

If you had to describe Pheon to a friend or family member back home, how would you describe it? (Probe: What would you tell them it was about? What kind of game is it?)

If there were additional versions or levels of Pheon to play in the Museum, how likely would you be to come back and play them?

Why or why not?

Were you aware that you could play Pheon online through Facebook?

No

Yes

I'm not sure

Other _____

If yes, how likely are you to play the game online once you leave the Museum today?

Why or why not?

What was the most interesting thing you saw while you played Pheon today?

What did you like MOST about your experience playing Pheon in the museum today?

When you were playing I noticed that you [something they did that you wanted to learn more about]. Can you tell me about that? What was happening? What did you decide to do?

What comments or suggestions do you have for improving the game for future visitors? (Probe: What could we do that might make you want to come back, if you could, and play again?)

Web-based Survey

Playing Pheon at the Smithsonian American Art Museum

*Denotes required questions.

Consent to participate in this survey

Thank you for taking a few moments to share your thoughts with us. This survey will help us better understand the ways in which people engage with the Smithsonian American Art Museum and Luce Foundation Center through our online and in-museum activities.

Provide your email at the end of the survey to be eligible for a \$5.00 Amazon.com gift card. A total of 30 gift cards will be given away in a randomized drawing. No participation required. To enter the drawing without completing the survey, send your name and email address to Smithsonian Institution, P.O. Box 37012 MRC 970, Washington D.C., 20013, attn: Georgina Goodlander. We will not share your contact information. Winners will be randomly selected and notified on September 1, 2011.

The survey should take 5-10 minutes to complete. Your participation in this survey is voluntary. You may stop at any time by closing your browser window. Your responses will be kept anonymous, and your open and honest feedback will be most useful to the Museum as we move forward with the development of future games and programs. If you have any questions about this survey, please contact Georgina Goodlander, Interpretive Programs Manager, Luce Foundation Center, at [goodlanderg\[at\]si\[dot\]edu](mailto:goodlanderg[at]si[dot]edu).

The Smithsonian is using SurveyGizmo, a third-party web-based survey tool to conduct this evaluation. Please note that SurveyGizmo's privacy policy and other terms apply. Any data that the Smithsonian receives from SurveyGizmo is subject to our privacy statement, which can be found at <http://www.si.edu/privacy/>.

If you are at least 13 years of age and voluntarily agree to participate in this survey, then please click the "I agree" button below:*

I agree

Getting started with Pheon

In this section, we're interested in learning about how you joined Pheon, an alternate-reality/transmedia game played online through Facebook or off-line at the Smithsonian American Art Museum. Even if you only played it a bit, we really want to hear from you. And, if you can't quite remember, that's fine. Just let us know!

How did you first hear about Pheon?*

- A friend or family member shared it with me
- Advertising through Facebook
- Advertising through the Smithsonian American Art Museum website (which includes the Luce Foundation Center website)
- Advertising through the Smithsonian American Art Museum building in Washington, D.C. (which includes the Luce Foundation Center space)
- Advertising or announcement through Ghosts of a Chance
- Advertising through third-party website (e.g. Brightest Young Things, The Washington Post)
- Other. Please describe:: _____

During which month did you visit the Luce Foundation Center in the Smithsonian American Art Museum and play the Pheon game?*

- January 2011
- February 2011
- March 2011
- April 2011
- May 2011
- June 2011
- July 2011
- August 2011
- September 2010
- October 2010
- November 2010
- December 2010
- I'm not sure

Did you play Pheon as a:*

- Stave
- Knave
- Both
- I'm not sure

Before playing Pheon at the Smithsonian American Art Museum, had you ever visited the Luce Foundation Center before?*

- No
- Yes
- I'm not sure

Playing Pheon in a museum setting

What was the most interesting thing you saw while you visited the Smithsonian American Art Museum to play Pheon?

What did you LIKE MOST about your experience playing Pheon in the museum?

What did you LIKE LEAST about your experience playing Pheon in the museum?

Playing Pheon in a museum (cont'd)

Please indicate how much you agree or disagree with each of the following statements on a scale from 1-7, where 1=strongly disagree and 7=strongly agree.

1 - Strongly disagree 2 3 4 5 6 7 - Strongly agree

Pheon was a more exciting way to engage with art and cultural objects compared to other art museum experiences I've had.

Pheon allowed me to see objects I never would have found in the Smithsonian American Art Museum on my own.

Playing Pheon made me feel more comfortable visiting an art museum than other art museum experiences I've had.

I felt strange playing a game like this in an art museum setting compared to other art museum experiences I've had.

If there were additional versions or levels of Pheon to play in the museum, how likely would you be to play them? (scale 1-7)

Please explain your rating: _____

Tell us what you think about Pheon (cont'd)

Now that we know what you did or did not do with Pheon, we want to hear what you think about it – the good along with the bad. We want you to be as honest and candid with your feedback as possible. And, we want your opinions even if you hardly ever played it.

On a scale from 1-7, how challenging did you find the game?*

On a scale from 1-7, how complicated did you find the story line?*

On a scale from 1-7, how enjoyable did you find the game?*

On a scale from 1-7, how appropriate did you feel an art museum was for playing a game like this?*

On a scale from 1-7, how likely are you to recommend the Pheon game to a friend or family member to play?*

Overall satisfaction score

On a scale from 1-10, how satisfied are you with your experience playing the Pheon game, overall?*

(If 9 or lower) What would have made the experience a "10"? _____

Any other thoughts or comments?

Is there anything else about Pheon and/or playing mission-based games in an art museum setting that you would like to share with us? Please write your comments here.

More about you

Finally, tell us just a bit more about yourself. This information helps us know who the Museum is reaching with its programs and online activities.

Which of the following options best describes who you played the game with?*

() Alone

- With one other adult
- With more than one adult
- With younger people under the age of 18
- With at least one other adult and at least one younger person under the age of 18
- I don't remember
- Other. Please describe:: _____

Did you play the game as part of a special group (e.g. tour group, summer camp, etc.)?*

- No
- Yes
- I'm not sure

Have you been back to the Smithsonian American Art Museum or the Luce Foundation Center since playing Pheon?*

- I have been to the Smithsonian American Art Museum but not the Luce Foundation Center
- I have been to the Luce Foundation Center
- I have not been back to either
- I don't know
- Other. Please describe:: _____

In the past week, approximately how many hours did you spend playing a computer-based game, if any?*

Do you consider yourself to be a "gamer"?*

- No
- Yes
- Sort of
- I'm not sure

In the past 12 months, how many times did you visit an art museum (if at all)?*

- 0 times
- 1-2 times
- 3-4 times
- 5-6 times
- 7+ times

Do you work in an arts or cultural heritage profession, or study an arts or cultural heritage field?*

- No
- Yes
- I'm not sure

Are you:*

- Female
- Male
- Prefer not to answer

In what YEAR were you born (e.g. 1982)? [drop-down list]

In which country do you currently reside?*[br/>[drop-down list]

State

In which state do you currently reside?[br/>[drop-down list]

Drawing for Amazon.com gift cards

If you would like to be included in the drawing to receive a \$5.00 Amazon.com gift card, please provide a valid and reliable personal email address below. We will not use this information for anything else, nor will we share it with any third party sites. Winners of the drawing will receive a gift card directly from Amazon.com by email on September 1, 2011.

Please provide a valid and reliable personal email address:

Email (e.g. jane.smith@gmail.com):: _____

Pheon online

Were you aware that you can play Pheon online through Facebook?*

- No
- Yes
- I'm not sure

Playing Pheon off-line

Did you ever play the game on Facebook, or intend to play it?*

- No
- Yes
- I'm not sure

Want to tell us more about your experience?

We are also interested in hearing from people who played the game online. If you are also interested in filling out that survey, please copy and paste this link into a new web browser window and then click the "submit" button below: <http://www.surveygizmo.com/s3/594917/Alternate-Reality-Games-and-Museums>

Thank You!

Thank you so much for your feedback and ongoing support! If you have any questions about Pheon or this survey, please contact Georgina Goodlander, Interpretive Programs Manager, Luce Foundation Center, at [goodlanderg\[at\]si\[dot\]edu](mailto:goodlanderg[at]si[dot]edu).

Appendix B: Game Description

Prior to game

1. Staff alerts other museum staff (security, custodial, information desk volunteers) of game in case they get asked unusual questions by players and so that they do not remove clues.
2. Staff members set up game by placing clues throughout the Museum. Staff members monitor the clues during game duration and replace clue (for example, tin foil sheets) as necessary.

At Registration Table

1. Staffer administers knave/stave questions to establish which game they will be playing (knave or stave). Staffer asks participants 3 of the questions from the list and mixes it up so that different groups are asked different sets of questions:

Which would you rather pig-out on?

- Salted peanuts (Stave)
- Cupcakes (Knave)

When you meet someone new, do you:

- Compare him/her to someone you already know. (Stave)
- Zero in on how unique he/she is. (Knave)

You witness a crime, which would you do?

- Take off, and once out of danger call the police. (Stave)
- Physically intervene. (Knave)

You're having a dream about fishing, are you?

- Wading in a stream. (Stave)
- On a boat in the middle of the ocean. (Knave)

If you have a choice, which route do you take?

- Uphill (Stave)
- Downhill (Knave)

Which would you rather untie?

- A knot (Stave)
- A bow (Knave)

If you played professional football, which squad would you be on?

- Defense (Stave)
- Offense (Knave)

You like someone. Do you show it by buying them—

- Candy (Knave)
- Flowers (Stave)

A flower you identify with.

- Daisy (Stave)
- Rose (Knave)

Shoes you prefer to wear.

- Running shoes (Stave)
- Boots (Knave)

Your favorite drink.

- Soda (Knave)
- Juice (Stave)

Would you prefer spending a day

- At a spa (Knave)
 - Hiking (Stave)
2. Staff member informs player of museum rules and gives introduction to game, including telling players the Terra Tectus narrative.
 3. Each team receives a knave or stave game card, a handwritten note, map of the Museum, and a pencil. Each player receives a button.

Knave Quest 1

1. The player has a knave game card and a small handwritten note that says "INVISIBLE FORCES" on one side, with a nice message from a previous player on the other (players write anonymous notes at the completion of all three missions). The player texts PHEONPHEON to 56512 to set up with Guide by Cell.
2. The game card directs the player to search for "Invisible Forces" on a Luce Center kiosk (keyword search). They find *After Wood* (1990.46a-b). In the media section is a file named "Terra Tectus, the Great, is Fallen!" Game card instructs player to write down "Terra Tectus."
3. Game card directs players to *Babylon, The Great, Is Fallen* in Folk Art on the 1st floor West. They are directed to text "what waters =" to 56512. Players text "nations." (The painting includes text that says "waters = nations")
4. Players receive text that tells them to turn around and look behind the pedestal. They find a box with tickets. The ticket directs them to *Among the Sierra Nevada* (1977.107.1). The ticket also includes a confirmation code: NCHCAGVVG.
5. Player goes to *Among the Sierra Nevada* on the second floor. The game card leads them to decode the confirmation code to get "LAFAYETTE." (A=Y, H=F, C=A, etc. subtract two from each letter to get the answer. Players might find it helpful to write out the alphabet)
6. Game card instructs players to find "LaFayette" in the Luce Center in case 20B (They find out the case number by adding the number of deer in the painting (7) to 13, per game card).
7. They find a sign near *Head of Marquis de Lafayette* tells players to go to the Registration Table and make "the face you'd make if you suddenly found yourself in Terra Tectus."
8. If the player makes a good face, the Museum staffer stamps the "1st quest" part of the game card and says: "That's a great face! But you will need to disguise yourself as a stave for the next mission." Staffer gives each player a skinny tie.

Knave Quest 2

1. Players wear their skinny ties. The ties say "35 Year Portrait" on the back. Game card instructs players to look for the "Preserve Jar" in case 28B.
2. A sign on case 28B near the jars tells players to look for the sculpture named on the back of their tie. The game card hints that it is in the Lincoln Gallery.
3. Players find *35 Year Portrait (2005.5.2)* in the Lincoln Gallery. The game card asks them to text missing word to 56512. Players text "Virgo" to 56512
4. Players receive a text that directs them to find "H&H" in room S222. They find *Hermia and Helena* (1990.21). Game card asks them to text the "latest year this work may have been painted"
5. Players text "1817" to 56512. The text response tells them to find *San Francisco to New York* (1986.65.126) on the first floor (folk).

6. Game card asks them to call 202-595-1193 and enter how many feet below the surface the rockets are (160, from the painting). The audio prompt gives directions to the plants in the "Moran's West" area on the 2nd floor. It tells them to find a Stave message in one of them, instructs them not to take it, but to memorize it. Game card tells them to return to Luce with the message.
7. Players find message in plant near Moran's Yellowstone paintings.
8. Player must whisper the message: *Preserve the past to protect the future – Staves!* to a staffer.
9. If they whisper the message correctly, staffer stamps the "2nd quest" part of the game card and retrieves the skinny tie.

Knave Quest 3

1. Game card directs players to the bottom of the West Stair Tower, where there is a VIP poster on the wall and a flashlight nearby.
2. Game card directs player to take a flash photo or to use the flashlight in order to see a hidden message written in glow in the dark paint on the poster. The message says: HALL 2N / RECORDING / ROSZAK
3. Players find *Recording Sound* (1989.25) on the 2nd floor in the north hallway. Game card asks them what kind of music the tiny figure in the piece is singing. Players must read the gallery label to discover that the answer is "opera", which they text to 56512.
4. Text response tells them to find the "early 1st lady of our republic, playing a harp on the 2nd floor (E252)." Players find *Mrs. John Quincy Adams* (1950.6.5).
5. Game card asks them to call 202-595-1193, press 0#, and sing what they imagine is the tune to "Oh Say Not A Woman's Heart is Bought" – the sheet music in the painting.
6. Voice message after the recording sends players to the first floor, south wing, to find a painting by a "Dove" of a source of light.
7. Players find *Sun* (1989.83.3). Game card instructs them to text "sun" to 56512. Response is a coded message that reads: AZ 1, AK 1, IN 4-5, DC 2-3, SC 1-2, VT 2, AZ 2, CT 1-2, OK 4-5
8. Game card tells them to go to the 1st floor, north wing, around the corner from the gift shop to decode the message. Players decode the message using *Preamble* (1988.39) – "AZ 1" means the first letter on the Arizona plate, "IN 4-5" means letters four and five on the Indiana plate, etc.
9. The decoded message is "OPTIMAL INFINITY." Game card directs players back to the Luce Center.
10. Players are directed to write down the decoded message (Optimal Infinity) on a piece of paper, and to write a pleasant message to the next player on the back. Once they've done this (and got the code correct) they receive their final stamp.
11. Players ring the bell and enter their team name on the scoreboard.

Stave Quest 1

1. The player has a stave game card and a small handwritten note that says "OPTIMAL INFINITY" on one side, with a nice message from a previous player on the other. The player texts PHEONPHEON to 56512 to set up with Guide by Cell.
2. The game card gives the players a key to rearrange the letters in "OPTIMAL INFINITY" to read "IMITATION FLY PIN."
3. Game card directs players to search for "Imitation Fly Pin" on the Luce Center kiosks. They find *You're Perfect* (2000.4).

4. Game card directs players to read the label to find the word "magnetism" and to text this to 56512. The response leads them to find "a painting of magnetic phenomenon" on the second floor.
5. Players find *Aurora Borealis* (1911.4.1) in E235. Game card directs them to text the last name of the explorer whose sketches served as inspiration for this painting.
6. Players text "Hayes" to 56512. Response leads them to *Monekana* (2002.3) in the Lincoln Gallery. They find foil nearby (under the bench) and the game card directs them to create a foil sculpture of *Monekana* and return it to the Luce Center.
7. Players submit their foil sculptures. Museum staffer stamps the "1st quest" part of the game card and says "Great work on that horse! You will have to disguise yourself as a knave for the next mission." Staffer gives each player a fake mustache.

Stave Mission 2

1. Players wear their fake mustaches. The mustaches have "Spy" written on the back. Game card directs players to text "spy" to 56512.
2. Text response instructs players to find *The Man with the Cat* on the 2nd floor, east wing. Players find *Man with the Cat* (1952.10.1) in E231.
3. Game card directs players to record which of the man's hands is visible (the left) and which is hidden (the right). They then follow the directions on the game card to the top of Stair 3.
4. A sign at the top of the stairwell directs players to return to the Luce Center and locate a "Knave agent" by searching for "effigy" on the kiosks.
5. Players find the painting of *Wee-ke-ru-law, He Who Exchanges* (1985.66.121) in case 3A in Luce. A sign on the case instructs them to go to the Courtyard and look under the chair with the blue tape. (Note, there will be two chairs with tape).
6. A sign on the bottom of the chair sends them to look for "A New York Lady on this floor – it's Art, Folks!" Players find *Statue of Liberty* (1997.124.74). Game card directs them to call 202-595-1193 and enter how many points are on her crown (7). (Note that there are two statue of liberty artworks, but they both have 7 points in the crown).
7. Voice prompt tells player to avoid capture by returning to the registration table and dance as outrageously as they can to prove their knaveishness.
8. A staffer verifies the dancing with a signature and then stamps the "2nd quest" space on the game card and retrieves the fake mustache.

Stave Mission 3

1. Game card directs players to *An American Puzzle* (2006.2) to find the word that comes before "Extra Heavy Flannel" (buffalo). Players note down buffalo as a keyword.
2. Game card sends players to Case 36A. A sign on the case instructs them to find a bust on the second floor of the man that helped to invent Morse code.
3. Players find *Samuel F. B. Morse* (1919.1.1) in the south hallway of the 2nd floor. The game card tells them to call 202-595-1193 and enter the year in which this bust was made (1831)
4. Players enter 1831# and hear an audio response that gives them a piece of Morse code: (first character: ...—second character: ._. third character: -..) They write this down on the game card.
5. The game card tells players to text the earlier keyword (buffalo) to 56512 in order to translate the Morse code.
6. Text response directs them to the area near "Moran's West" and to look under the buffalo pelt on the round seat. Players find a Morse code key. [Morse code key]

7. They decipher the Morse code to read "3rd" Game card together with the decoded message directs the players to find "Atomic Age" on the 3rd floor.
8. Players find *Sculpture Symbolizing World's Communication in the Atomic Age* (1979.107a-d) in the Lincoln Gallery. Game card directs them to write down two words from the label "We live in a time dominated by these _____/_____. They write down "INVISIBLE FORCES." Game card instructs them to return to the Luce Center.
9. Players are directed to write down the decoded message (Invisible Forces) on a piece of paper, and to write a pleasant message to the next player on the back. Once they've done this (and got the code correct) they receive their final stamp.
10. Players ring the bell and enter their team name on the scoreboard.