Evaluating the Usability and Ease of Use of a Mobile Game to Enrich Understanding of Hawaiian History and Culture for 4th Grade Students

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Abstract: According to the Social Studies Standard 4.1.1, elementary teachers in Grade 4 are responsible for teaching about Hawaii's history and about understanding that history, by examining change, continuity and causality. Through this project, "Kualii's Journey: A Search for Hauwahine," a place-based, mobile game was developed to provide an enriching and culturally sensitive experience for students to learn of these concepts as they "journey" around the Kawai Nui Marsh, visiting three significant sites, in Kailua, Oahu. Using the neighboring community as a resource and a story that incorporates key characters in the history of the Kawai Nui Marsh, Na Pohaku o Hauwahine and Ulupo Heiau, the goal of the project was to provide an engaging tool for students. This tool would aid in teaching about changes in history, what may have caused those changes and how they can have an impact on the continuity of Hawaiian culture in their community and beyond. Therefore, the purpose of this project was to evaluate the ease of use of a place-based, mobile game of Kawai Nui Marsh. This web-based game was developed using ARIS, an open source tool for creating mobile learning games. The study identified the game's ease of use and motivational factors. The study also contributed to improvement of the game as results from students and adults were analyzed. Feedback indicated that clear instructions, an obvious purpose, and added audio for walking and listening ease, was preferred by users. Revisions were made. The usability tests included a pre-survey, a usability protocol and a post-survey.

Introduction

As a fourth grade teacher, I am continually looking for effective ways to teach the subject of Social Studies. According to the Hawaii Content & Performance Standards, I am to teach the history, historical understanding, cultural anthropology, political science and civics, economics and geography of Hawaii to my students. As a classroom teacher, it is my responsibility to provide enriching and culturally sensitive lessons that are engaging, meaningful and relevant for my students.

Currently we have two textbooks and two workbooks to guide us through the teaching of ancient Hawaiian history and contemporary Hawaiian history. One of the textbooks, *The*

Hawaiians of Old, purchased in the 1980's, and still the central textbook to the Hawaiian studies curriculum, is highly criticized as presenting a colonial history of a Native civilization (Kaomea, 2005). With the lack of current curriculum, the study of Hawaii is a subject we often push aside. Whether it is because we are more familiar with the other subjects or it is not a "high stake" subject that gets tested at the end of the school year, Hawaiian studies is not being taught the way it should be. According to the Social Studies Standard 4.1.1, we are responsible for teaching students about Hawaii's history and about understanding that history, by examining change, continuity and causality. By teaching historical understanding, students will be able to understand change and continuity of aspects of Hawaiian culture, including its religion, land use and the social class system. By examining change, students will develop empathy and perspective to explain historical events with multiple interpretations and judge the past on its own terms.

It is crucial to keep students engaged and interested in learning about the past. I find myself looking online for resources due to the lack of curriculum material. I also look for field experiences that can enhance the information gained from any printed material used in the classroom. I enjoy getting students out of the classroom and exploring their island home. Our school is located in Kailua on the island of Oahu. We are fortunate to have the state's largest wetland in our little town.

At one time, curriculum included environmental education. This environmental curriculum provided a hands-on approach that took students into the community. Students participated in this place-based education that instilled values about caring for the land and its resources. It was an integrated approach in learning science, social studies, math and language arts. Students were able to take Apple eMates to record data and problem solve as they explored and discovered the plants and animals so important to the area. However, with the implementation of the Hawaii Content & Performance Standards, environmental education as it was taught before, is not included in current standards. I believe there is much that students can understand about historical changes and continuity by exploring places like the Kawai Nui Marsh.

Therefore, the purpose of this usability project was to evaluate the ease of use of an immersive, web-based, mobile game of Kawai Nui Marsh created to enrich the understanding of Hawaiian history and culture for 4th grade students at an elementary school in Kailua. By developing a walking tour/mobile game, students have the opportunity to recognize the changes that have occurred, describe and analyze the change and continuity of aspects of Hawaiian culture at the Kawai Nui Marsh and significant sites such as the Ulupo Heiau and Na Pohaku o Hauwahine. My task in developing the game was to include a story that provided factual information as students visited three sites. Features in the game provided rewards or incentives as students made choices that resulted in a message of looking forward to the future, presented in two pathways. The goal of my game was to provide a meaningful, respectful and culturally sensitive story about a central character and his journey through change, causality and continuity. The purpose was to present it in a format that was easy to use. This was a personal challenge since it was my first experience in game design.

Literature Review

There have been numerous studies on mobile game-based learning environments that are used to increase motivation and engagement (Boyce, Acey and Barnes, 2010). In the past twenty years, the importance of meaningful learning has been emphasized. Mobile and place–based technology can provide opportunities for learning in authentic environments (Huizenga et al., 2009).

The importance of place has become a central theme in games and this idea of place and mobile technology together, unexpectedly works. It is here that we see motivation, engagement and learning, occurring together. We have so much knowledge on devices that can go with us wherever we go. Therefore, we can use the technology to provide more information about the place to make it even more meaningful (Holden and Sykes, 2012).

Taking the technology outdoors can also lead to greater enthusiasm for environmental issues and encourage young people to "engage more fully in a sustainable society," according to the Sustainable Development Commission. Therefore the use of technology can be used to motivate children, especially older children to play outdoors and appreciate nature. According to this source, the use of ARIS is found to be relatively user-friendly and it is an open source platform where children can play and create mobile games for use outdoors (Grundy et al., 2014). This connects perfectly with the idea of taking a mobile place-based, game-based bit of technology out of the classroom and into the community. According to Drigot (1982), "Educators who utilize their own communities to provide learners with opportunities in environmental education instill valuing skills and problem solving skills." I am very proud to say that our elementary school created our environmental education curriculum with Diane Drigot and although the research is over 30 years old, the concept and the information in her study on the Marsh are not antiquated.

In an article by Mugge (2016), the question was asked, "Why do we believe that mobile gaming and storytelling is particularly useful for community learning?" It was found that the use of smartphones and tablets, the participation through open authoring systems such as ARIS, mobile gaming and the concept of story, fit well with modern community learning (Mugge, 2016). Therefore, as a teacher looking for a game to create, I went to the many legends associated with the Kailua ahupua'a, Kawai Nui in particular. According to Anderson (2006) these legends explain the cultural history behind significant places and serve to reconstruct a Hawaiian sense of place.

Several native birds are mentioned in the game. If we examine the wetlands closely in the Kailua ahupua'a, we find that the Kawai Nui wetlands are inhabited by five endangered endemic waterbird species. These include the Hawaiian Coot ('alae ke'oke'o), Hawaiian Duck (koloa maoli), Hawaiian Stilt (ae'o), and Hawaiian Gallinule (Moorhen) ('alae 'ula). The control of invasive plant and non-native animal species all directly influence recovery and survival of these endemic species (Underwood, et al., 2013). This

examination of the animals and plants will correlate well with the study of historical understanding and the concepts of change and continuity in this important habitat.

Furthermore, augmented reality technology in a mobile game or tour is able to create user-centered, visualized operations, and real time feedback in a learning environment (Chou and ChanLin, 2012). This technology thus keeps the player motivated and engaged. When information and materials are interwoven into game scenarios or stories, players or learners are further engaged as they are presented with problems to solve (Hsu and Ching, 2015). Once again, ARIS opens creative pathways by using the smartphone to take learning on the move. This is positive for students as they take a theme, narrative guidance of a fictional character and exploration (Adam, et al.). In this case, the exploration of Kawai Nui Marsh can hopefully lead to knowledge and discovery.

Likewise, testing usability is key in designing a new technology or tool. It is said that testing the usability of a "serious" game presents unique usability challenges in itself because designers want players or learners to discover knowledge. Players interact with the game and experience the game so two categories can be created, system related and user related (Pable et al., 2012). The International Organization for Standardization (ISO) defined usability as the "extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use (Harrison, et al., 2013).

According to John Keller's ARCS Model of Motivational Design Theories (Keller, 2000), there are four steps for promoting and sustaining motivation in the learning process: Attention, Relevance, Confidence, and Satisfaction (ARCS). Therefore, the research questions for the project's game are based on the four steps:

1. Does the story stimulate curiosity and gain the attention of the user? (Attention)
2. Does the game allow choice in order to increase the user's motivation? (Relevance)
3. Does the game allow players to feel successful and that objectives were met in a meaningful way? (Confidence)
4. Does the game provide feedback and reinforcement and provide a sense of achievement? (Satisfaction)

As for the usability study of the game itself, the following questions were asked:

1 How easy or difficult is it for students to start the game, read and navigate through it, to completion?
2 How easy or difficult is it for students to figure out the correct sequence of actions to get to the next task?
3 Is it engaging and fun for the player?

Consequently, my goal was to create a usable game that allowed students or players to discover history or knowledge through a story and fictional character, about a place called Kawai Nui with some degree of effectiveness, efficiency and satisfaction.

Project Development

The idea for my project came during my first semester in instructional design. I missed the environmental education portion of our school curriculum. Ten years ago, we utilized the Kawai Nui Marsh as an outdoor classroom. We had experts helping us create a curriculum, but it all went away with Hawaii Content & Performance Standards and Common Core State Standards. I didn't know exactly what to do when I was asked to submit my first idea paper a year ago, but I knew it had to be about the Kawai Nui Marsh. I knew that I wanted my students to learn Hawaiian history in a meaningful and authentic way. I knew I wanted them to be excited about learning about their community. I knew I wanted students to take technology with them as they did almost ten years ago.

Taking a class about learning in informal environments got me interested in doing a project on Kawai Nui. It was during this class that I was introduced to ARIS Game Editor, an open-source tool for creating learning games. My challenge was to create a game that was easy to understand and easy to use for my 4th Graders. I wanted to give them enough choice that they remained motivated, and had to create pathways so they could make those choices. As I continued to rcreate the game, I wanted students to think about their choices, put themselves in the main character's shoes and be empathetic to what was happening in the story. I wanted to give them a game that was motivating and meaningful. I wanted to make them curious about history and about Kawai Nui so they developed a sense of inquiry.

With this intention, I knew there was a need to include some of the history of this place. Therefore I included actual people connected to Kawai Nui, legendary characters, and facts about the three sites the game takes players to in the story. The story introduces a hero, although fictionalized, an actual chief who resided in Kailua in 1640. I included the concept of change and continuity in the story as Kuali'i, the main character travels in time and sees change but learns that change doesn't have to mean the end of what is. He learns that people need to make a conscious effort to ensure continuity. Figures 1-4 show the sequence of tasks needed to create a game--from an unsophisticated first flow chart, a script of informational plaques and conversations in the game developed before beginning in ARIS editor, scenes in the ARIS editing program and lastly, the conversations used as triggers in the game.

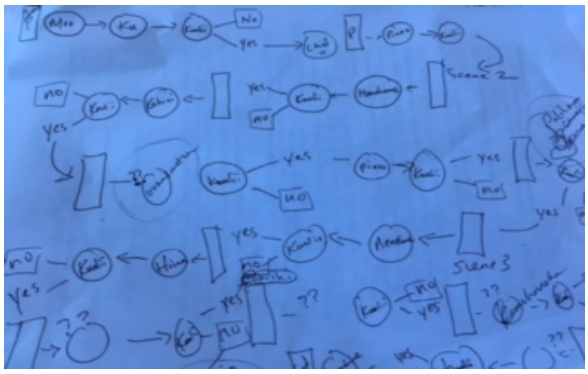
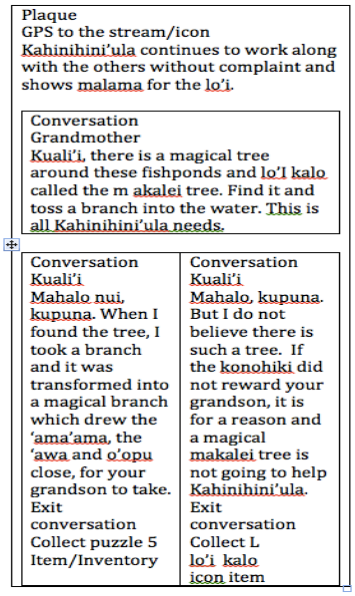


Figure 1. A flowchart of characters, conversations and information preceded the script.



Plaque
GPS to the stream/icon
Kahinihini'ula continues to work along with the others without complaint and shows malama for the lo'i.

Conversation
Grandmother
Kuali'i, there is a magical tree around these fishponds and lo'I kalo called the m akalei tree. Find it and toss a branch into the water. This is all Kahinihini'ula needs.

Conversation Kuali'i Mahalo nui, kupuna. When I found the tree, I took a branch and it was transformed into a magical branch which drew the 'ama'ama, the 'awa and o'opu close, for your grandson to take. Exit conversation Collect puzzle 5 Item/Inventory	Conversation Kuali'i Mahalo, kupuna. But I do not believe there is such a tree. If the konohiki did not reward your grandson, it is for a reason and a magical makalei tree is not going to help Kahinihini'ula. Exit conversation Collect L lo'i kalo icon item

Figure 2. After research and a written story, a script was created for ARIS.

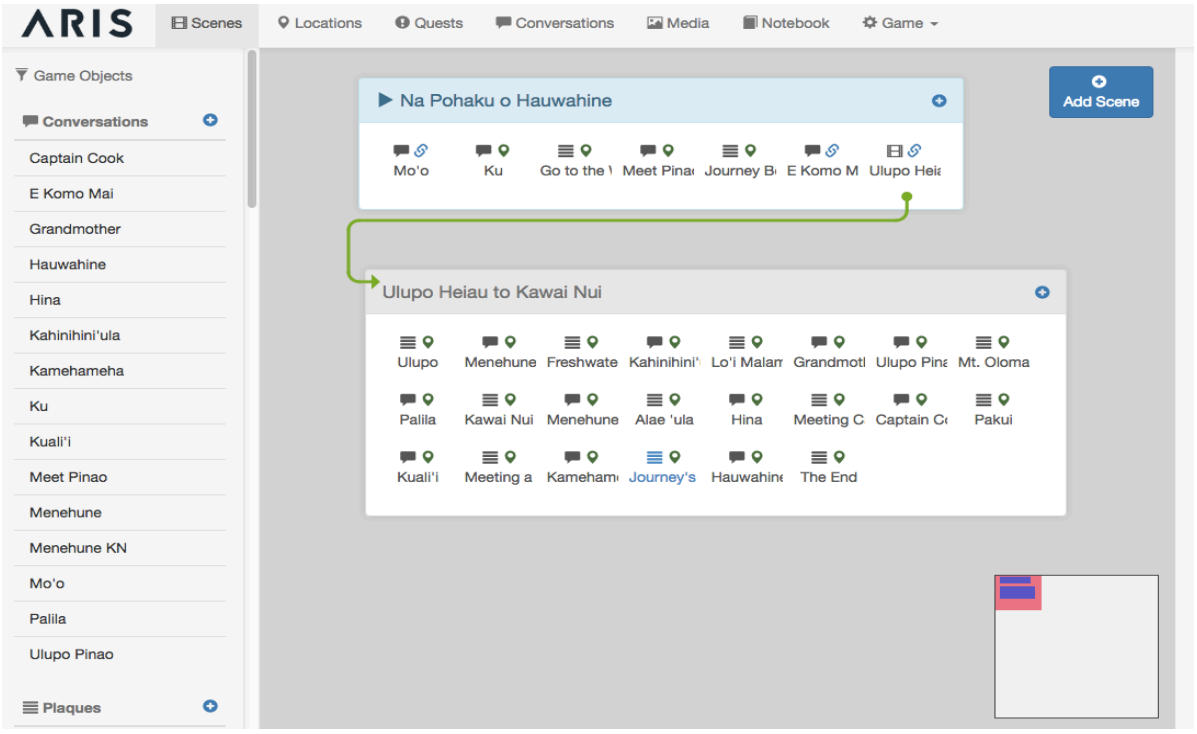


Figure 3. This is a screenshot of the editing page in ARIS.

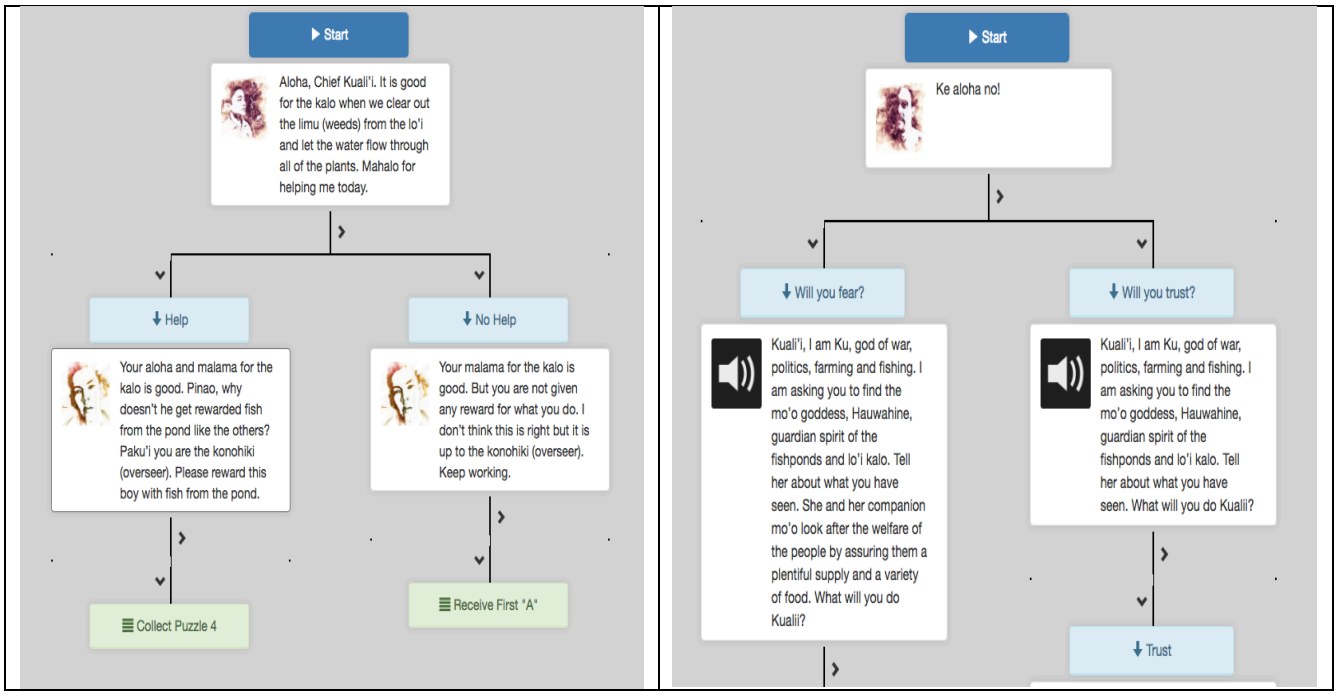


Figure 4. These are before and after shots of a conversation screen with audio added in the second round of testing.

After developing a story with historical characters, graphics became an issue. Copyright laws for images used for the story's characters became a concern. Free to use images were very limited and getting permission for a dozen character images that weren't free to use seemed unattainable. The graphics were all very different. There was no consistency in the kinds of pictures selected as seen in Figure 5.

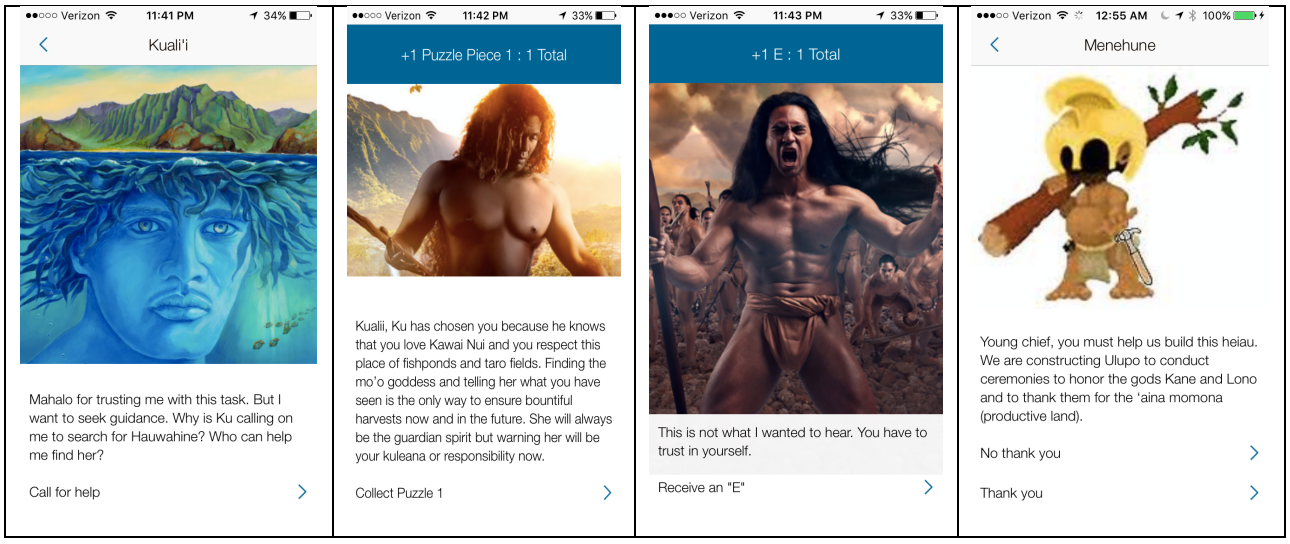


Figure 5. Character graphics were very inconsistent.

I decided to use photos of people I knew to represent the story's characters. I received their permission to use their photos and used an application called Fotocam to alter the photos for use in the game. The photos in Figure 6 represent the main character, a chief, the god Ku and a menehune.

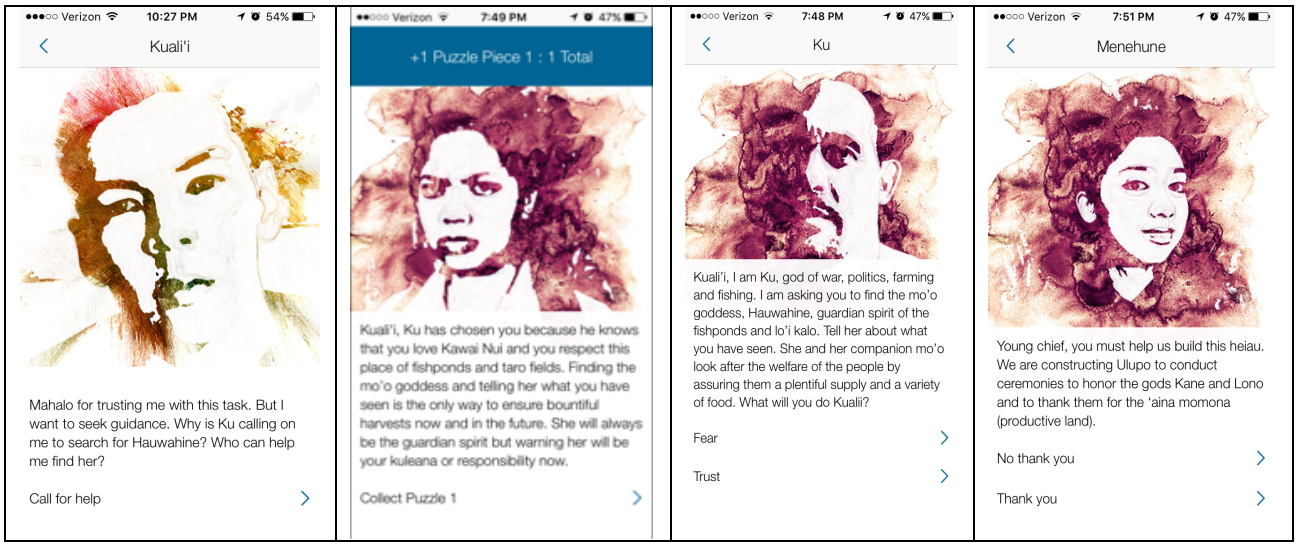


Figure 6. Photographs were altered using the application Fotocam.

The first five screens are instructional, presented by a "kumu" or teacher, on how to navigate through the game. Figure 7 shows a "Welcome" page that a player would see after they start the game. The picture represents Kualii, standing on Na Pohaku o Hauwahine, looking over Kawai Nui.

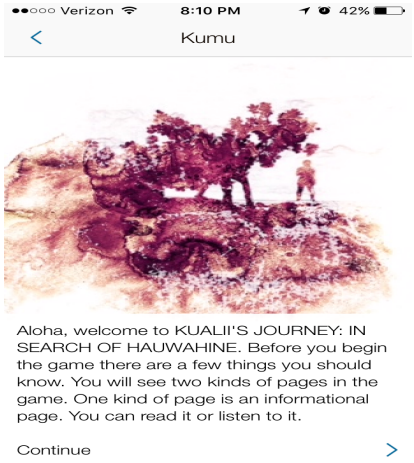


Figure 7. The tutorial begins on the first screen.

Informational plaques that offer the option of listening to text as well as reading the text were used, as shown in Figure 8.

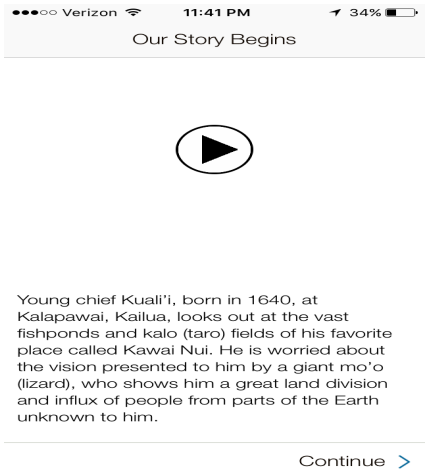


Figure 8. An audio option is available.

Several modifications were made to the informational pages and the conversation pages after the first round of usability testing. Pictures were added to the instructional pages as shown in Figure 9.

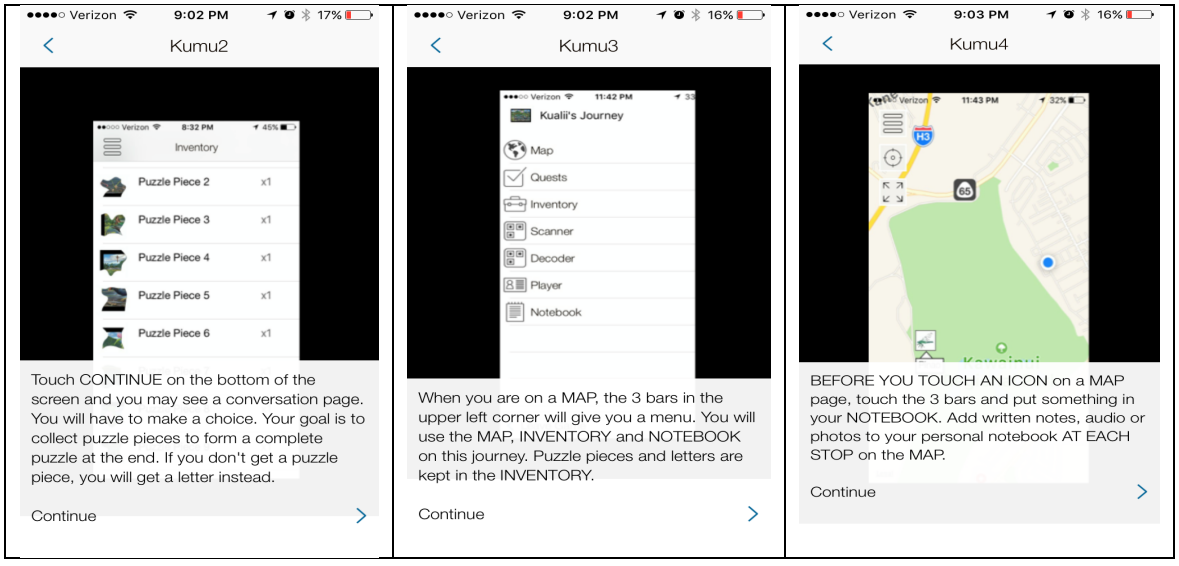


Figure 9. The instructional pages have added screenshots.

The conversation pages originally included text only and frustrated the player who was walking on the path at Na Pohaku o Hauwahine, as they were reading. The option to listen to some of the conversation pages was added, as seen in Figure 10, thus decreasing the need to read and walk at the same time. It would have been ideal to combine a

picture or graphic with voice but there was a problem with using video in ARIS. The file became too large and had difficulty loading when the game was in play.

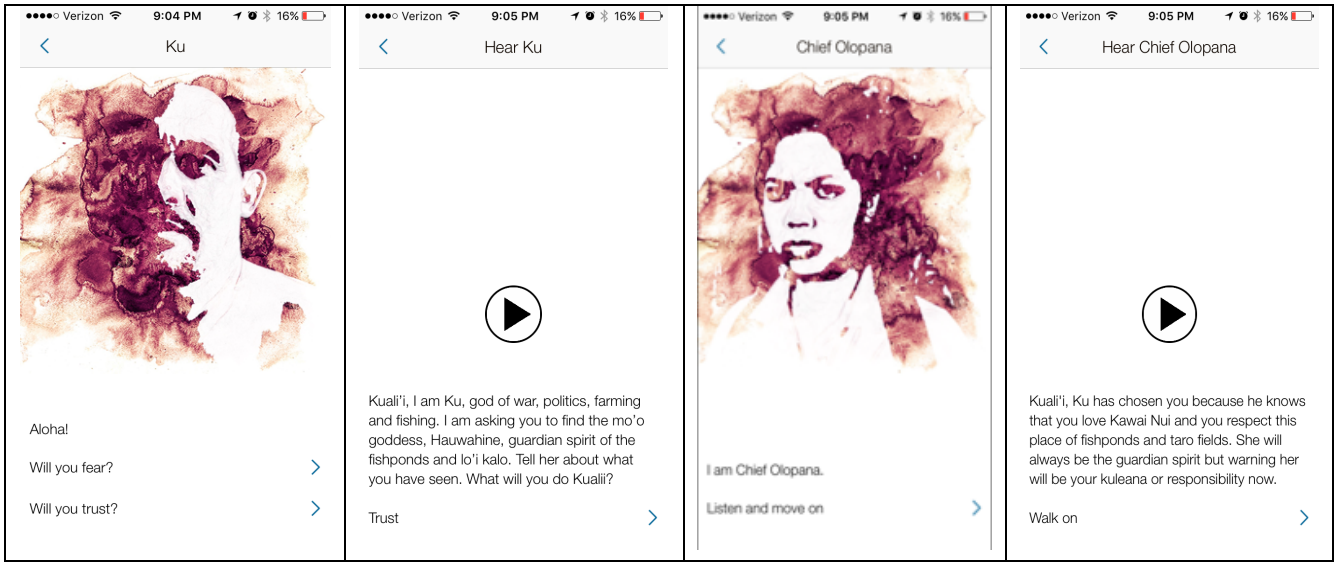


Figure 10. The conversation pages have added audio.

Methods

The usability study included two rounds of testing with time between rounds to implement revisions. Both rounds of testing took place throughout the months of February and March. Six participants, three students and three adults were recruited for each round. One of my student participants did not participate in the second round due to illness. The students included elementary and high school aged minors. The adults included two pre-school teachers, one part-time high school teacher and two college students in elementary and secondary education programs.

Each participant agreed to be tested at the first location in the game. Participants were told that testing would take 30-45 minutes, including the 5-mile commute to and from the site. Before going to the location at Na Pohaku o Hauwahine, participants signed an agreement to participate in the study. The form included consent to be audio recorded. Each participant was informed that their personal identity, would be kept private and the audio and data would be destroyed. Each participant was asked to complete a pre-study survey (Appendix A).

The participant was read a script to guide them through three tasks (see Appendix B), which followed Steve Krug's informal usability testing from Rocket Surgery Made Easy (2010). Participants were given task cards of the three scenarios for reference during the session. At the end of the test session, participants were given

a copy of the post-study survey (see Appendix C). Once the first round of testing was completed, participant narrations from recordings were reviewed. Post-survey data was analyzed and grouped into two categories: ease of use and attitudinal data. Based on the comments and suggestions of the first round, feasible changes were implemented prior to the second round.

Participants

There were a total of six adults and six students. Approval from the Department of Education was not necessary in this usability study because participation was voluntary and the study was conducted outside of the school setting. The first group ran through a test on a first iteration prototype. This group used the game on location. The second group also used the game on location, using a revised prototype. The adults and students were asked if they were familiar with the iOS (Internet Operating System) device. They were also asked about their familiarity with the game system ARIS. Some of the adults were teachers and others were not. Some of the participants had some knowledge of the location, Kawai Nui Marsh. Interestingly, data was collected from students, in the 4th-12th grade, ages 9-17, student teachers in college educational programs, and teachers, with some background knowledge in Hawaiian terms, vocabulary and legends. None of the participants had experience with ARIS. The first group took about 30-45 minutes on the first iteration of the prototype and visited one site. The second group took about 30 minutes and also visited one of three sites using the game after suggested revisions. Information about participants from the pre-study survey is shown in Appendix J.

Instruments

Before we began the study, a pre-survey was given to participants (see Appendix A). Information gathered was helpful in knowing participants' familiarity with Kawai Nui Marsh, its location and its cultural significance, experience with the ARIS game creator, experience with mobile games and experience with smartphones. Participants were asked if they wanted to complete surveys online or on a hard copy.

During the usability test, participants were presented with three scenarios in which an audio recording device was used to capture commentary. The scenarios were presented in the usability protocol in Appendix B. "Scenario 1" asked the player to read the directions and introduction and then begin the game. "Scenario 2" asked the player to make a decision to collect the first reward. Finally "Scenario 3" took the player to another location in the game, after rewards had been accumulated and notes had been taken. The player was asked to locate where those rewards were recorded and where notes were recorded. Participants were assured that all test material and answers would be deleted and destroyed at the end of the project. All testing was kept confidential.

Procedures

The usability test included an invitation to participate. When the participant agreed to test the game, appropriate permission and consent forms were completed (Appendices F-I). When a time was decided, participants performed the first round of testing at Na Pohaku o Hauwahine. Participants were given a copy of the usability protocol to review before the test was conducted. Transportation was provided and gave the participant time to review the protocol. Appropriate permission forms for participating in a water-related activity were available, although minors did not go into the water. Once at the site, participants started the game and began the short walk to the water's edge of "the rocks of Hauwahine." I originally planned to use an application to capture the screen activity as well as the narrative but it didn't work with this game. Consequently, I recorded just voice and made notes of their narrative on the form shown in Figure 11.

Name of Participant _____

Date _____

Time _____

Task 1:	Time on Task:
Comments: Plan to begin the "journey	
Comments: See during process	
Comments: Think about during process	
Comments: Next steps	
Task 2:	Time on Task:
Comments: Plan to collect rewards (puzzle pieces; letters)	
Comments: See during process	
Comments: Think about during process	
Comments: Next steps	
Task 3:	Time on Task:
Comments: Plan to get to correct page for Inventory/Notebook	
Comments: See during process	
Comments: Think about during process	
Comments: Getting back to the game	

Figure 11. A recording sheet was used for audio responses.

Analysis

Quantitative data such as "Task Completion Rate," was analyzed and recorded on Tables 2 and 3. The tasks were completed at 100% during each round. All participants were able to begin the game, gather the puzzle piece rewards and find them in the inventory.

Table 2. Task Completion Rates, Round 1

Participant	Task 1	Task 2	Task 3
1	x	x	x
2	x	x	x
3	x	x	x
4	x	x	x
5	x	x	x
6	x	x	x
7	x	x	x
8	x	x	x
9	x	x	x
10	x	x	x
11	x	x	x
12	x	x	x
Success	12	12	12
Completion Rates %	100%	100%	100%

Table 3. Task Completion Rates, Round 2

Participant	Task 1	Task 2	Task 3
1	x	x	x
2	x	x	x
3	x	x	x
4	x	x	x
5	x	x	x
6	x	x	x
7	x	x	x
8	x	x	x
9	x	x	x
10	x	x	x
11	x	x	x
Success	11	11	11
Completion Rates %	100%	100%	100%

Answers to questions on the post-survey were analyzed on a 5-point Likert Scale to get a "mode rating" and a percentage of the "easy" responses shown in Tables 4 and 5. This survey gave me the needed information about the ease of use of the game and the attitude and motivation of the participants.

Table 4. Post-Study Survey: Ease of Use, Round 1

	Very Easy 1	Easy 2	Neutral 3	Difficult 4	Very Difficult 5	Mode Rating	Percent Easy
Easy to start the game	5	1				1	100%
Easy to read	1	1	3	1		3	33%
Easy to figure out next steps	1	2	1	2		3	50%

Table 5. Post-Study Survey: Ease of Use, Round 2

	Very Easy 1	Easy 2	Neutral 3	Difficult 4	Very Difficult 5	Mode Rating	Percent Easy
Easy to start the game	4	1				1	100%
Easy to read	3	2				1	100%
Easy to figure out next steps	3		1		1	1	60%

Upon completion of the tasks, participants provided feedback for what they liked most and least about the game. Comments were uploaded to Wordle.net to create a word cloud for each category. Figure 12 and 13 below show Round 1 responses to the statement, "Name your three favorite things about the game" and Figures 14 and 15 show responses to the statement, "Name your three least favorite things about the game." Student responses and adult responses were analyzed separately.

The bigger font in the word cloud, means the word in the cloud was said by more than one participant. In Round 1, participant responses favored the words "story," "puzzle," "pictures" and "interactive."

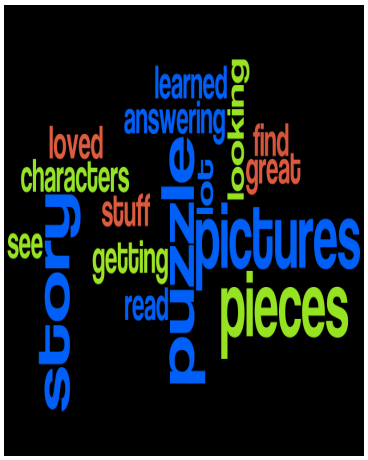


Figure 12. Round 1 student response to "favorite things".

Figure 13. Round 1 adult response to "favorite things".

As for the participants' least favorite things, "time" stands out in the student word cloud and "text" stands out in the adult text. When asked the question, "If you could change one thing on this game, what would be at the top of the 'to do' list?" student participants wanted "more time to read, explore and comprehend the storyline" and adult participants wanted "text to audio" and "listen to or read text". Another suggestion by an adult participant was "to have the prompts guide you to a specific area before you can progress in the story."

Figures 14. Round 1 student response to “least favorite things”.

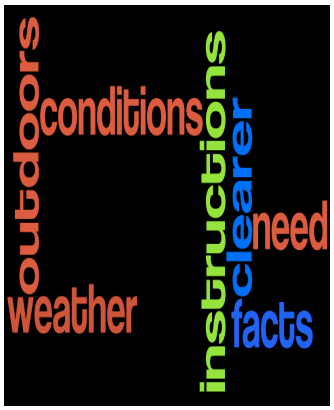
Figures 15. Round 1 adult response to “least favorite things”.

A second set of word clouds were created for Round 2. Figures 16 and 17 show the responses to the statement, “Name your three favorite things about the game.” The words that stand out in the student word cloud in Figure 16 are “new” and “learning”. As for the adult words in Figure 17, “graphics,” “story,” “options,” and “audio” were significant words to me.

Figures 16. Round 2, student response to “favorite things”.

Figures 17. Round 2 adult response to "favorite things".

Figures 18 and 19 show the responses to the statement, "Name your three least favorite things about the game" in Round 2. Nothing really stands out on the student or adult word clouds but the words "instructions" and "clearer" on the student word cloud and the word "purpose" on the adult word cloud are noteworthy. When asked the question, "If you could change one thing on this game, what would be at the top of the 'to do' list?" student participants wanted "to add more facts about the journey…the facts were very interesting". Adult participants in this round were more critical and wanted "the purpose of the game more clear" or suggested I "get maps up and running in their spots." During the second round of testing, changes in the game resulted in a map not appearing when it was supposed to, thus "map" and "working" appear on the word cloud. Another suggestion by an adult participant was "I wish I got to see the final puzzle".



Figures 18. Round 2 student response to "least favorite things".

Figures 19. Round 2 adult response to "least favorite things".

This game takes the player to three different sites on a field trip. The usability test was scheduled for 30-45 minutes and visiting one site took 30-45 minutes, with a 5-mile round trip to and from the location included in this time, so participants did not play the game to completion.

Figures 20 and 21 examined motivational factors. Was the game motivating and did it keep the attention of the player by entertaining them? All the recorded responses are from participants from Rounds 1 and 2.

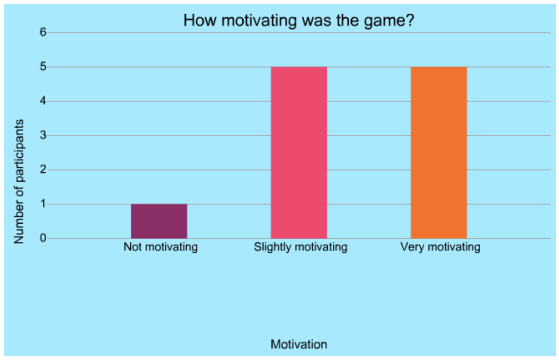


Figure 20. This question was asked of both students and adults in the post-survey.

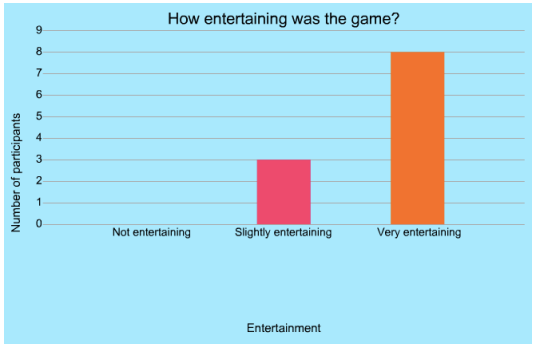


Figure 21. This question was asked of both students and adults in the post-survey.

Conclusion

In summary, usability testing is an effective way to evaluate the game. Data collected in two rounds of testing made it evident that this was an iterative process and one or two users can provide powerful feedback. The students and adults in the study responded differently in each round. As a group of participants, the students tested were very motivated and entertained. As for the adults in the study, responses tended to be more critical of the design and purpose. The suggestions were all well received and appreciated. Usability is about meeting the needs of the target audience. My target audience is a class of 4th graders. Therefore motivation was an important factor.

The ultimate goal of the project was to develop something that could be used with a group of 4th graders, on a field trip, in their community. I anticipated that the user would gain a positive attitude about Hawaiian history and would be motivated as they explored the area and played the game. I hoped to have developed skills of inquiry and empathy as I stimulated curiosity and took players out to an actual place where people lived and worked long ago. I hoped that the game inspired students to enjoy their home, their community and to share in the responsibility of caring for it. Finally, I hoped to inspire students to create their own games about the place they live and to take playing a game to another level. Usability testing was a very humbling experience as a "designer". So inspiring students to create their own games would be a very rewarding next step.

Overall, usability testing is an effective way to evaluate a game, a website, or an application. The data gathered provided the suggestions needed to improve the current iteration. It had been suggested by participants that it be called a scavenger hunt or a walking tour rather than a game. This will be considered. More time and perhaps more assistance with game design may provide the means to create a more satisfactory product that could be used in the 4th classroom.

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Appendix A

Usability Study: Pre-Study Survey for Kualii's Journey

Demographic Information Questionnaire
Answer all questions, please

Are you male or female?

Male
Female

What is your occupation? What do you do during the day?

Student
Teacher
Other

What is your age range?

5-10
11-13
14-17
18-24
25+

What is the grade level you are in or you teach? (For students and teachers)

Elementary
Middle School
High School
College

How often do you play web-based games?

Daily
Weekly
Monthly
Occasionally
Never

Would you be interested in a place-based game?

Yes
No

Are you familiar with the Kawai Nui Marsh in Kailua?

Yes
No

Have you had experience with an ARIS game?

Yes
No

SUBMIT

Appendix B

Usability Protocol
Evaluating Usability of a Web-Based Mobile Game for 4th Grade Students at a Local Elementary School

Modified from Usability Script- Rocket Surgery Made Easy © 2010 Steve Krug

Technology Set-Up Checklist (Facilitator)

1. Set up a smartphone with an audio recording device,

2. Make sure phone is charged

3. Make sure phone has internet connectivity

After smartphone is set up:

1. Load your application in whatever presentation software you choose to use

2. Start the audio recording device

Facilitator Script

Hi, [insert participant's name]. My name is Ms. (Kim) Mah, and I'm going to be walking you through this session today.

Before we begin, I have some information for you, and I'm going to read it to make sure that I cover everything.

I'm asking people to take a look at a mobile game that will eventually be used on field trips, for a 4th Grade Social Studies class in Hawaiian history. I would like to see what you think of it and how you think you would complete a few challenges with an interface like this. The session should take about 15-30 minutes.

The first thing I want to make clear right away is that I'm testing the game, not you. You can't do anything wrong here. In fact, this is probably the one place today where [P.1] you don't have to worry about making mistakes.

As you complete the tasks, I'm going to ask you as much as possible to try to think out loud: to say what you're looking at, what you're trying to do, and what you're thinking. This will be a big help to me.

Also, please don't worry that you're going to hurt my feelings. I'm doing this to improve the game, so I need to hear your honest reactions.

If you have any questions as we go along, just ask them. I may not be able to answer them right away, since I'm interested in how people do when they don't have someone who can help. But if you still have any questions when we're done I'll try to answer them then.

And if you need to take a break at any point, just let me know. Do you have any questions so far?

Ask participant a few preliminary questions:

OK. Before we look at the game, I'd like to ask you just a few quick questions:

1. Adults: What is your occupation? Students: What school do you go to?

2. Are you familiar with the Kawai Nui Marsh? Do you know where it is located? Have you ever been to the Kawai Nui Marsh, Ulu Po Heiau or Na Pohaku o Hauwahine?

3. Now, roughly how many hours a week altogether—just a ballpark estimate—would you say you spend using a smartphone, at work and at home?

4. What experience do you have with mobile games, on a smartphone? If so, what applications have you previously used? Have you ever used ARIS?

OK, great. We're done with these questions, and we can start testing out the game.

Have participants do a narrative of the game's overall appearance for one or two minutes, at most:

I'm going to ask you to look at this game's homepage, and tell me what you make of it: what strikes you about it, what you can do here, and what it's for. Just look around and do a little narrative. You can scroll around if you need to.

Ask participant to complete a few specific tasks (be sure to give the participant a handout of the scenarios):

Thanks for doing that. You did a great job. Now I'm going to ask you to try doing some specific tasks. I'm going to read each one out loud. You should have received a copy of these before this study. Again, as much as possible, it will help us if you can try to think out loud as you go along.

Allow the user to proceed from one task to the next until you don't feel like it's producing any value or the user becomes very frustrated. Repeat for each task or until time runs out.

Scenarios ("tasks") for Usability Protocol

Scenario 1:
You are a 4th grader on a field trip at the Kawai Nui Marsh and are given a smartphone. You enter the game and have read the directions and introduction. You want to begin the game. How would you go about completing this task?

Start Game:

1. **Explain how you planned to begin the "journey."**
2. **Explain what you are seeing during this process.**
3. **Explain what you are thinking about.**
4. **Explain what you should do next.**

Scenario 2
You are still a 4th grader on a field trip. You have come to a stop on journey and are faced with decisions. You want to collect the first reward. How would you go about completing this task?

Scenes:

1. **Explain what you would do first.**
2. **Explain what you are seeing during this task.**
3. **Explain what you are thinking about as you are going through this task.**
4. **Explain what you could do next.**

Scenario 3:
You have progressed through the game, perhaps got to another location with your smartphone. You have been collecting your rewards and taking notes. You want to check what you have accumulated in the Inventory and the Notebook.

Game Menu

1. **Explain how you got to the correct page.**
2. **Explain what you are seeing as you looked for the correct page.**
3. **Explain what you are thinking about as you are going through this process.**
4. **Explain how you would get back to the game at this point.**

Thanks, that was very helpful.

I am done with the main questions, but I have a few more general questions to ask you.

1. On a scale of 1 to 5, with 1 representing very difficult and 5 representing very easy, how would you rate your experience during today's testing?
2. After participating in this study, would you recommend this game to any of your friends? Why?

That's the last question, Do you have any questions for me, now that I'm done?

I want to thank you for your time and willingness to be a participant in this study.

Please go to this link to take the POST-STUDY SURVEY or goo.gl/akfHa6

After the Session:

1. Save the audio recording

Appendix C

Usability Study: Post-Study Survey for Kuali`i's Journey

Please Let Us Know What You Think...

How easy was it to read the story?

Very easy
1
2
3
4
5
Very difficult

How easy was it to start the game?

Very easy
1
2
3
4
5
Very difficult

How easy was it to figure out the correct sequence of actions to take you to the next task?

Very easy
1
2
3
4
5
Very difficult

How motivating was it?

Not motivating
Slightly motivating
Very motivating

How entertaining was Kuali`i's Journey?

Not entertaining
Slightly entertaining
Very entertaining

How were the game's graphics and layout?

Very appealing
1
2
3
4
5
Not appealing at all

Name your three favorite things about the game.

Your answer

Name your three least favorite things about the game.

Your answer

Do you think some people would have problems using "Kualii's Journey? What kinds of people? What kinds of problems?

Your answer

If you could change one thing on this game, whether it is major or minor, what would be at the top of the "to do" list?

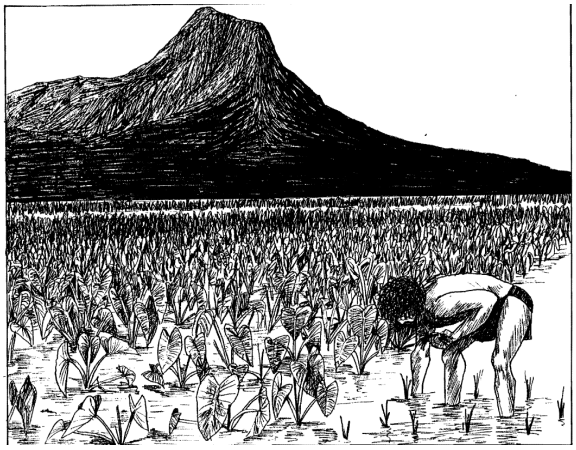
Your answer

SUBMIT

Appendix D

Inviting Participants for a Usability Study of "Kuali`i's Journey"

Evaluate the usability and ease of use of a web-based, mobile game about Kawai Nui Marsh.



During each session, participants will provide one-on-one feedback to evaluate the ease of use of a mobile game designed to enrich learning of Hawaiian culture for 4th Grade students.

- The study will be conducted on a prototype in the field, with the GPS enabled. Each session, with the prototype, will take approximately 30-45 minutes.
- Each session will be recorded. All information will be kept strictly confidential.

If you may be interested in participating, please click on the link below to complete the appropriate permission forms: goo.gl/qAMYJR

For more information please contact: Kim Mah
kimmah@hawaii.edu

Appendix E

Welcome and Purpose

Aloha! My name is Kim Mah and I am a student at the University of Hawaii at Manoa. Thank you so much for coming today. The purpose of this study project is to evaluate the usability and ease of use of an immersive, web-based, mobile game of Kawai Nui Marsh to enrich the learning of Hawaiian history and culture for 4th grade students at an elementary school in Kailua. I wanted to give you a little information about what you will be looking at and give you time to ask any questions you might have before we get started.

Today I am asking you to serve as an evaluator of a game, "Kuali'i's Journey," and to complete a set of tasks. Our goal is to see how easy or difficult you find the game to use. Your participation in this study will help determine the changes to be implemented on the game to improve user experience.

I am here to record your reactions and comments about the game you will be playing. During this session, I would like you to think aloud as you work to complete the tasks. I will not be able to offer any suggestions or hints, but from time to time, I may ask you to clarify what you have said or ask you for information on what you were looking for or what you expect to have happen. There is no right or wrong answer. I am not testing you. If you have any questions, comments or areas of confusion while you are working, please let me know. If you ever feel that you are lost or cannot complete a task with the information that you have been given, please let me know. If at any time, you may withdraw from the study at anytime without penalty. I will ask you what you might do in a real setting and then either put you on the right track or move you on to the next scenario. There will be three scenarios.

You will be asked to complete an online demographic survey prior to the beginning of the usability test. A short debriefing interview will be conducted after completion of the usability test, as well as a post-survey to gain further understanding of your experience. The entire usability study, including both surveys and debriefing interview, will last 30-45 minutes.

The data taken from your participation in this study will be used solely for the purpose of this usability study. You are not being tested. The data will be stored on a password-protected computer. When I report the results of my research project, I will not use your name or any other personal information. The recording from this study will be transcribed to determine commonalities from all participants. Once the research is complete, all recording will be destroyed. You may withdraw from the study at any time. Because this usability study is for a place-based game, participants will be doing the study at a marsh or wetland. Participants, specifically minors under age 15, should be accompanied by an adult, for safety.

Appendix F

KUALII'S JOURNEY: A USABILITY STUDY
Minor Assent Form

My name is Kim Mah and I am a 4th Grade teacher at Aikahi Elementary School in Kailua, Oahu. I am also a Master's student in the Learning Design and Technology department at the University of Hawai'i at Manoa. I request your permission to participate in a usability research project on a place-based game I designed to enrich the Hawaiian Studies curriculum for 4th Grader.

WHAT WE'RE DOING.
I am asking you to help me test a game I created called, "Kualii's Journey," and to complete a set of tasks. Our goal is to see how easy or difficult you find the game to use. Your participation in this study will help determine the changes to be made on the game to improve user experience.

The study will take approximately 20-30 minutes one day after school. In that time you will be testing the ease of use of the smartphone game in which I have created. This game will be downloaded and used on my cell phone and you will be testing how easy it is to use some of the features that have been designed. During the study I will be recording the smartphone screen you are using. The recorder also takes an audio recording of your responses that I will use later to check my notes taken during the session.

The study also consists of two surveys. One of the surveys will be given before introducing the game. This survey will ask for your grade level and current use of games and devices. The second survey will be given after you test the game and ask for your attitudes about the game itself. The project will be explained in terms that you can understand and you will participate only if you are will to do so.

WHAT'S IN IT FOR YOU?
There is no benefit to you for participating in this study other than learning about this new software and to help us figure out if technology can help students like you.

WHAT COULD HAPPEN?
There is minimal risk to participating. Any information we get from you will be kept safe. That means that no one else will know what you personally said. They will only know that a student said it. I will be the only person who has access to the recordings and survey data. Once the study is over, all data will be deleted.

PARTICIPATION: YOU HAVE THE CHOICE.
Whether or not you choose to participate in this study is up to you. You can say, "No," at any time, even if you have already started working with me. I promise

not to hold it against you in any way and this will not affect your grade or anything to do with what you do in my class. Your parent or guardian must also sign a consent allowing you to participate.

WHAT IF YOU HAVE QUESTIONS OR PROBLEMS?

Should you have any questions or desire further information, please call me at 254-7944 or email at kimmah@hawaii.edu. You may also contact my advisor, Dr. Catherine P. Fulford at (808) 927-8009 or email at fulford@hawaii.edu. Also, The University of Hawai'i at Manoa has a special office that deals with people who participate in research studies. You or your parents can call that office 808-956-5007 if you have questions that we can't answer.

ASSENT

_____I grant permission to participate in this study on a mobile, place-based game AND have my audio recorded.

_____I grant permission to participate in this study on mobile, place-based game but do NOT want to have my audio recorded.

_____	_____	_____
Print name	Signature	Date

Appendix G

KUALII'S JOURNEY: A USABILITY STUDY

Dear Parent or Guardian:

My name is Kim Mah and I am a 4th Grade teacher at Aikahi Elementary School in Kailua, Oahu. I am also a Master's student in the Learning Design and Technology department at the University of Hawaii at Manoa. I request permission for you child to participate in a usability research project on a place-based game I designed to enrich the Hawaiian Studies curriculum for 4th Graders.

WHAT WE'RE DOING.
I will ask your child to help me test a game I created called, "Kualii's Journey," and to complete a set of tasks. Our goal is to see how easy or difficult your child finds the game to use. Your child's participation in this study will help determine the changes to be made on the game to improve user experience.

The study will take approximately 20-30 minutes one day after school. In that time your child will be testing the ease of use of the smartphone game in which I have created. This game will be downloaded and used on my cell phone and they will be testing how easy it is to use some of the features that have been designed. During the study I be recording the smartphone screen your child is using. The recorder also takes an audio recording that I will use later to check my notes taken during the session.

The study also consists of two surveys. One of the surveys will be given before introducing the game. This survey will ask for your child's grade level and current use of games and devices. The second survey will be given after your child tests the game and asks for their attitudes about the game itself. The project will be explained in terms that your child can understand and your child can understand and your child will participate only if he or she is willing to do so.

BENEFITS
There is no benefit to your child for participating in this study, other than learning about this new software and to help us figure out if technology can help students like your child.

RISKS
There is minimal risk to your child's participation. All data will be kept secure and I will be the only person with access to the recordings and survey data. Once the study is over all data will be deleted.

VOLUNTARY PARTICIPATION
Your decision whether or not to allow your child to participate is voluntary and you or your child can choose to withdraw from the study at any time. The decision to withdraw will not affect the services normally provided to your child, their grades, or any classroom activities. Your child must also agree to participate in the study by signing an assent form.

WHAT IF YOU HAVE QUESTIONS OR PROBLEMS?
Should you have any questions or desire further information, please call me at (808) 254-7944 or email at kimmah@hawaii.edu. You may also contact my advisor, Dr. Catherine P. Fulford at (808) 9278009 or email at fulford@hawaii.edu. If you have any questions about your child's rights as a research subject, you may call the UH Human Studies Program at 956-5007, or email: uhirb@hawaii.edu.

CONSENT
Please indicate whether or not you wish to allow your child to participate in this project by checking one of the statements below, sighing your name and having your students return to me a signed copy and keep one for your records.

_____ I grant permission for my child to participate in Ms. Kim Mah's study on a mobile, place-based game and have their audio recorded

_____ I grant permission for my child to participate in Ms. Kim Mah's study on a mobile place –based game but dp NOT want to have their audio recorded.

_____ I do not grant permission for my child to participate in Ms. Kim Mah's study on a mobile, place-based game.

Signature of Parent/Guardian

Printed Parent/Guardian's Name

Printed Name of Child Date

Appendix H

Consent Form (Adult)

The purpose of this usability project is to evaluate the effectiveness and ease of use of an immersive, web-based, mobile game of Kawai Nui Marsh to enrich the learning of Hawaiian history and culture for 4th grade students at an elementary school in Kailua. I wanted to give you a little information about what you will be looking at and give you time to ask any questions you might have before we get started.

The study consists of two surveys. One of the surveys will be given before introducing the game. This survey will ask for your occupation and current use of games and devices. The second survey will be given after you test the game and ask for your attitudes about the game itself. The project will be explained in terms that you can understand, and you will participate only if you are willing to do so. Only I will have access to information on you.

The study will take approximately 30-45 minutes. In that time you will be testing the ease of use of the smartphone game in which I have created. This game will be downloaded and used on my cell phone and you will be testing how easy it is to use some of the features that have been designed. During the study I will be recording the smartphone screen you are using. The recording app also takes an audio recording that I will use later to check my notes taken during the session. Only I will have access to both of these recordings and once the study is over they will be deleted along with the rest of the information you have given to me.

Today I am asking you to serve as an evaluator of a game, “Kuali’i’s Journey,” and to complete a set of tasks. Our goal is to see how easy or difficult you find the game to use. Your participation in this study will help determine the changes to be implemented on the game to improve user experience.

I agree to participate in the usability study conducted by Kim Mah.

I understand that participation in this usability study is strictly voluntary and I agree to immediately raise any concerns or areas of discomfort during the session with the study administrator, Kim Mah.

I understand that my verbal responses and screen activity will be recorded as I participate in this usability study. These audio recordings will only be accessed by the researcher and will be destroyed once the research is complete.

Please sign below to indicate that you have read and you understand the information on this form and that any questions you might have had about the session have been answered.

Date: _____

Please print your name:

_____

Please sign your name:

_____

Thank you! We appreciate your participation.

Thank you! We appreciate your participation. Please click on the link below to complete this short survey: PRE-STUDY SURVEY or go to goo.gl/1a5Dl5

Appendix I

Department of Education Guidelines for Water-Related Activities

Planning and Preparation:
1. All water-related activities must be an extension of the standards-driven classroom instructional program or part of a Department of Education approved activity. Clear objectives must be established, and understood by all participants. Standards driven lesson plans, which include pre- and post-field trip activities, should be retained in the teacher's file.
2. Activity leaders and participants must conform with all swimming, boating, and other water-related activity protocols.
3. Participants and parents/guardians must be informed of the inherent dangers and hazards associated with the activity. Documentation of understanding and agreement by participants and parents/guardians must be received prior to participation and must be kept on file.
4. Parental permission forms should be reviewed prior to the activity. Forms should include student medical information and be carried on the field trip.
5. Activity leaders must conduct an assessment of the field site to identify hazards prior to the planned activity and develop appropriate safety instruction for all participants.
6. All participants, including chaperones, will receive appropriate water safety instruction.
7. Supervision should be adequate and appropriate. Chaperones should understand and agree to perform designated responsibilities during the field trip activity. Adult to-student ratio depends on the type of activity, number and type of students, and adult chaperone responsibilities. The following adult student ratio is recommended:
Grades K-3 1:4

Grades 4-6 1:6

Grades 7-12 1:10

The level of supervision must be greater for special needs students.
8. Every student participating in the activity will have a partner.
9. A trip itinerary shall be filed at the school and shall include names of all participants. Changes in the activity will be immediately reported to the school.

m at Aikahi Elementary. School. The game is a location-based game that takes students to three sites at the Kawai Nui Marsh.

The study consists of two surveys. One of the surveys will be given before introducing the game. This survey will ask for their grade level and current use of smartphones and game apps and if they have any experience with ARIS. The second survey will be given after they test the game and will ask for their attitudes about the game. The study will be explained in terms that your child can understand, and your child will participate only if he or she is willing to do so. Only I will have access to information on your child.

During the study I will be recording the smartphone screen your student is using. The recording app also takes an audio recording that I will use later to check my notes taken during the session. Only I will have access to both of these recordings and once the study is over they will be deleted along with the rest of the information given to me by your student.

There is no benefit in taking part in this usability study and participation is voluntary. Your decision whether or not to allow your child to participate will not affect the services normally provided to your child. Even if you give your permission for your child to participate, your child is free to refuse to participate. If your child agrees to participate, he or she is free to end participation at any time.

Should you have any questions or desire further information, please call me or email me at 254-7944 or kim_mah@notes.k12.hi.us or kimmah@hawaii.edu. If contact needs to be made with my faculty advisor at the University you may contact Dr. Catherine P. Fulford at fulford@hawaii.edu. Keep this letter and have your student return the signed consent form back to me in class.

Sincerely,
Kim Mah
Grrade 4 Teacher
Aikahi Elementary School

Appendix J

Usability Study Participants

Male/ Female	Occupation	Age range	Grade in or grade taught	Time playing games	Interest in place based game	Familiar with ARIS	Familiar with Ka Wai Nui
F	part-time teacher/ other	25+	high school/ college	weekly	yes	no	yes
F	student	14-17	high school	occasionally	yes	no	yes
F	student	5-10	elem school	weekly	yes	no	no
M	student	18-24	college COE	daily	yes	no	yes
F	student/ teacher	18-24	college /pre-school	occasionally	yes	no	yes
F	teacher	25+	pre-school	daily	yes	no	yes
M	student	14-17	high school	daily	yes	no	yes
F	student	11-13	elem school	occasionally	yes	no	yes
F	student	18-24	college COE	occasionally	yes	no	yes
F	part-time teacher/ other	25+	high school/ college	weekly	yes	no	yes
F	student	14-17	high school	occasionally	yes	no	yes