SCIENCE NOW, SCIENCE EVERYWHERE
Liberty Science Center's Mobile Learning Companion

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INTRODUCTION

At Liberty Science Center (LSC), we believe the growth of mobile phones in the public domain provides the potential to expand the museum learning experience into a new dimension. Just like museums have used the Web as a tool for online learning, we'd like to use mobile phones as a tool for mobile learning, or m-learning. No longer will our science center only offer hands-on experiences, but it will allow visitors to engage with exhibits in a totally new way by permitting them to *interact* with exhibits, *retrieve* extra content and *extend* the learning experience - all from their mobile phones. A key benefit of m-learning is its potential to make learning available anytime and anywhere. Therefore, visitors can use their phones as tools for learning not only inside the museum but also outside of the museum after their visit. Anyone with a mobile phone can utilize this learning companion which is called Science Now, Science Everywhere (SNSE).

BACKGROUND

Before we settled on the design of the SNSE Learning Companion, we felt it was important to understand how our visitors currently use their mobile phones as well as their willingness to use their phones in an exhibition and as an extension of their science center experience. So in the Spring and Summer seasons of 2005, LSC contracted with the Institute of Learning Innovation to conduct a Front End Evaluation. Institute researchers had already conducted three front-end evaluation studies for LSC's *Communication* exhibition, including a 2004 study dealing specifically with the technology in *SNSE.*

We were greatly encouraged to find out in 2005 that more than three-fourths (84%) of our visitors owned a mobile phone. More importantly, this percentage was up 2% from the 2004 study showing a growing trend of mobile phone owners in our visitorship. Visitors were interviewed about what features they had access to on their service plan and how much they utilized those features. Visitors were also asked about their interest in proposed SNSE activities. By synthesizing the information learned from this Front-End Report, we were able to paint a clearer picture of what SNSE should be.

SNSE LEARNING COMPANION

We would like to create learning experiences that take advantage of the unique capabilities of the mobile phone. We realize that each mobile learner will be partial to certain activities based on their phone and how they use it; therefore, all SNSE experiences will be offered in more than one exhibition area. The following descriptions detail how our visitors will be able to use the SNSE Learning Companion in July 2007 when we reopen our main building after our expansion. The descriptions are clustered according to the following broad categories:

I. *Interact* with Exhibits
II. *Retrieve* Extra Content
III. *Extend* the Learning Experience

I. *Interact* With Exhibits

One of the main impacts we hope to have during the life of this grant is to broaden our visitors' engagement with exhibits by taking advantage of the unique capabilities of mobile phones. In order to achieve that impact, we felt it was important to offer activities that involved not only audio but also text messaging (SMS) and picture messaging (MMS).

Use Your Phone to Listen to Audio Interpretation

Roughly 60% of our visitors who own a mobile phone use it only to make calls. So, in order to appeal to that part of our visitor population, we knew we had to offer audio interpretation. But our hope is that by making audio available, that part of the population will become comfortable and excited about using SNSE and possibly experiment with other aspects as well. During the Front-End evaluation, visitors were asked to rate their opinion about taking a cell phone tour of an exhibition. As it turns out, on a scale of 1 to 10, where 1 is "I am not at all interested in doing that" and 10 is "I am very interested in doing that," our visitors rated it an average of 5.44. This is a good rating; more importantly, it was rated well across all ages. An audio application will be created in each exhibition.

Eat and Be Eaten: Listen to our Animal Husbandry Staff

- In the Eat and Be Eaten exhibition, visitors can use their phones to access commentary from our Animal Husbandry staff about the animals. Visitors will find out about the unique characteristics of the animals along with basic background information. This feature will be available for at least eight animals in the exhibition.

Communication: Listen to an Oral History

- In the Communication exhibition, guests will encounter a sample of cultural artifacts in the Hall of Symbolic Objects. Each object has a story; oral traditions often involve a variety of cultural teachings, laws and rules, social histories and family relationships. Visitors can use their phones to listen to oral histories about the artifacts.

Breakthroughs: Listen to Live Audio

- The Times Square of Science is a multi-element, science/technology art piece being developed by Onomy Labs, located in Menlo Park, CA. It will be included as part of the Breakthroughs exhibition. Several video screens will be part of the art piece. Visitors can use their phones to access the audio component from any screen in the display.

Use Your Phone to Vote in a Poll

Text messaging was the most common feature visitors reported having as part of their service plan, with 20% of all visitors having access to it and 16% of all visitors reported using text messaging. When asked about their familiarity with certain phone applications, the most commonly recognized application was text messaging to vote in a contest or take a quiz; more than three-fourths (77%) of visitors had heard of this application for text messaging. However, only 4% had ever done this. A large part of the SNSE project is improving technological literacy among our audience; therefore, it was clear we needed to include this application. A poll application will be created in each exhibition. When visitors text in their response, they will immediately receive a confirmation of their response along with the running tally of all visitor responses.

Eat and Be Eaten: Animal Behavior Poll

- A graphic panel near an animal exhibit will prompt guests to observe the animal and report what it is doing. For example, is the animal (A) eating, (B) sleeping, (C) exploring their environment or (D) interacting with another animal? Guests who use this SMS application will be encouraged to look at the animal and log their observation by sending us a text message.

Communication: Express Your Opinion Poll

- Guests use their phone to log their opinion about a current events poll. For example, is Bush doing enough to help hurricane victims? (A) yes, absolutely! (B) yes, but not enough (C) no, he's barely making an effort or (D) no, absolutely not! Guests who use this SMS poll application will be encouraged to think about a current event and communicate their opinion to us. This poll question will change on a regular basis to stay up to date with current events.

Breakthroughs: Breakthroughs Survey

- As part of the Breakthroughs exhibition on current topics in science and technology, guests use their phone to log their answers to survey questions. Visitors use this SMS application to contribute their answers to our survey database. The Times Square of Science display will also pull data from the survey database and present it as part of an ever-evolving exhibit component.

<u>Use Your Phone to Contribute to Exhibit Displays</u>

Visitors were asked to rate their opinion about sharing ideas with others in the exhibition using the same scale of 1 to 10 where 1 is "I am not at all interested in doing that" and 10 is "I am very interested in doing that." Visitors ages 8-12 were most interested, ranking this activity 8.3 out of 10. This is a very high rating. We realize that children under 12 may not have their own mobile phones yet, but this might be the perfect opportunity for a parent and child to use the adult's phone together to contribute something to the exhibit. On average, those under 18 were much more interested (6.72) than adults (3.81) in sending information about themselves to the exhibition. Again, this might be a nice opportunity for a child and parent to participate together.

Communication: Leave Your Mark

- At CM.ex.4.24, on a large multimedia wall, guests see text messages and images. The display is completely derived from guest contributions and captures what people are thinking-feeling-doing in the moment. Since personal devices have the functionality to text message, take and send pictures and take and send video clips, this is a chance for guests to contribute something to the exhibit. Using SMS or MMS, visitors can contribute content directly from their phone into the exhibit display.

Breakthroughs: Jukebox

- The Times Square of Science is a multi-element, science/technology art piece in the Breakthroughs exhibition. Visitors will be able to submit Internet sites for display in this art piece. Guests can also use this SMS application to control the display by selecting which of several videos they would like to see in the display.

<u>Use Your Phone to Participate in a Camera Phone Challenge</u>

Visitors were asked to rate their opinion about receiving personalized maps that direct you to other relevant topics within the exhibit or elsewhere in the science center. Visitors ranked their interest on the same scale of 1 to 10. This activity was rated an average of 6.9 by all visitors. That is the highest rating of any activity. This was also the highest ranked activity in both 2004 and 2005. It's even more interesting that teachers ranked the same activity as 8.12 indicating that an application with this type of functionality could have a use with school groups.

Additionally, we asked about an application where visitors could collect pictures and information about wildlife and load those to a website. Those under 18 rated the feature highly at 8.17 out of 10.

We put both of these ideas together and the result is the camera phone challenge described below. It allows visitors to collect pictures and load them to a website, while it also encourages you to follow topics that are threaded throughout the science center.

Inside the Museum: Camera Phone Challenge

- The main focus of the camera phone activity is to challenge players to capture photos of "science things" with their camera phones. LSC will create challenges that remind the players to look for specific "science things" in the museum environment. For example, one challenge might be to collect pictures of all the inventors that you learn about throughout the science center. Upon entry into the museum any visitor will have the ability to sign into the system and create an account via a web-based kiosk. A multi-player sign-in screen will exist so an entire group of users can sign up and play together. When you sign in, you select which challenges you want to participate in. Each challenge is sent to you as a text message. As you collect pictures, you reply to that message with the picture attached. All the pictures from your group are collected on a private website that only your group can see.

II. ***Retrieve*** Extra Content

Another major impact we hope to have during this grant is to develop experiences that sustain the informal learning experience by encouraging subsequent learning experiences beyond the walls of the science center. In order to achieve that impact, we felt it was necessary to put content on the visitor's phone. As we discovered in our 2004 evaluation, visitors who downloaded content on to a handheld device said they would prefer to look at the information later, rather than in the exhibit, and overwhelmingly expected to share it with family and friends. We intend to provide content to our visitors through text messaging (SMS) and picture messaging (MMS).

<u>Use Your Phone to Take Information with You</u>

Visitors were asked to rate their opinion about receiving more detailed information about a topic on the same scale of 1 to 10. Visitors ranked this activity 6.1 out of 10. This is a high rating. This was rated as the second highest ranked activity in both 2004 and 2005. Teachers also rated this as top experience with an average of 8.09 out of 10. From the front end evaluation, it was clear we needed to include this type of application, so there will be several opportunities where visitors can receive information.

Eat and Be Eaten: Receive Animal Facts

- In Eat and Be Eaten, guests can receive basic fun facts associated with the animals as a text message on the mobile phones: Graphics prompt the visitors with questions like "Why do chameleons change color?" and "Why does a Hissing Cockroach hiss?" Visitors simply send an SMS message and receive a reply with the answer.

Eat and Be Eaten: Receive Animal Pictures

- In Eat and Be Eaten, guests can receive basic information about the animals through MMS on their mobile phones. Guests are provided with a picture of an animal in the exhibition along with some basic information about where it lives and what it eats. This reinforces the main goals of the exhibition. The picture could also help them see what the animal is that they are looking for in the exhibit – since a lot of our species like to camouflage themselves.

Communication: Receive an Invisible Ink Recipe

- At CM.ex.2.24, visitors learn about steganography, the art and science of writing hidden messages in such a way that no one apart from the intended recipient knows of the existence of the message. Visitors can request this invisible ink recipe by sending us an SMS message; the recipe will be sent as a reply message. By receiving this take-away experiment on their phone, visitors will have a recipe that they use to create invisible ink at home. They could even stop at the grocery store on the way home to pick up the ingredients!

<u>Use Your Phone to Save Multimedia Creations</u>

Visitors were asked to rate their opinion about creating and saving multimedia creations. Those activities were creating and saving ring tones, creating and saving video clips, and creating and saving an animation. On the same scale of 1 to 10, each activity was rated at either a 5.4 or 5.5 – all relatively high ratings for a general audience question. More importantly, the highest rated activity for pre-teens was creating and saving a video clip with a rating of 9.29. This was the highest rating given to any activity overall by a particular age group. So we knew we should include that activity if at all possible. Also worth noting, adults rated ringtones, video clips, and animation quite low, creating a real generational divide on the popularity of these activities. However, we believe, this could be another opportunity for a child and a parent to participate together. There are two experiences that allow visitors to save their multimedia creations and they are both in the *Communication* exhibition.

Communication: Save Your Pictogram

- Pictures communicate meaning without the use of written words. Pictograms are those special symbols that we see throughout our daily environment – such as the symbols to designate the men's and women's restrooms. At CM.ex.1.17, guests use a touch-screen interactive to create their own pictogram using our custom software. For inspiration, guests can look at the set of international symbols developed by the American Institute for the Graphic Arts (AIGA) or samples of Olympic Pictograms. When finished, they can publish the pictogram to the flat-screen monitor overhead and/or save it to their phone. If the visitor provides their phone number, the software will automatically send the picture as an MMS message.

Communication: Save Your 5 by 1

- Media is information that is created, packaged and distributed to a mass audience. At CM.ex.3.10, visitors use a touch-screen to produce their own set of media assets called a 5 by 1. Within our unique software framework, visitors are given a blank template with 5 spaces to fill. These spaces can be filled with a still image, a video or perhaps a sound or some text. We want the guests to fill the template with things that have importance to them. When finished, they can publish their 5 by 1 to the media wall and/or save it to their phone. If the visitor provides their phone number, the software will automatically send the set of media as five individual MMS messages.

III. ***Extend*** the Learning Experience

As we mentioned in the last section, we want to sustain the informal learning experience by encouraging subsequent learning experiences beyond the walls of the science center. Putting content on to the visitor's phone should sustain the learning experience somewhat, but we realize the longevity may be limited. Here is how we intend to really encourage subsequent learning experiences.

<u>Use Your Phone to Subscribe to Current Science Updates</u>

As discussed above, from our Front-End research, we know that receiving detailed information about a topic is great interest to our visitors. But what if we offered a free subscription to current science information? Will our guests be interested in this type of service? If so, will it encourage subsequent learning experiences?

Breakthroughs: Subscribe to Current Science Updates

- In Breakthroughs, visitors learn about current topics in science and technology. Content in the media display is ever-changing and content in the exhibition will be updated every few months. As an extension of this exhibition, we will offer visitors the opportunity to subscribe to SMS science updates. Visitors simply send a SMS message to us to start the subscription and then each week, visitors will continue to get up-to-date science information in the form of a text message long after they have left the science center.

<u>Use Your Phone to Subscribe to Camera Phone Challenges</u>

What if we sent text messages that encouraged our guests to observe relevant science topics in their everyday life? Will our guests be interested in this type of subscription? Will it encourage subsequent learning experiences if we ask them to send us pictures of what they observe?

Outside the Museum: Subscribe to Camera Phone Challenges

- The main focus of the camera phone activity is to challenge players to capture photos of “science things” with their camera phones. As described above, guests can participate in challenges that take place within the museum. From the web-based kiosk, visitors will also be able to subscribe to camera phone challenges – a new challenge sent out each week by the staff of Liberty Science Center. The difference is these challenges will be designed to take place outside the museum. For example, LSC might ask participants to submit a picture of the most energy efficient device that they observe. Every person who has a subscription will be able to submit one picture that they feel best satisfies that week’s challenge. LSC will review the pictures before they go online. Once they are on the web, participants can vote on each others’ submissions. The person who took the most popular picture will receive a prize – possibly an IMAX movie ticket.