SCIENCE ON A SPHERE INTERPRETIVE FEATURES: PROTOTYPING REPORT

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Purpose

Science on a Sphere is utilized at the Science Museum of Minnesota (SMM) to display a variety of scientific visualizations related to Earth surface dynamics, water, and the solar system. This new technology is awe-inspiring to visitors, however the difficulty lies in moving visitors beyond their initial fascination to understanding what they are viewing on the Sphere. During January 2007, SMM carried out a study to gather visitor feedback on a variety of potential interpretive features of the Sphere. Visitor preferences related to the use of interpretive labels and graphics directly on the Sphere and the speed in which visualizations rotate were studied.

Methodology

A continuous random sampling method was used for data collection. Using this method, the interviewer positioned him/herself near the exhibit entrance and drew an imaginary. The first eligible visitor to cross this line was approached for an interview. Upon completion of the interview, the interviewer repositioned him/herself and repeated the sampling method. The sample included all visitors ages eight and above. Interviews took place from January 13 to 27, 2007. A total of 51 visitors were interviewed. Visitor demographics can be found on page 8.

Results & Discussion

Placement of Labels
When visitors sat down at the exhibit, they were first shown three unlabeled visualizations: an image of Earth's moon and two different images of Earth. Visitors were then shown a clip from NASA's *Footprints* movie that included images of various planetary bodies with their names on the image. After viewing these visualizations, visitors where asked if they liked having the labels directly on the image or if they would prefer that the name of the image not be on the Sphere but available elsewhere in the exhibit area. Three-quarters of visitors (75%) liked having the labels directly on the Sphere, while a quarter (25%) said they would prefer the labels somewhere else in the exhibit area.

Duration of Labels on Image
Visitors were then asked a series of questions about labels, assuming the museum decided to place labels directly on the Sphere. Visitors were first asked if they would prefer a label to stay on an image the entire time an image is displayed or disappear after a period of time so the image can be viewed without a label. Most visitors (94%) wanted the label to disappear after a period of time. Only a small percentage (6%) preferred that the label stayed up the entire time the image was displayed.

Visitors were asked describe their preference. The visitors who wanted the labels to stay up the entire time said they wanted to make sure visitors who wander into the exhibit after a visualization begins would know what they were viewing. The responses from the 48 visitors who preferred the label to disappear were coded into themes, with some visitors providing more than one reason they preferred the labels to disappear after a period of time. A majority of visitors (69%) said they wanted the label to disappear so they could see everything on the image.

"To see the actual image itself. It looks more realistic." *"So you can see what's under the area. It's a clearer picture without anything on it."* *"Then you can see the whole image without having to look around something."* A fifth of visitors (21%) felt that keeping the label up the entire time would be distracting. *"(Label appears and disappears) intermittently; refreshes your memory but doesn't distract."* *"Distracting if it's up there too long."* Some visitors (13%) simply felt the label didn't need to be on the Sphere the entire time. One visitor was unable to articulate why he/she preferred that the label disappear.

Additional Labels on Visualizations

Visitors were also asked if they wanted any additional information the name of the image. Half of the visitors (49%) wanted more information. An additional 10% said it would depend on what the image was trying to show. The 25 visitors who wanted more information were asked what kind of information they would like on the image. Responses were coded into themes and representative responses are included for each. Some visitors had multiple ideas for additional information to include on the Sphere. Almost three-quarters of visitors (72%) mentioned that they would like the labels to provide additional facts about the image, beyond the image's name. A third of visitors (32%) desired labels pointing out specific features on an image.

More Information (n=25)

72% Facts About Image
- Depends on what it is. I would like facts about what it (the image) is.
- More information about what the image is. Amount of information needed would depend on the image. Need less for Earth than for moon of Jupiter.
- As long as it's not too technical, just basic information.
- Labeling what it is on the Sphere. The extra information about the image could be somewhere else in the exhibit area.
- If it were the moon of another planet it would help to know that.
- When was the planet discovered? That kind of stuff.
- Describing temps or other things that help explain what we're looking at.

32% Specific Feature
- Names of specific features that are less obvious or recognizable.
- Maybe an arrow for, "You are here in Minneapolis".
- I would want an arrow pointing to a special feature like the eye of Jupiter for a second if that's what the narration talked about.
- Specifics that you don't normally find on maps like ocean currents, trenches, or air currents moving the clouds.
- If it was interactive. Hit a button, see features, and then shut off. That would be cool.
- A diagram of what we see: oceans, glaciers, mountains

The 21 visitors who did want additional labels were asked if there was a particular reason they did not want more labels. Visitors most frequently mentioned (82%) that the additional labels would be too much to look at on the Sphere and distract visitors from the actual image. *"It would get in the way. You would spend more time reading than actually looking at the image." "Just too much. Maybe more other information on the wall."* Other reasons for not wanting

additional information on the Sphere included the desire to have the information available as audio narration instead and the feeling that people should know what they are looking at so additional information is not necessary.

Highlighting Special Features

Visitors were then asked a series of questions about using graphics to highlight special features on visualizations. Visitors were shown a visualization of Hurricane Katrina from *Footprints.* This visualization included a graphic on the image that highlighted the Hurricane as it moved across the Gulf Coast of the United States. After viewing the image, visitors were asked if they would prefer special feature graphics to stay on an image the entire time it was displayed or disappear after a period of time. Two-thirds of visitors (65%) preferred that the graphic disappear, while a little more than a third (35%) wanted the graphic to stay up the entire time an image is playing.

Visitors were then asked to explain their preference. Of the 33 visitors who preferred that the graphic disappear, more than half (58%) wanted the graphic to disappear so they could see the entire image. *"You can zero in on the feature. Then the graphic goes away so you get the full effect of the image." "Give a more natural image to the picture." "You're focused onto a spot and can't see the surrounding areas."* A little less than a third (30%) felt that keeping the graphic up the entire time would be distracting. *"It catches the eye but then it will get distracting if it doesn't go away."* A small percentage of visitors (18%) did not provide a reason for their preference, but offered suggestions related to the graphic disappearing. Suggestions included having a graphic fade in and out so visitors coming in at various times will still know what they are looking at; have the graphic disappear and then new graphics pointing out different features appear; and having the graphic either disappear or become translucent, *"Box there makes it look kind of fake. Try to make the box as subtle as possible so the realness remains."*

There were 18 visitors who preferred the graphic to stay on the image the entire time it was displayed. Almost all of these visitors (16 out of 18) said they wanted the graphic to stay on the image because it would help draw their attention to the special feature of the image. *"You should keep it there to make it clear where to look." "You're looking at a pretty small area in the graphic. It helps you focus." "Want it to stay up because of the Earth rotating and might lose focus on it otherwise."* Two visitors mentioned that the graphic should stay on so all visitors can see it regardless of where they sit or when they enter the exhibit.

Labels of Continents and Oceans on Special Feature Images

Visitors were asked to rate on a 10-point scale, where 1 was "not at all interested" and 10 was "extremely interested", how interested they would be in seeing labels of continents and oceans on the image in addition to the graphic indicating the special feature. As displayed in the graph below, the distribution of visitor responses was bimodal with peaks at ratings of four and nine. A majority of visitors (60%) chose a rating somewhere between one and five, expressing low interest in including labels of continents and oceans in addition to special feature graphics. Only 22% of visitors expressed high interest (rating of nine or ten) in labeling continents and oceans.

Level of Interest in Labeling Continents and Oceans (n=51)
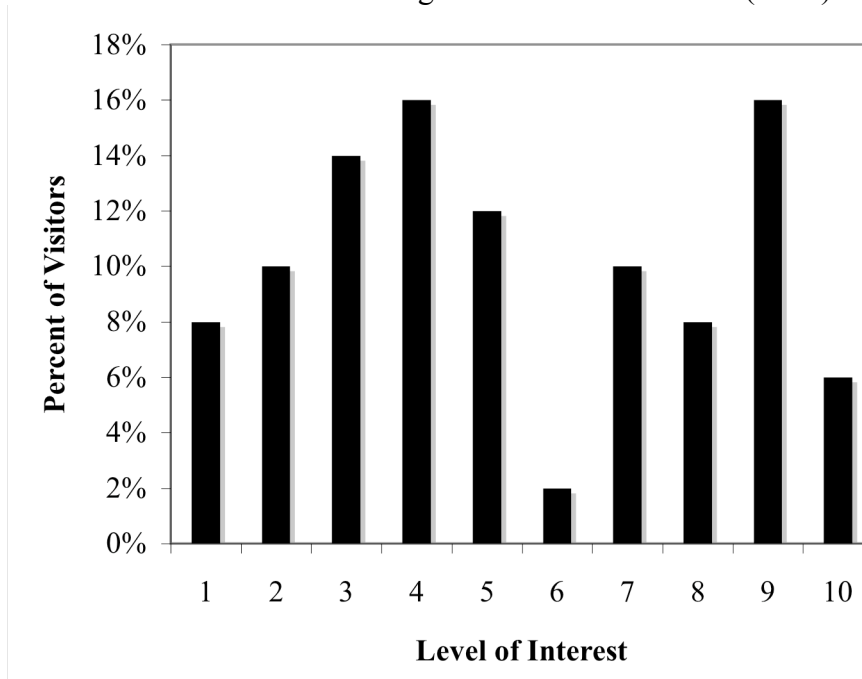
Additional Information on Special Feature Images
Visitors were also asked if they wanted any additional information beyond that of continents, oceans, and special features included on the image. A quarter of visitors (24%) wanted more information, and an additional 12% said it would depend on what the image was trying to show. The 12 visitors who wanted more information were asked what kind of information they would like on the image. Some visitors had more than one suggestion for additional information to include on the Sphere. Visitors most frequently mentioned additional information related to the Hurricane Katrina image they viewed during the interview.

More Information (n=12)

Information about Hurricane Katrina
- The intensity of Katrina might be good.
- Time period for how long of storm progression. If other info helps kids it doesn't hurt to have it up for adults.
- Hot winds of Africa and how it impacts hurricanes. If it helps explain what you see, show it.
- Maybe something that says it's Hurricane Katrina. The major cities around the featured area.
- Maybe the source of the information or maybe major cities in the hurricane's path should be labeled, like New Orleans or Biloxi.
- Depends on what the information would pertain to. Want to know where the hurricane started and how fast it traveled.
- When the hurricane happened.

Other Types of Information
- A key somewhere that says what the colors mean, distances, population. Depending on what you show, you could do different things.
- Large countries and maybe facts, like the first person who landed on the moon was.
- Unless there was something significant to show. The year we are seeing. A thermal thing highlighting temperatures.
- The first place that they discovered like a sea serpent or something.
- It depends. An arrow pointing to "you are here" might be good for kids.
- Maybe some interesting information about the place. It depend on the thing (image).

Speed of Rotation of the Images

To understand visitor preferences for the speed in which images rotate, visitors were shown similar Earth images moving at varying speeds. The first image was from *Footprints* and rotated at a quick pace. The second image was from SMM's regular playlist and rotated at a much slower speed than the first image. Visitors were then asked if they preferred the speed of the first image (fast image), the second image (slow image), or some other speed. Almost half of the visitors (47%) preferred the slower speed, while only 14% preferred the faster speed. More than a third of visitors (39%) preferred a speed in between that of the two images shown.

Visitors were also asked to explain why they chose their preferred speed. Visitor responses were coded into themes based on the speed they preferred and representative responses are then included for each theme. Of the 24 visitors who preferred the slower speed (second image), the most frequently mentioned reason (71%) was that they liked having more time to see the details of the image. A little more than a quarter of visitors (29%) said they preferred the slower speed because it seemed more realistic.

Reason for Preferring Slower Speed of Second Image (n=24)

71% More Time to See Details of Image
- Then you can see what's there. You can see more. You can do your own exploration at the slow speed. There's a lot to see there.
- Time to really study and see what's what. I'm a little slow so I need it to go slower. There is some interesting detail there.
- You might miss something if it's going too fast. You have more time with this one.
- More time for your eyes to focus on things.
- First was like a whirling top, too fast to really get a grasp on what you're looking at.
- Gives you a chance to take everything in. You absorb more. Allows for your mind to process it.
- Get more of an outlook on things. You can actually see the detail.

29% Speed More Realistic
- Feels pretty real. This is a good pace for a general audience.
- Looks more like you're an astronaut in outer space.
- It's what one would expect the Earth to look like. It adds ambiance. It's an experience.

There were 20 visitors who preferred a speed other than the two speeds they viewed. Almost two-thirds of these visitors (65%) said they preferred a different speed because the first image was too fast and second image was too slow. A little more than a third of these visitors (35%) that preferred a speed that was closer to the speed of the slower image (second image).

Reasons For Preferring a Middle Speed (n=20)
65% Speed in Between Fast and Slow Images
- First one was two fast, but the second was too slow.
- The first seems too fast, you might lose interest, but the second is too slow. Speed has to deal with the complexity of the image.
- Listening to information would require a speed in between the two speeds to absorb the information, but the second one is too slow.
- Slow enough to look at the details of the image, but not as slow as the second one.

35% Closer to the Speed of the Slower Image (Second Image)
- The first was so fast that you had to jump around. The second one made you want it to hurry up. It should be closer to the second though, just a bit faster.
- A little faster than the second one. The first was too fast. I couldn't find anything on it. The second was too long and I lost interest.

There were seven visitors who preferred the faster speed of the first image. These visitors most frequently mentioned that they preferred the faster image because they could see more of the Earth in a shorter timeframe.

Reason for Preferring Faster Speed/First Image (n=7)
- Because in one spot I can see the whole thing, the full view, much quicker.
- You can actually see more, more quickly.
- I can see the whole world at that speed.
- Fast enough that you can see the entire Earth without having to wait too long. Seems more realistic at the first speed.

Visitor Demographics
Demographic information is self-reported.

Interest Level in Science (n=51)
Interest level 1-5: 6%
Interest level 6-10: 94%

Knowledge of Science (n=51)
Knowledge level 1-5: 24%
Knowledge level 6-10: 76%

Sex (n=51)
Females: 53%
Males: 47%

Primary Language (n=51)
English: 94%
Urdu: 2%
Romanian: 2%
Thai: 2%

Ethnicity (n=51)
White: 86%
African-American: 2%
Asian: 2%
Native American: 2%
Mixed/other: 8%

Age (n=51)
Median age: 34
Minimum age: 8
Maximum age: 65

Age Range (n=51)
8 – 16: 24%
17 – 24: 10%
25 - 34: 18%
35 – 44: 24%
45 – 54: 18%
55 – 64: 6%
65+: 2%

SMM Members (n=51)
No: 57%
Yes: 43%

Education (n=51)
Less than High School: 22%
Completed High School: 8%
Some College/Technical School: 26%
College Degree: 26%
Post-grad Degree: 20%

Household Income (n=48)
Under $30,000: 17%
$30,000 to $39,999: 10%
$40,000 to $49,999: 13%
$50,000 to $59,999: 10%
$60,000 to $69,999: 4%
$70,000 to $79,999: 4%
$80,000 to $89,999: 10%
$90,000 to $99,999: 4%
$100,000 to $149,999: 8%
$150,000 and higher: 19%

Group Composition (n=51)
Adults and Children: 67%
Adults only: 31%
Alone: 2%

Number of Other Visitors in Group (n=51)
Median: 3
Minimum: 0
Maximum: 6

Ages of Other Visitors in Group (n=126)
Median age: 23
Minimum age: 3 months
Maximum age: 72

Number of Visits to SMM in the Last 2 Years (n=51)
None: 28%
1-2 times: 24%
3-5 times: 31%
More than 5 times: 18%