SCIENCE ON A SPHERE

FORMATIVE EVALUATION REPORT

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Methodology

In May of 2006, Science on a Sphere (SOS) was set up in a permanent exhibit space on Level 3 of the museum. With the new installation of the Sphere, came the addition of a variety of features that were not included in the initial front-end study. These new features included an expanded playlist, new audio for some of the visualizations, accompanying labels projected on the wall describing the visualization, indication on the labels of what image will be playing next, and seating for visitors so they can sit and view the sphere. The new master playlist was composed of three smaller playlists titled "In Our Solar Neighborhood", "Earth, the Water Planet", and "Earth Surface Dynamics". The duration of the entire master playlist was 55 minutes.

A formative evaluation of SOS was carried out to gain feedback on the new exhibit features. Visitors were unobtrusively observed when they entered the exhibit area to understand visitors' behavior at the exhibit and how long they stay. When visitors left the exhibit they were approached for an interview to gain a deeper understanding of their experience. A random sampling method was used in which the third visitor to walk over an imaginary line was observed. The sample included all visitors ages 8 and above. Observations and interviews took place May 26 to June 12, 2006. A total of 50 visitors were observed and interviewed. Visitor demographics can be found on page 10.

Observations Results & Discussion

A. Time Spent at Science on a Sphere

Visitors spent a median total time of 3 minutes, 29 seconds at the sphere, with a minimum time of 30 seconds and a maximum time of 30 minutes, 17 seconds (a little more than half of an entire playlist). For comparison, a much shorter playlist was used (6 minutes, 55 seconds) during the front-end evaluation and visitors stayed a median total time of 3 minutes, with a minimum time of 16 seconds and a maximum time of 14 minutes, 4 seconds (two loops of the playlist).

B. Behaviors at Sphere

Visitors were highly engaged with the Sphere as evident by their behaviors at the exhibit. As illustrated in Table 1, a majority of visitors were observed reading the label (82%), talking about the content on the Sphere (72%), and pointing to the Sphere (62%). Seating was a new addition to the exhibit area, and many of the visitors (60%) sat down to watch the visualizations.

Table 1: Behaviors Viewed at Science On a Sphere (n= 50)

Behavior	Percent of Visitors
Read label	82%
Talk about content on the Sphere	72%
Point to sphere	62%
Sit down	60%
Read label out loud	24%
Talk about technology of the Sphere	22%
Point to label	20%

C. Total Time at Sphere Based on Sitting Behaviors

Additional analyses were carried out to see if visitors stayed longer at the exhibit when they sat down for all or part of their visit. An independent-samples *t* test was carried out to compare the mean total times of visitors who sat down and visitors who did not sit down. There was a statistically significant difference between the mean total times ($p < 0.01$). The mean total time of visitors who sat down was significantly higher (*m* = 8 minutes, 2 seconds, *sd* = 7 minutes, 16 seconds) than the mean total time of visitors who did not sit down (*m* = 2 minutes, 43 seconds, *sd* = 2 minutes, 9 seconds). Table 2 also illustrates the differences in median, minimum and maximum times spent at SOS for the two groups.

Table 2: Total Time at SOS (n=50)

	Median Time	Minimum Time	Maximum Time
Sat Down (n=30)	5 min., 54 sec.	51 sec.	30 min., 17 sec.
Did Not Sit Down (n=20)	2 min., 12 sec.	30 sec.	7 min., 30 sec.

Interview Results & Discussion

A. Visitor Interest and Enjoyment

Visitors were interested in the sphere and enjoyed the exhibit. As shown in Table 3, around three-fourths of the visitors (72%) were so interested in the Sphere that they would come see it again. None of the visitors felt the Sphere was not interesting at all. Table 4 illustrates that most visitors (94%) found the exhibit enjoyable with 52% stating that they would encourage others to come see the exhibit.

Table 3: Interest in Science on a Sphere (n=50)

	Percent of Visitors
I was so interested I'd come see it again.	72%
I was interested, but I wouldn't come see it again.	22%
I wasn't really interested.	6%
I didn't find this interesting at all.	0%

Table 4: Enjoyment with Science on a Sphere (n= 50)

	Percent of Visitors
It was so enjoyable, I'd encourage others to come see it.	52%
It was enjoyable.	42%
I didn't really enjoy it.	4%
It didn't find this enjoyable at all.	2%

B. How Visitors Viewed Visualizations

Visitors were also observed to understand how they viewed the Sphere. Many of the visualizations rotated so a visitor could stand in one location and view an entire visualization. However, there were also visualizations in which visitors had to walk around the Sphere to experience the entire visualization. Table 5 shows that over half the visitors (52%) circled less than half of the sphere (26% stood in one place, 26% circled less than half the sphere).

Table 5: How Visitors Viewed the Sphere (n= 50)

	Percent of Visitors
Stood in one place	26%
Circled less than half	26%
Circled half or more	12%
Circled entire exhibit	36%

During the interview, visitors who circled less than half of the sphere were asked if they realized they could walk all the way around the Sphere. Of these 26 visitors, most of them (81%) realized they could circle the Sphere, but chose not to. These visitors were then asked if there was a particular reason they did not walk around the sphere to find out if visitors thought they could view everything by standing in one place. Visitors' responses were coded into themes and representative responses are included for each. Visitors' reasons for not circling the sphere were spread across a variety of themes. Only 14% of visitors felt it wasn't necessary to circle the sphere in order to see an entire visualization.

Is there a particular reason you didn't walk around the sphere? (n= 21)

24% Not Interested
- Resting.
- I wanted to sit down.

19% Time Constraints
- We weren't going to stay long, have to go to body worlds.
- About to leave.
- We wanted to see something else.

14% Following Kids
- I was watching my children.
- Because the kids came out of the exhibit.

14% Wasn't Necessary to See Everything
- I thought the sphere would turn to me.
- Because it was spinning.
- I didn't think to walk around.

10% Didn't Want to Get in People's Way
- Thinking about other people who are watching. Didn't want to get in anyone's way.

5% No Reason
- No particular reason.

14% Other
- We were interested in the information at that spot.
- I have difficulty walking.
- Had to go to the toilet.

C. Technology of the Exhibit

During the front-end evaluation visitors were asked what they found most interesting about the sphere. Forty percent of visitors were most interested in the exhibit's technology. To further understand visitors' interest in the exhibit's technology and guide future development of the exhibit, visitors were asked if there was anything they wanted to know about the exhibit's technology and what they would like to know. Almost half the visitors (46%) wanted to know something about the exhibit's technology. Visitor responses were coded into themes and representative responses are included for each. The most common thing visitors want to know about the Sphere was how the images are projected onto the Sphere (43%).

What would you like to know (about the exhibit's technology)? (n=23)
*Some visitors wanted to know more than one thing.

43% How Images Are Projected
- A little more information about how it is projected on to the globe.
- How they got it (image) all the way around?
- How is it projected and synchronized?
- I would like to know how they get the images to transition so smoothly?
- Are there cameras inside? Is it a movie screen?
- Is that inside or outside projection?

22% How the Sphere is Set Up
- How it hangs? Is it floating on air?
- How do they make it move?
- What was the sphere made out of? What was it that the manufacturer used to make the sphere?

22% How Exhibit Works (didn't specify what they were referring to)
- How does it work?
- Know how it was done. (Friend said: Put it higher because people's heads are getting projected onto the screen.)

9% Where Images Are From
- Where do they get the pictures? Are they from satellite images, like from NASA?

17% Other
- How long is this movie?
- General background.
- Is the global tilted at the right axis?
- What was the time delay across the sphere?

D. Labels for Visualizations

Each of the visualizations had an accompanying label that was projected on the wall. The label included information about the visualization and what image was playing next. Some labels also included questions for visitors to think about as they viewed an image. As stated earlier, 82% of visitors were observed reading the labels.

The following visualizations had labels that included questions:

- In Our Solar Neighborhood: Mars, Jupiter
- Earth, The Water Planet: NASA's blue marble, Through the seasons, Hurricane Katrina and Rita, Real time weather
- Earth Surface Dynamics: Mars, Hurricane Katrina, Season, Global Dams

Visitors were observed to see which visualizations were playing when they were at the exhibit. Seventy-six percent of visitors viewed images that had questions on the label. Of these 38 visitors, 26% said they saw the questions on the labels. A few visitors provided comments of why they did not view the questions. *"Didn't have a chance. Have four little kids running around." "Couldn't see the question from where I was sitting."* To determine the usefulness of the questions, these 10 visitors were asked if the questions improved their experience. A majority of these visitors (60%) said the questions improved their experience and provided feedback on how the questions improved their experience.

Can you explain how they improved your experience? (n=6)

- It made me think around how toilets flush differently when you're in a different hemisphere.
- Knowing what was on the globe, made us look for Jupiter's eye.
- It made me think about what I'm looking at.
- Open up my mind. As years go by, I wonder how much more knowledge they will find.
- You look at it in more details and try to solve it yourself.
- Read the questions and we answered it.

Visitors were also asked if they noticed the text on the labels that indicated what image was playing next. A little over half the visitors (58%) noticed this text. Of these 29 visitors, 46% said they waited to see a particular image because they noticed it was playing next. Additionally, 82% said it was helpful to know what was playing next. One visitor who said it was not helpful commented, *" It was two face for me. It takes time to read and walk around the globe. It was too quick. It went to the next image while I was explaining it to the kids. Labels - longer sequence, slower better."* The visitors who said the next image text was helpful were asked how it was helpful. Visitor responses were coded into themes, and representative responses are included for each. Half of the visitors (50%) said it was helpful to know what image was playing next but were not able to articulate how it was helpful.
How was it helpful? (n= 24)

29% Looked For a Certain Image

- We wanted to stay to see the day and night image.
- It was helpful because my mom wanted to see the hurricane image and I told her that Venus was next.
- Yes, I saw there was something about hurricanes.
- So you can tell if it is something you would want to watch next. Waited for Katrina.
- You knew what was next. For example after it talked about earth, we knew planet was next.
- It was helpful. Waited around to see Vegas.

13% Stayed Longer
- Because it made us stay longer.
- Use it to keep son's attention and for him to sit longer at the exhibit.

8% Other
- It gets your mind set for it. The audio was good.
- To determine whether or not we want to stay.

50% of visitors couldn't articulate how helpful

The 21 visitors who did not notice the "next image" text were asked if their visit to the exhibit would have been different if they would have seen the information indicating what image was playing next. 38% of visitors felt their experience would have been different while 24% were unsure and said their experience would have maybe been different. A little over one-third of visitors (38%) felt knowing what the next image was would not have changed their experience. The 13 visitors who felt their experience would have or maybe would have been different were asked to describe how they thought their experience would have changed. Responses were coded into themes, and representative responses are included for each. Responses were spread across themes with visitors most visitors saying they would have stayed longer (31%). Almost one-third of the visitors (31%) were unable to articulate how knowing what the next image was would have changed their experience.

How would it have been different? (n=13)

31% Stayed Longer
- I might have stayed to see something.

23% Looked For a Certain Image
- Yes, because I saw that it had an image of Katrina and Rita before from the sign but I didn't know it would be shown.
- Probably look for something specific on the globe.

15% Other
- I would know that it had more than one thing.
- The commentary was different between the audio and the wall. It would be hard for people who are hearing impaired.

31% of visitors couldn't articulate how helpful

E. Exhibit Changes to Enhance Visitor Understanding

Visitors were asked if the museum could change anything about the exhibit to help them better understand what they were viewing on the Sphere. Only 36% of visitors had suggested changes. Suggested changes were coded into themes and representative responses are included for each. Visitors had a variety of suggested changes. The most frequently mentioned change was related to the quality of the audio (33%). This was something museum staff was already aware of because the audio volume was not consistent across visualizations due to the prototype format of the narrations.

What changes would you suggest? (n= 18)
*Some visitors had more than one change

33% Quality of Audio
- Volume, We tried to move so we could hear better but nothing worked, it was just hard to hear.
- Make it louder. It was very hard to hear.
- Improve the sound system it's hard to understand.
- Audio is mumbling. Need to be clearer.

28% Labels
- Signs on the railing describing what you are seeing (not on the wall).
- Put the words in another spot. Words on screen.
- Need something to highlight what the commentary is talking about.
- If there were labels on the sphere it would be helpful for me because I don't travel much to know what country is what.

22% Different View
- I think you should either lower the globe, or have a platform so you can see the northern hemisphere better. It is very hard to see the northern hemisphere and that was the most interesting thing to show my children.
- Hard to see the top because tilted like the earth is.
- Is hard to see the top part like the US.

11% More Audio Narration
- Wish they talked through the whole thing, not just some of them.

11% Slow down images
- Moves from one image to another fast, if you read the label you miss the image.

17% Other
- What image was playing at a certain time.
- I want to be able to have something you can touch. Hands on rather than visual.
- Add more seating.

F. Main Message

Visitors were asked what they thought the exhibit was trying to show. Visitor responses were coded into themes, and representative responses are included for each. Most visitors' answers were related to their prior familiarity with the images, such as solar systems (48%) and weather or climate (16%). One of the objectives of SOS was that visitors would understand basic global cause-and-effect processes. Few visitors expressed this comprehension of the visualizations; with less than a fifth mentioning human's impact on the Earth (14%) or how the Earth changes over time (12%). The fact that there is not a cohesive storyline for each of the playlists or between the three playlists may account for this lack of deeper understanding.

What do you think this exhibit is trying to show? (n = 50)
*Some visitors provided more than one response

48% Solar System
- Diversity of the planets.
- Looks like it's trying to educate us about the Solar System
- General info on our planet, solar system. The planets' complexity.
- Different atmospheric images of the earth and the planets.
- Lists of things about the planets.
- The topography of different planets.
- Doing a lot of comparisons between existing biosphere, contrasting it against other planets of the Solar System and water erosion in Mars. Putting basics into science.
- What the atmosphere of the solar system is.
- Scale of planet and planet in relation to Solar System.
- How much other planets have changed.
- About what more is out there.

28% Features of the Earth
- Different views of the earth under different conditions.
- Explaining to you the differences around the world. Very informative about the world.
- Different topography of the earth.
- I was only there for a portion of it. It showed waterways, light patterns, and how different countries vary.
- Trying to show the characteristics of the planet.
- Different things you can see on the earth. How the earth processes works.
- How the planet works all at once.

16% Weather & Climate
- Just how volatile our weather is. The El Nino cycle and things.
- How the weather affects the globe.
- Trying to show all the different weather that is changing the Earth.
- Some of the changes of the earth's climates and atmosphere.
- Weather systems.
- Climate.

14% Humans' Impact on the Earth
- Images of how we have changed the planet by lights and dams.
- Population and the global problems we have created.
- Just the expansion of the world and our learning and the technology of different things. What we are doing to damage the world with our pollution, etc.
- How man is changing the Earth.
- How we destroy the Earth.

12% How the Earth Changes Over Time
- That the earth is a living, evolving planet.
- The earth at different times.
- Changes in the world over time.
- The overall trends of the earth on a global scale.

4% New Technology (of Exhibit)

- Show new technology.

4% Other

- Fire on the Earth.
- Focus on how the ocean and water sustain the Earth.

Visitor Demographics

Visitor demographic information is self-reported.

Sex (n=50)
Males: 56%
Females: 44%

Primary Language (n=49)
English: 98%
Spanish and English: 2%

Ethnicity (n=49)
White: 96%
Hispanic: 2%
Mixed (African American, White, Native American): 2%

Age (n=50)
Median age: 37
Minimum age: 11
Maximum age: 83

Age Range (n=50)
8 - 12: 8%
13 – 16: 2%
17 – 24: 18%
25 – 34: 18%
35 – 44: 26%
45 – 54: 12%
55 – 64: 6%
65+: 10%

Education (n=50)
Less than High School: 14%
Completed High School: 12%
Some College/Technical School: 16%
College Degree: 40%
Post-grad Degree: 18%

Interest Level in Science (n=50)
Rated self 1-5: 8%
Rated self 6-10: 92%

Household Income (n=50)
Under $30,000: 20%
$30,000 to $39,999: 6%
$40,000 to $49,999: 0%
$50,000 to $59,999: 6%
$60,000 to $69,999: 2%
$70,000 to $79,999: 12%
$80,000 to $89,999: 2%
$90,000 to $99,999: 6%
$100,000 to $149,999: 14%
$150,000 and higher: 10%
Didn't provide info: 22%

Group Composition (n=50)
Adults and Children: 50%
Adults only: 32%
School Groups: 12%
Alone: 6%

Number of Other Visitors in Group (n=43)
*Doesn't include school groups.
Median: 3
Minimum: 0
Maximum: 5

Ages of Other Visitors in Group (n=109)
*Doesn't include school groups.
Median age: 22
Minimum age: less than 1
Maximum age: 78

SMM Members (n=50)
No: 76%
Yes: 22%
Unsure: 2%

Number of Visits to SMM in the Last 2 Years (n=50)
None: 24%
1-2 times: 46%
3-5 times: 16%
More than 5 times: 14%

Science on a Sphere: Observations

Total time at SOS Exhibit _____:_____:_____
Hour Min. Sec.

Did the visitor do the following behaviors?

Sit down	Yes	No
Read label	Yes	No
Read label out loud	Yes	No
Talk about content on the sphere	Yes	No
Talk about technology of the sphere	Yes	No
Point to sphere	Yes	No
Point to label	Yes	No

How did the visitor view the sphere? (Check the highest level of movement)

- ☐ Stood in one place
- ☐ Circled less than half of the exhibit
- ☐ Circled half or more of the exhibit
- ☐ Circled the entire exhibit

Which images were displayed when the visitor was at the exhibit?

In Our Solar Neighborhood

- ☐ The sun
- ☐ Venus
- ☐ Day and night on Earth
- ☐ Earth's moon
- ☐ Mars*
- ☐ Jupiter*
- ☐ IO – Moon of Jupiter
- ☐ Eurpoa – Moon of Jupiter

Earth, The Water Planet

- ☐ Nasa's blue marble*
- ☐ Earth's topography
- ☐ Day and night on earth
- ☐ Through the seasons*
- ☐ El Nino and la Nina
- ☐ Hurricanes Katrina and Rita*
- ☐ Real time weather*
- ☐ Earth at night

Earth Surface Dynamics

- ☐ Earth's topography
- ☐ Earth's moon
- ☐ Mars*
- ☐ Titan - moon of Saturn
- ☐ Hurricane Katrina*
- ☐ Through the seasons*
- ☐ Global rivers
- ☐ Sediment thickness
- ☐ Global dams*
- ☐ Earth at night

*These visualizations have questions on the label

Interview

Excuse me, my name is _____ and I work here at the museum. We are talking to visitors to get feedback about the Science on a Sphere exhibit you just visited. Would you be willing to take a few minutes to share your opinions? *(Secure parental permission if under 16 and confirm that s/he is at least 8.)*

1. **How interesting was this exhibit?**
   - ☐ I was so interested I'd come see it again.
   - ☐ I was interested, but I wouldn't come see it again.
   - ☐ I wasn't really interested.
   - ☐ I didn't find this interesting at all.

2. **How enjoyable was this exhibit?**
   - ☐ It was so enjoyable, I'd encourage others to come see it.
   - ☐ It was enjoyable.
   - ☐ I didn't really enjoy it.
   - ☐ It didn't find this enjoyable at all.

3. (*Only ask if they <u>circled less than half</u> of the sphere*) **Did you realize that you could walk all the way around the sphere?** Yes No N/A circled half or more

   (If Yes) **Is there a particular reason why you didn't walk around the sphere?**

4. **Is there anything you would like to know about the technology of this exhibit?** Yes No
   (If Yes) **What would you like to know?**

5. *(If someone mentions that they read labels but you didn't observe it, make sure you circle "yes" for reading labels on the observation sheet)* **The labels (***point to wall*) **provide information about the images on the sphere. Some of these labels also include questions for you to think about. Did you see any of these questions?** Yes No

   (*If Yes*) **Did the questions improve your experience?** Yes No Other

   (If Yes or Other) **Can you explain how they improved your experience?**

6. **The labels also include information indicating what image will be playing next *(point to the area of the label where this is)*. Did you notice that information?** Yes No

   (If Yes) **Was it helpful to know what was playing next?** Yes No **How was it helpful/not helpful?**

   (If Yes) **Did you wait to see a particular image because you noticed it was playing next?** Yes No

   (*If No*) **Would your visit to this exhibit have been different if you had seen the information indicating what image was playing next?**
   Yes No Maybe *(If Yes or Maybe)* **How would it have been different?**

7. **Is there anything we can change to help you better understand what you are viewing on the sphere?** Yes No *(If Yes)* **What changes would you suggest?**

8. **What do you think this exhibit is trying to show?**

Visitor Information Sheet

Please answer the following questions to help us serve our audience.

1. How would you rate your interest in science on a scale of 1 to 10 if 1 is "I have absolutely no interest in science" and 10 is "I am extremely interested in science"? (CIRCLE ONLY ONE NUMBER)

I have absolutely no interest in science	1	2	3	4	5	6	7	8	9	10	I am extremely interested in science

2. What is your age? _____

3. Are you... ☐ Male ☐ Female

4. What is the primary language spoken at your home? _____

5. What is your ethnicity (CHECK ALL THAT APPLY)
   - ☐ African-American
   - ☐ White
   - ☐ Hispanic
   - ☐ South Asian
   - ☐ Asian
   - ☐ Native American

6. Who did you come with to the museum today? (CHECK ONLY ONE ANSWER)
   - ☐ I am here alone
   - ☐ I am with a school group
   - ☐ I am here in a social group that includes adults and children (not a school group)
   - ☐ I am here in a social group that includes adults only

7. Please list the ages of all the other people you are with today at the museum.

____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____

8. Are you or your family a member of this museum? ☐ Yes ☐ No ☐ Unsure

9. How many times have you visited this museum during the last 2 years?

- ☐ None
- ☐ 1-2 times
- ☐ 3-5 times
- ☐ 5 or more times

10. What is your zip code? _____

11. What is the highest level of education you have completed? (CHECK ONLY ONE ANSWER)

- ☐ Less than High School
- ☐ Completed High School
- ☐ Some College or Technical Education
- ☐ College Degree
- ☐ Post-Graduate Degree

12. What was your total annual household income last year? (CHECK ONLY ONE ANSWER)

- ☐ Under $30,000
- ☐ $30,000 to 39,999
- ☐ $40,000 to 49,999
- ☐ $50,000 to 59,999
- ☐ $60,000 to 69,000
- ☐ $70,000 to 79,999
- ☐ $80,000 to 89,999
- ☐ $90,000 to 99,999
- ☐ $100,000 to 149,999
- ☐ $150,000 or more
- ☐ I don't know

Thank you for your time today!

Your feedback will help us improve the museum.