



Science on a Sphere Baseline Visitor Study

July 2011

Timing and Observation N=109; Interview N=72

Introduction

As part of NASA grant award NNX09AL70G, the department of Visitor Research & Program Evaluation at the Denver Museum of Nature & Science (DMNS) has been conducting various evaluations of the Museum's Science on a Sphere (Sphere).

The main goals of the 5-year NASA grant are to educate audiences about planetary exploration missions, how they illuminate climate science through comparative planetology, and to produce new educational materials, interpretation techniques, and knowledge that will facilitate more effective informal education on these themes nationally. The objectives in pursuing these goals are to: (1) boost literacy in climate science; (2) build awareness of NASA's space science missions and the relevance of NASA Earth observing satellites to contemporary issues of global change; and (3) provide new knowledge of the effectiveness of different modes of employing these innovative, rapidly proliferating, visually compelling but inadequately tested display systems. Internal evaluation plays a crucial role in assessing and ultimately reaching these goals and objectives.

The Sphere was installed in DMNS' permanent space science gallery, *Space Odyssey*, in February 2010. *Space Odyssey's* "Museum Galaxy Guides" (volunteer facilitators) were trained on Sphere operation and content in April 2010 with training continuing as new programming is added. The purpose of the Baseline Visitor Study was to establish a baseline of visitors' length of stay, behavior, interactions, perceptions, and interest in the Sphere near the beginning of the grant period. These data and findings will serve a basis of comparison for future evaluations and studies to occur after enhanced development of Sphere facilities, peripherals, and programming.

Method

Data was collected over 2 weekends, two Fridays, and two weekdays in July 2011. Research assistants timed and observed a random sample of 118 adult visitors at the Sphere. Ninety-two of those visitors were also interviewed following their time at the Sphere. Those interviewed were asked to complete a visitor information sheet, providing researchers with demographic information. An incentive of one IMAX voucher per person was used. There were 38 refusals for the interview.

The research assistant protocol, observation sheet, interview questions, and visitor information sheet can be found in the Appendix of this report.

Observation Results and Discussion

Time Spent at Science on a Sphere

Visitors spent a median total time of 3 minutes at the Sphere, with a minimum time of 32 seconds and a maximum time of 20 minutes and 44 seconds. This was very similar to the 2010 Baseline Visitor Study. There are many factors which may influence length of stay at the Sphere, including available seating, total time of the playlist (i.e. loop), if a movie is shown (e.g. *Footprints*), or if facilitation (i.e. a show or interactive activity) is occurring.

Behaviors at Science on a Sphere

Visitor behavior indicated a high level of engagement. As illustrated in Table 1, a majority of visitors were observed talking about the Sphere’s content (80%), pointing at the Sphere (71%), and examining or reading the signs (55%). Table 1 also compares and contrasts the information from the 2011 baseline with that of the 2010 baseline study.

Table 1: Behaviors Observed at Science on a Sphere
DMNS

Behavior	Percent of Visitors	
	2011 Baseline N=109	2010 Baseline N=118
Sat down	14%	4%
Pointed at sign	23%	11%
Talked about Sphere's technology	17%	21%
Examined/read sign	55%	31%
Interacted with Galaxy Guide	46%	62%
Pointed at the Sphere	71%	75%
Talked about Sphere's content	80%	86%

Whereas most behaviors were comparable between the 2010 and the 2011 baseline studies there were increases in the number of visitors that sat down, pointed at, and talked about or read signs.

Table 2: Sitting Behavior Observed at Science on a Sphere

Behavior	Visitor Count 2011 Baseline		Visitor Count 2010 Baseline	
	Stood	Sat	Stood	Sat
Stayed less than 3min	35	6	64	1
Stayed more than 3min	61	7	46	4
Total	96	13	110	5

Observations indicated that 39.4% (n=43/109) of visitors stood in one place while viewing the Sphere.

Museum Galaxy Guide Facilitation

A unique element of DMNS’ Sphere is the presence of *Space Odyssey* Galaxy Guides who facilitate the visitor experience. DMNS is four times more likely to facilitate the Sphere when compared to other Sphere sites. ILL’s cross-site summative evaluation cited facilitation 21.2% of the time, whereas DMNS’ Sphere was facilitated 84.7% of the time. Examining what behaviors occurred as part of the facilitation, Galaxy Guides were observed using the Wii remote to manipulate the Sphere, using their fingers and hands—as well as electronic pointers—to point things out on the Sphere, amplifying their voices with a microphone, and using peripheral laptops to show visitors websites and send links home to visitors’ emails. Table 3 illustrates the most commonly observed methods of facilitation observed.

Table 3: Galaxy Guide Facilitation Observed at Science on a Sphere

Type of Galaxy Guide Facilitation	Percent of Visitors	
	2011 Baseline N=109	2010 Baseline N=118
Wii	45%	69.5%
Pointer	32.1%	23.7%
Microphone	5.5%	16.1%
Laptop	6.4%	6.8%
Finger/Hand	26.6%	5.1%

Museum Galaxy Guide facilitation did not appear to have a statistically significant affect on whether visitors found the Sphere interesting or would recommend it to a friend. The one exception was when Galaxy Guides used electronic pointers. The use of pointers *did* seem to significantly increase the visitors' self-reported interest level in the Sphere¹. This is consistent with the results from the 2010 baseline study.

The ILI cross-site summative evaluation found that 87% of visitors who had a facilitated Sphere experiences reported learning something new. This difference in visitor perception was statistically significant, meaning that visitors who had facilitated experiences were more likely to perceive they learned something new.

Images Viewed

Visitors were observed viewing several images more often than others, including "Earth: Day and Night," "Earth: Air Traffic," "Paleo-Plate Tectonics," "Tsunamis," "Earth: Weather," "Earth: Seasonal Changes and Sea Floor," and "Mars." Several of the most viewed images are the same as those in the 2010 baseline study. As in the first baseline study it is unknown whether or not this is due to Museum Galaxy Guides choosing these images, visitors requesting them, or a combination of these and other factors.

Interview Results and Discussion

Previous Experience with Science on a Sphere

For three quarters of those interviewed (75%, n=54/72), it was their first time seeing a Science on a Sphere, this is slightly higher than those the 2010 baseline in which 66% of visitors were seeing a Science on a Sphere for the first time. Most visitors who had seen a Sphere previously had done so at DMNS (a previous visit), but the National Oceanic and Atmospheric Administration (NOAA, in nearby Boulder, CO), the Denver Botanic Gardens (which is a *Magic Planet*), and Washington, D.C. were also cited.

Interest in Science on a Sphere

Employing a rating scale of 1 (not at all interesting) to 10 (extremely interesting), visitors gave the Sphere a mean score of 9.4. Fifty percent (n=36/72) of visitors rated it a 10. Over 85% of those interviewed rated it an 8, 9, or 10. The lowest rating a visitor gave was a 5 (one individual). These results were comparable to the 2010 baseline report.

Recommending Science on a Sphere

¹ $\chi^2(5, N = 109) = 20.33, p = .041$

When asked if they would recommend the Sphere to a friend, 95.8% visitors who responded to this question (n=69/72) indicated they would recommend it. The 2010 baseline study indicated that all visitors (n=90) would recommend the Sphere to a friend.

Circling Science on a Sphere

Visitors' paths around the sphere were observed and recorded as circling the entire Sphere, circling more than half of the Sphere, and circling less than half of the Sphere. 23.9% of visitors circled less than half of the Sphere (n=26). 22.0% (n=25) circled the entire Sphere, and 10.1% (n=11) circled more than half of the Sphere.

Confusion with Science on a Sphere

About seventy-six percent (n=55/72) of visitors indicated they did *not* find anything confusing, this is lower than the results of the 2010 baseline with 76% of visitors indicating they did *not* find anything confusing. When visitors did indicate confusion, it was to do with what they were seeing (what the images were and what the colors meant). Several visitors did mention that the Museum Galaxy Guides were able to explain things and eradicate the confusion. The reasons for confusion were consistent from 2010 and 2011.

Screens for Science on a Sphere

In the summer of 2011 three back screens were added to the Science on a Sphere exhibit area, the screens add more content and replaced the sign referenced in the baseline study in 2010. Researchers asked visitors who participated in the interview about the screens. Most visitors took note of the screens around the Sphere (75.7%, n=53/70). Of the visitors who did *not* notice the screens, half (50%, n=16/32) *felt* that their visit to the Sphere would have been different had they seen the screens. These visitors believed the screens would have provided more information about what they were seeing on the Sphere.

Improvements to Science on a Sphere

Just over 42% (42.3%, n=30/71) of the visitors interviewed felt that there were things the Museum could do differently to help visitors better understand the Sphere, this is comparable to the 2010 baseline. Several visitors expressed the need for more explanations to accompany the visuals, in both written (signage) and oral forms (Galaxy Guides):

- "Other screens nearby – if you don't realize the signs are back there you miss it, then you don't know what you are looking at"
- "Plaques around sphere – signage closer?"
- "I didn't realize screens behind were related"
- "It would be nice to have person on microphone talking about sphere – like they do for school children"
- "People have to look away from the sphere to get the info. They should be underneath the sphere."

Visitors also referenced how useful it was to have the Galaxy Guides at the Sphere

- "The guide (human) was fantastic. He was enthusiastic!"
- "Galaxy Guide presented well"
- "The Galaxy Guide was clear"
- "The Galaxy guide was great!"
- "Galaxy Guide helped"

When asked if the Museum Galaxy Guides could do anything with the Sphere to make it more interesting or improve their experience, many visitors (49.1%, n=28/57) either commented on the helpfulness of the Guides or could not think of any improvements, this was quite a bit lower than found in the 2010 baseline where 80% of visitors (n=72/90) either commented on the helpfulness of the Guides or could not think of any improvements. Of the visitors who did have recommendations, there were several suggestions for the addition of speakers and a microphone so more visitors could be engaged at once and so it would be easier to hear the guide, having the

guides provide more in depth information about the sphere was also mentioned, and two mentioned the need for Guides to interact better with smaller children.

Visitors' Selection of Learning Outcomes

In the September 2010 Science on a Sphere: Cross-Site Summative Evaluation by the Institute for Learning Innovation visitors were asked to choose three of fourteen statements (developed by ILI researchers based on potential Sphere outcomes) that best reflected their experience. In the 2011 baseline study DMNS added this questionnaire to the self administered portion of the survey; along with 4 additional statements; (1) The Sphere reminded me that the Earth is a planet, just like other planets in our solar system, (2) I was amazed at the way the Sphere appeared to float and rotate, (3) The Museum Galaxy Guide helped me make sense of what I was seeing, and (4) The Sphere helped me better understand climate change.

Overall Outcomes Ranked 1, 2, or 3	DMNS Percentage of Visitors (N=61)	ILI Percentage of Visitors (N=691)
I appreciated how realistic the information appeared when on the Sphere.	47.5%	36%
The Sphere helped me visualize specific events.	42.6%	30.9%
It helped me to visualize certain concepts of time and scale.	31.1%	24.9%
I was amazed at the way the Sphere appeared to float and rotate.	24.5%	
It made me think about the complex interrelations in earth systems.	24.5%	22.6%
I was amazed at the beauty of what was shown on the screen.	22.9%	22.3%
The Sphere helped me better understand geography of Earth or other planetary objects.	21.3%	15.9%
The Sphere helped me understand the global process.	21.3%	21.3%
The Museum Galaxy Guide helped me make sense of what I was seeing.	18%	
The Sphere helped me better understand climate changes.	11.5%	
I felt a sense of the vastness of Earth.	9.8%	17.9%
I learned or was reminded that the earth is always changing and evolving.	9.8%	22.6%
I became interested in where the information on the Sphere comes from.	4.9%	6.8%
I felt a sense of how small Earth is compared to the greater universe.	4.9%	12.9%
I was thinking about how this planet is my home.	1.6%	6.4%
I felt a sense of sacred in regards to Earth.	1.6%	7.2%
The Sphere reminded me that Earth is a planet, just like other planets in our solar system.	1.6%	
I felt a need to take better care of Earth.	0%	0%

Visitor Information: Demographic Results and Discussion

Visitor demographic information was self-reported.

Sex/Gender (n=63)

Male: 60.3%
Female: 39.7%

Age (n=66)

18-25: 7.6% 56-65: 16.7%
26-35: 19.7% 66-75: 3.0%
36-45: 18.2% Over 75: 1.5%
46-55: 33.3%

Ethnic Background/Heritage (n=67)

African, African American,
or Black: 0%
American Indian, Native American, or
Alaskan Native: 1.5%
Asian or Asian American: 3.0%
Latino, Hispanic, Chicano, or
Latin American: 7.5%
Middle Eastern, Arab, or
Arab-American: 0%
Native Hawaiian, Filipino, or
Pacific Islander: 0%
White, Caucasian, or
European American: 88.1%

*Of the above, 1.5% chose more than one category

Languages Spoken in the Home (n=66)

English only: 57.8%
Spanish only: .9%
German only: .9%
Japanese only: .9%
English *and* Another Language: 10.6%
*Of the above, Spanish was most common

Highest Level of Education Completed (n=65)

Less than High School: 3.1%
Completed High School: 6.2%
Some College or Technical Education: 15.4%
College Degree: 41.5%
Graduate/Post-Graduate Degree: 33.8%

Museum Membership (n=65)

Members: 28.9%
Lapsed Members: 14.4%
Non-Members: 50%
Someone else in Group is Member: 6.7%

Group Composition (n=66)

Alone (no group): 1.5%
School Group: 3%
Social Group with Children: 63.6%
Social Group *without* Children: 31.8%
*The above includes 64 children (youth under 18)

Visits in Past Year (n=66)

First-time Visitor: 3.1%
First Visit in Past Year: 6.2%
1-2 Visits: 15.4%
3-5 Visits: 41.5%
More than 5 Visits: 33.8%

Joint Annual Income (n=58)

Under \$50K: 19%
\$50-74.9K: 27.6%
\$75-99.9K: 17.2%
\$100-124.9K: 13.8%
\$125-149.9K: 3.4%
\$150-174.9: 10.3%
\$175K+: 8.6%

When the above demographics are compared to the DMNS visitor baseline study for the entire Museum in fall 2011, they are generally similar. There are more males in this study than is typical for DMNS' general Museum audience (60.3% for the Sphere baseline compared to 39.7% on the fall Museum baseline). Age, race and ethnicity, income, education, past visitation, group composition and membership are all comparable to the fall Museum baseline.

Next Steps

The baseline visitor study will continue in project year three.

For more information, please contact Kathleen Tinworth, Director of Visitor Research & Program Evaluation at the Denver Museum of Nature & Science: kathleen.tinworth@dmns.org.

APPENDIX

Research Assistant Protocol

Science on a Sphere Front-End Evaluation

September 2010

Materials in SOS Box (to be picked up from and returned to Security Subpost):

- Copies of Science on a Sphere: Observations
- Copies of Science on a Sphere: interview (on one side) & Visitor Information Sheet (on the other side)
- 1 clipboard
- Pens/pencils
- RA written assignment for Science on Sphere Front-End Evaluation
- RA protocol for Science on Sphere Front-End Evaluation (this document)
- Kathleen's business cards
- IMAX vouchers (*one per interviewed visitor)
- SOS playlists (For reference only! **Please keep in the box for other RAs!**)

1) Scan in with your badge and pick up the clear plastic survey box at security labeled "Research Assistants S.O.S." Make sure you are visibly wearing your badge. If you forgot your badge, please let security know you need a contractor temp badge for the day.

2) Go into *Space Odyssey* and find a good place to observe visitors approaching the Sphere. Though standing and being mobile is recommended for observations (so that you can see and hear the visitors), feel free to sit on the benches near the Sphere or use one of the mobile stools in the gallery if you need to rest during your shift.

3) Load one observation sheet and one interview/visitor information sheet onto your clipboard with the *observation sheet on top* and have a pen/pencil ready. Make sure your stopwatch is clear/reset to zero. Write the date and your name on the top of the observation sheet where indicated.

4) We want a **random sample** of visitors. When you are free (i.e. not observing or interviewing a visitor), approach the second adult visitor you see looking at/approaching the Sphere. We are surveying **adults only** (those who appear to you to be 18+), and only one adult per group. This approach will help make sure we don't observe and interview the same "type" of people, even on accident (e.g. those who don't have strollers or little kids, those who look annoyed/unapproachable).

5) Start your stopwatch to time how long the visitor looks at/interacts with the Sphere. There is a space on the observation form for you to record the time (in hours, minutes, and seconds). While the visitor you are observing is looking at/interacting with the Sphere, use the observation form to note behaviors demonstrated, whether or not the visitor circled the Sphere, the Galaxy Guide's role and activities, and what image(s) were displayed during the observed visitor's encounter. If you do not know what image(s) were on the Sphere, consult the playlist reference sheet, the stanchion sign, or ask a Galaxy Guide.

The more information (including detailed notes) that you are able to record on the observation sheet, the better.

6) When the observed visitor appears to disengage, stop the stopwatch and record the total time spent at the Sphere. Record the time on the observation sheet.

7) As soon as possible, approach the visitor you just observed and use the opening line from the interview sheet:

“Hi, my name is _____ and I’m talking to visitors today about (point to Sphere) Science on a Sphere. If you’re able to spend a few minutes letting me know what you think, I have a free IMAX voucher for you.”

Feel free to let visitors know you expect it to take 5-7 minutes of their time.

If the visitor refuses, please note that on the “survey #” line on the observation sheet (top right). Note the reason for the refusal (if know)—e.g. not a native English speaker, going to IMAX show, etc. ***Remember, we are visitor advocates. It is absolutely ok if visitors say no! Expect is to happen on your shift and never feel you have to hound or pressure our visitors. They are helping us!***

If the visitor refuses, return to step #3 above and repeat.

If the visitor accepts, continue as below.

8) Go through the interview sheet in the order it is written and ask the questions verbatim.

If the visitor has questions that you cannot answer, please either refer them to a staff member/volunteer who can help or give them my card. (*Note: If the question is about how the Sphere works, there is an informational sign to the left of the Sphere.)

Please record all answers as clearly and completely as possible and using the visitors’ own words.

9) When you complete the interview, thank them and tell them about the visitor information sheet using the language on the bottom of the interview form:

“Thank you so much! Your feedback will really help us improve this exhibit. Before you go, let me hand this over to you and get you to fill out the back of this.”

10) Flip the sheet over on the clipboard and hand it, with a pen or pencil, to the visitor to complete. This side of the sheet should be filled out by the visitor, not the RA.

Important Notes

Like our Baseline survey, the visitor information sheet has some personal and oftentimes sensitive questions on it. There is an explanation about why we collect this data at the top of the sheet. If you are asked about why we need to know this sort of demographic information, refer to the explanation on the top of the sheet and let them know it is completely confidential.

We have added a check box where people who identify as GLBTIQ can indicate as such. This is a demographic we have not previously collected, and we are experimenting with the best way to collect this data. As such, you may get asked about it. GLBTIQ stands for “Gay, Lesbian, Bisexual, Transgender, Intersex, Queer (or Questioning). Most people who identify as any of these will know the acronym and can choose to self-identify on our form. For some visitors this may be an unfamiliar term. If it is, most will simply ignore it. If you are asked about it however, feel free to simply and directly explain/answer that it is “for those within the gay and lesbian community.”

11) Collect the form from the visitor when they are done and thank them again. Give them an IMAX voucher. (One IMAX voucher per interview. If they do the interview but refuse to do the information sheet/demographics, still give them the IMAX voucher as a thank you for their time.)

12) ***Ensure the date and your name gets added to the interview sheet. Also add the survey number to both the interview sheet and the observation sheet.*** This way the data on the two sheets can be linked. Use this format for survey numbers: mmddyy + #. For example, if it’s September 3rd and it’s your 4th survey of the day, the survey number would be: 0903104.

Go back over all your notes to ensure they are complete and legible before you move to your next observation.
 When ready, return to step #3 above.

13) Take breaks as needed!

At the end of your shift, please note down any additional observations or comments you have. Return all materials to the survey box, return the box to the security Subpost, and remember to scan out with your badge.
 Be sure you keep a note of the dates and hours you worked, as you will need them for invoicing.

APPENDIX

Science on a Sphere: Observations

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

*****only if more than 30 seconds*****

Did the visitor do the following behaviors?

Behavior	Yes	No	Comments
Sat down			
Examined/Read signage (screens)			
Talked about content on the Sphere			
Talked about technology of the Sphere			
Pointed to Sphere			
Pointed to signage (screens)			
Interacted with Galaxy Guide			

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

Indicate the Galaxy Guide’s role/facilitation while this visitor was at Sphere:

- Used Wii remote
- Used microphone
- Used laser pointer
- Use laptop
- Pointed with hand/finger

Other/notes:

Note which images were displayed when the visitor was observing the Sphere (you can use the playlist screen and peripheral screens near the Sphere and/or ask the Galaxy Guides):

ADDITIONAL NOTES:

APPENDIX

Interview Questions

Science on a Sphere: Visitor Questionnaire

Still thinking about your experience with the Sphere...

- Please read each statement below.
- Choose up to 3 statements that best reflect what you got out of your experience with the Sphere.
- Then rank those 3 statements with #1 being the most important to you, #2 the second most important, and #3 the third most important.

Your reaction to the Sphere:

_____ I felt a sense of the vastness of Earth.

_____ The Sphere reminded me that the earth is a planet, just like other planets in our solar system.

_____ I was amazed at the way the Sphere appeared to float and rotate.

_____ The Museum Galaxy Guide helped me make sense of what I was seeing.

_____ I felt a sense of how small Earth is compared to the greater universe.

_____ I felt a sense of the sacred in regards to Earth.

_____ The Sphere helped me better understand climate change.

_____ I was thinking about how this planet is my home.

_____ I was amazed at the beauty of what was shown on the Sphere.

_____ I appreciated how realistic the information appeared when on the Sphere.

_____ I learned or was reminded that the earth is always changing and evolving.

_____ It helped me to visualize certain concepts of time and scale.

_____ I felt a need to take better care of Earth.

_____ It made me think about the complex interrelations in earth systems.

_____ I became interested in where the information on the Sphere comes from.

_____ The Sphere helped me visualize specific events.

_____ The Sphere helped me better understand geography of Earth or other planetary objects.

_____ The Sphere helped me understand global processes.

We also want to ensure we are an inclusive cultural institution, reflective and responsive to our community and visitors. These questions are private and confidential, and will be used only for the purposes of learning more about our visitors.

Your Age:

- Under 18.....
18 to 25.....
26 to 35.....
36 to 45.....
46 to 55.....
56 to 65.....
66 to 75.....
76 or more.....

Your Gender: Male Female

Please check if you self-identify as GLBTIQ.....

What is your Ethnic Background or Heritage? (Check as many as apply.)

- African, African American or Black.....
American Indian, Native American or Alaskan Native.....
Asian or Asian American.....
Latino, Hispanic, Chicano or Latin American.....
Middle Eastern, Arab, or Arab-American.....
Native Hawaiian, Filipino or Pacific Islander.....
White, Caucasian or European American.....

If other, please specify: _____

What language(s) do you/your family speak at home? _____

Are you, or have you ever, been a member of the Museum of Nature & Science? (Please choose ONE.)

- Yes, I am a member.....
No, I am not a member and have never been.....
No, I am not a member but I used to be.....
No, I am not a member but someone in my group is.....

How many times have you visited the Museum in the past year? (Please choose ONE.)

- This is my first visit here ever.....
This is my first visit in the past year.....
1-2 times.....
3-5 times.....
5 or more times.....

What is the highest level of education you have completed? (Please choose ONE.)

- Some high school.....
High school.....
Some college or technical education.....
College degree.....
Post-graduate degree.....

What is your home Zip Code (or country, if non-U.S.)? _____

What is the joint annual income of your family? (Include you and those you live with; choose ONE.)

- Under \$50,000.....
\$50,000 to \$74,999.....
\$75,000 to \$99,999.....
\$100,000 to \$124,999.....
\$125,000 to \$149,999.....
\$150,000 to \$174,999.....
\$175,000 or more.....

Who did you come to the Museum with today? (Please choose ONE.)

- I came here alone.....
I am here in a family/social group that includes adults and children.....
I am with a tour/school group....
I am here in a family/social group that includes just adults.....

If other, please specify: _____

Please list the ages of all the other people who are with you at the Museum today:

Thanks again for your time!
Please return this to the person who gave it to you.