Formative Evaluation of *Science on a Sphere*, Supplemental Interpretive Components at the Maryland Science Center

A. Perception of Interpretive Messages
   1. Perceived ease of understanding what’s on the sphere
   2. Initial perceptions of what the sphere is showing
   3. Understanding the kiosk & trackball computers
   4. Did the computers help people to better understand the SOS exhibit?

B. Reactions to the Kiosk & Trackball Computers
   1. What people liked most
   2. What they didn’t like
   3. Appeal of the computers (interest, appearance, graphics, ease of use)

C. Visitors’ Suggestions for Science on a Sphere
   1. What could make the sphere easier to understand?
   2. What could make the sphere more interesting?
   3. What else would you like to know about the sphere?

D. Characteristics of the Samples

prepared by
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Northampton, Massachusetts

June, 2007
Executive Summary
A. Perception of Interpretive Messages

This first section of the report presents information about visitors’ initial perceptions of the SOS program, and an analysis of visitors’ understanding of the information provided by the supplemental computers (kiosk and trackball). Highlights of the results are:

- Initially, about half of the adults and only one-quarter of the children expressed a clear understanding of what was being shown on the sphere (based on open-ended questions about the program). This pattern corresponded to their self-report about how easy it is to understand what’s on the globe – about half of the adults and only 20% of the kids thought it was easy.

- Most visitors who used the kiosk (67%) had a reasonable understanding of the content (El Nino, hurricanes). About one-third of the trackball computer users looked at the information about El Nino or hurricanes, while others explored different topics (e.g., topography, solar system), and didn’t necessarily see the part that supplemented the programs on the sphere at that time. Approximately one-third of the visitors chose to explore more than one topic.

- Kiosk users were more likely than trackball users to believe that the computer helped them to better understand what they saw on the sphere, although there was not a substantial difference in their ultimate understanding of the exhibit based on coding of open-ended responses.
A.1. Perceived ease of understanding what’s on the sphere

OVERVIEW: Initially, children expressed significantly more difficulty understanding what’s on the sphere compared with adults. When observing the sphere for less than a minute, only 20% of children thought it was easy to understand, while 56% of adults said it was easy. Factors that were identified as contributing to perceived understanding were: listening to the narration, familiarity with TV weather reports (visualizations of hurricane and weather patterns), and recognition that the different colors represented a temperature scale. However, some people thought the colors represented precipitation (as on Doppler radar). Children seemed able to discern that dark areas were continents and blue was water.

How easy do you think it is to understand what’s on the globe?

<table>
<thead>
<tr>
<th></th>
<th>Overall (n=99)</th>
<th>Adults (n=50)</th>
<th>Kids (n=49)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very</td>
<td>38%</td>
<td>56%</td>
<td>20%</td>
</tr>
<tr>
<td>Somewhat</td>
<td>47%</td>
<td>40%</td>
<td>55%</td>
</tr>
<tr>
<td>Not so easy</td>
<td>14%</td>
<td>4%</td>
<td>25%</td>
</tr>
</tbody>
</table>

Why is it very easy?

ADULTS

Audio

It's so visual especially for an adult it's easy to understand

Colors

My background

I am a technical person - engineer

Colors, different colors, the motion

Flow of hurricane, red center and fades where it's less strong

Color scheme makes it obvious that it's temperature change

Because of color contrast that's used

Nothing complicated about it

KIDS

Darker colors mean danger, light means okay, time/date is good

Now speaker is telling you about it and explaining so you understand

Lots of color

Because I watch weather channel, red means hot, blue is cold, green I’m not sure
Why is it somewhat easy?

**ADULTS**

It should be hanging a little lower
Have to move with globe because when you sit you don’t see everything
Depends on who’s looking at it
When hear audio it helps pinpoint what you're looking at
Needs more explanation
We don’t get tornadoes so I wouldn’t really know
If you’ve seen the news then you know
If you have an idea what the colors represent then you know what it is
I'm fairly educated and know what I’m looking at
Uses same format as weather station and same terminology

**KIDS**

It can be confusing sometimes
Some people can’t really have a good idea what sphere really is
Have to work to understand what's on it
Someone who is younger wouldn't understand what's going on
It’s not exactly clear and if not listening might not know
Because warm colors are warm, cool are cool, I don’t know how warm or cool they are
A small child wouldn't know what it is
May be hard to read it for some people
Because you can tell what it is because it’s like moving
Some people would know what it is because they would listen to the voice
If you’re not listening then you wouldn't understand

Why is it not so easy?

**ADULTS**

Hard to identify swirls, if you listen you could come up with what it is

**KIDS**

It's hard to understand
Have to know what all the colors mean; heat, rain, etc.
This is what the world is
If somebody didn’t know what it was or didn’t know what they were looking at
Can't understand what its saying
Because the world is so big you never know what's going to happen
**Tell me something you understand about it already**

**ADULTS who said it was VERY easy**

Africa, South America
Storms moving across the planet
Temperature of water affects weather
Saw hurricanes, and now El Nino and La Nina but not listening to audio
Hurricanes form and many other patterns across earth
Weather patterns
Already know about hurricanes, Gulf Stream
El Nino already knew about
Watching the hurricane and that they come across the ocean
Storms form off coast of Africa
The path of them
Temperature effects on the water, at the surface and below
I study hurricanes
Doppler radar, watch on TV, swirls of hurricanes, start mid Atlantic, different color
It's a model of earth, a scale model

**ADULTS who said it was SOMEWHAT easy**

Storms, how they work and how they move, coming off Africa, moving across
The movements, the wavelike patterns
See radar patterns on internet, and these look similar
Global data distribution or at least half of it from where you're standing
Colors signify warmer and cooler throughout the globe
Haven't really listened or watched it
I know the wind patterns
Tracking over time can see clock
The years change

**ADULTS who said it was NOT easy**

The voice (narrator)
Tell me something you understand about it already

**KIDS who said it was VERY easy**
Yellow/green/red is warm; blue and white are cold
The continents
Hurricanes
The colors, continents, the years
Years are changing and getting hotter in one region

**KIDS who said it was SOMEWHAT easy**
Lines are latitude and longitude
The colored areas are where the storms are
It's colorful
That storms are moving and where the patterns go throughout the past
Colors show you warmer and hotter and colder waters
The places that are black are land and blue, green are water
I see South America, North America and colors
It shows the map and the way everything is moving like the weather channel
The stuff that's moving, different colors means different things
Dark parts that aren't moving are continents and color parts are water
Where hurricanes have been
Different colors and different years
How clouds are changing throughout days

**KIDS who said it was NOT easy**
Well, looks like we have a lot of hurricanes
There's land, a year (label)
I don't know
Different years that the temperatures changed
You have to understand what colors mean
A.2. Initial perceptions of what the sphere is showing

OVERVIEW: Analysis of visitors’ open-ended responses yields a similar pattern of results as their self-reported understanding: adults are more likely than kids to understand what the sphere is showing. After spending less than a minute looking at the sphere, most adults had a reasonable idea about what it showed, e.g., hurricanes, weather patterns (in general), water temperatures, and El Nino. Children were more likely to give vague answers (33%) – and only 26% gave good answers.

What do you think the globe is trying to show people?

<table>
<thead>
<tr>
<th></th>
<th>Adults</th>
<th>Kids</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(n=50)</td>
<td>(n=49)</td>
</tr>
<tr>
<td>34%</td>
<td>14%</td>
<td>hurricanes, storms</td>
</tr>
<tr>
<td>32%</td>
<td>41%</td>
<td>weather patterns, wind, temperature, the atmosphere</td>
</tr>
<tr>
<td>14%</td>
<td>6%</td>
<td>water temperatures</td>
</tr>
<tr>
<td>12%</td>
<td>33%</td>
<td>vague answer: the planet, how the earth works</td>
</tr>
<tr>
<td>8%</td>
<td>2%</td>
<td>El Nino</td>
</tr>
<tr>
<td>4%</td>
<td>4%</td>
<td>global warming</td>
</tr>
<tr>
<td>54%</td>
<td>26%</td>
<td>had a good understanding (hurricanes, El Nino, ocean temperatures)</td>
</tr>
<tr>
<td>34%</td>
<td>41%</td>
<td>some idea (weather, storms, temperatures, atmospheric conditions)</td>
</tr>
<tr>
<td>12%</td>
<td>33%</td>
<td>vague, didn’t understand (world, wind, solar system, places, global warming)</td>
</tr>
</tbody>
</table>

Sample of ADULT answers

- Information about how our planet works
- Global warming, El Nino
- Climate and effect of ocean temperatures on climate
- Satellite image of hurricanes, how storms move
- Satellite weather patterns
- Storms develop over Africa and become hurricanes
- Heating and cooling of the water
- Storm systems
- The weather patterns around the world
- Different heat patterns on the oceans
- Changes in climate that are creating hurricanes
- Looks like different weather patterns
- Ocean temperatures
Sample of KID answers
Weather, where certain storms are and intensity
Forms of the earth
The world
How temperature of water affects weather, how different temperatures in whole world
When storms form and where they mostly form
The warmer and cooler air around the earth
Weather
The world's changing every second of the day
How like the El Nino and El Nina move around
Where hurricanes are
Trying to show what's happening in different years and colors are changing
Rain and precipitation
The currents, wind
Initial perceptions (continued)

OVERVIEW: Adults were more likely than children to say they knew what it was showing because they listened to the narration (32% vs. 14%) or because of the color scheme (e.g., red is warm, blue is cold). Some children said that what they saw on the sphere looked similar to what they have seen on the Weather Channel (top answer).

What makes you say that?

<table>
<thead>
<tr>
<th>Adults</th>
<th>Kids</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>32%</td>
<td>14%</td>
<td>listening to the narration</td>
</tr>
<tr>
<td>24%</td>
<td>6%</td>
<td>the colors, red is warm, blue is cold</td>
</tr>
<tr>
<td>14%</td>
<td>16%</td>
<td>the patterns, movement, the wind</td>
</tr>
<tr>
<td>10%</td>
<td>24%</td>
<td>it looks like the weather channel on TV</td>
</tr>
<tr>
<td>6%</td>
<td>4%</td>
<td>I’m already familiar with the content, I just know</td>
</tr>
<tr>
<td>4%</td>
<td>4%</td>
<td>the visuals</td>
</tr>
<tr>
<td>10%</td>
<td>8%</td>
<td>other</td>
</tr>
</tbody>
</table>

Sample of ADULT answers:
- Listening to audio
- Saw El Nino and La Nina
- That’s what the picture and voice are about
- Listening
- Blues and reds
- See hurricanes and pockets of heat
- Satellite data, thermal stuff (data set changed from hurricane to el nino)
- You can see Doppler radar data
- Because you have the whole globe and weather patterns are moving around
- Because it says one hurricane after another and another and the names
- Different colors mean different temperatures
- Listening and looking at it
- I see weather reports on TV that show similar info - radar
- I recognize maps and from listening

Sample of KID answers:
- Moving colors that are flashing
- What happened in hurricane Francis and other storms were forming and where they went
- Shows same colors as on weather channel, I’ve seen them in movies
- Listening, showing about hurricanes
- Because of what it’s saying and the colors
- Different colors represent different heats
- Because the wind moves and everything is moving
- Because see there are whirlwinds and where the whirlwinds, there is pink stuff
- I usually watch news and things with swirls are usually hurricanes
- Colors moving and swirling around
- Can see on the news, they show hurricanes
- Showing which way wind is moving
A.3. Understanding the kiosk & trackball computers

OVERVIEW: Most kiosk users had a reasonable idea of what it showed (El Nino, changing water temperatures, or hurricanes). The trackball computer users gave a variety of answers depending upon which screens they had viewed (since they could choose among the six parts of the program). About one-third specifically mentioned different aspects. The other most cited parts were geography, El Nino, and Mars (or other planets). It appears that many of the trackball users were exploring screens other than what was being shown on the sphere; approximately one-third to one-half chose to follow the program on the sphere and used the computer to find out more about that aspect.

(after looking at the kiosk or using the trackball computer)

What would you say that small screen was about?

<table>
<thead>
<tr>
<th>Kiosk (n=52)</th>
<th>Trackball (n=47)</th>
</tr>
</thead>
<tbody>
<tr>
<td>46% El Nino, changes in water temperature</td>
<td>19%</td>
</tr>
<tr>
<td>21% hurricanes</td>
<td>9%</td>
</tr>
<tr>
<td>17% weather, clouds, temperature</td>
<td>4%</td>
</tr>
<tr>
<td>10% it explains what’s on the sphere</td>
<td>19%</td>
</tr>
<tr>
<td>0 mentioned multiple topics (looked at more than one screen)</td>
<td>30%</td>
</tr>
<tr>
<td>0 continents, geography, topography, earth science</td>
<td>23%</td>
</tr>
<tr>
<td>0 sun, mars, planets, solar system</td>
<td>19%</td>
</tr>
<tr>
<td>6% other / night sky, unclear</td>
<td>4%</td>
</tr>
</tbody>
</table>

Sample of KIOSK answers

ADULTS

El Nino

Typical water temperatures in ocean water
El Nino pattern; average temperatures of oceans
Temperatures
Showing it’s warmer in SE Pacific .. El Nino
Temperature variations that affect El Nino
El Nino
Water temperatures in average year
Water temperature in average year and El Nino
Like a supplement to globe and tries to explain what’s going on
Cloud temperatures
Differences in El Nino and the average year
Show you where hurricanes form in Atlantic, direction and wind movement
Hurricanes
KIDS
How everything occurs
Water is warmer than normal in east Pacific Ocean
Giving you closer idea about what's going on on the big globe
It tells you about the storm that's called El Nino or something
Where hurricanes are and cloud temperatures with colors
It's talking about different oceans and El Nino effect....on oceans
The average year and El Nino year
Like the temperature of disasters
Telling you where the hurricanes are
About hurricanes
Hurricanes
Cooler place is where hurricane hits
Hurricane in Florida

Sample of TRACKBALL answers

ADULTS
Shows different aspects of earth's temperature, climate, lights, weather
Seeing the different presentations without having to wait for it to be on sphere
Science of the planet
What Earth looks like from space
Showing different views like El Nino, night time
World in different views
Different planets
Highlighting parts of earth and particular characteristics
Different ways to look at the planet and mars
Basic patterns on Mars, Earth
Number of different images of globe, the earth
Satellite view of different things, how much does it relate to globe?
El Nino, comparing to no El Nino

KIDS
Tell about planets
Earth and all its different forms and night, hurricanes, past & future
Gives information on globe
Helps you understand what speaker is saying and sphere is showing
How the earth just started
About what goes on on the earth, weather, climate, hurricanes
Helps explain which one it is
About the water that is warmer
It's to see how good you know the colors on globe
Showing you two hurricanes and how they made it to land or disappeared
El Nino
Mars and earth
A.4. Did the computers help people to better understand the SOS exhibit?

OVERVIEW: Kiosk users were somewhat more likely than trackball users to say that it had helped them better understand what was on the sphere (which makes sense because trackball users can get sidetracked with additional information and not necessarily see what’s relevant to the current sphere program). The most helpful elements of the kiosk, according to visitors, were the key that explains how colors relate to ocean temperatures, the fact that the image didn’t move (some think the sphere changes too quickly), and the labels of places and hurricanes. Only half as many trackball users mentioned the color key, and the most frequent answer was just that it gave additional information (no details).

*Did the computer help you to better understand what you saw on the big sphere?*

<table>
<thead>
<tr>
<th></th>
<th>Kiosk (n=52)</th>
<th>Trackball (n=47)</th>
</tr>
</thead>
<tbody>
<tr>
<td>definitely</td>
<td>67%</td>
<td>51%</td>
</tr>
<tr>
<td>a little</td>
<td>29%</td>
<td>40%</td>
</tr>
<tr>
<td>not really</td>
<td>4%</td>
<td>9%</td>
</tr>
</tbody>
</table>

(if definite/little) *How did it help?*

<table>
<thead>
<tr>
<th></th>
<th>Kiosk (n=52)</th>
<th>Trackball (n=47)</th>
</tr>
</thead>
<tbody>
<tr>
<td>33%</td>
<td>17%</td>
<td>ocean temperature color key</td>
</tr>
<tr>
<td>23%</td>
<td>11%</td>
<td>can see more details, globe changes too quickly</td>
</tr>
<tr>
<td>19%</td>
<td>2%</td>
<td>gives labels for places and names of hurricanes</td>
</tr>
<tr>
<td>12%</td>
<td>28%</td>
<td>gives more information, explanation</td>
</tr>
<tr>
<td>6%</td>
<td>6%</td>
<td>you can match them up, compare</td>
</tr>
<tr>
<td>4%</td>
<td>9%</td>
<td>I prefer reading or visual learning over listening to narration</td>
</tr>
<tr>
<td>2%</td>
<td>9%</td>
<td>other</td>
</tr>
<tr>
<td>12%</td>
<td>15%</td>
<td>no answer or negative comment about helpfulness, prefer big sphere</td>
</tr>
</tbody>
</table>

Sample of answers: *How did the KIOSK help?*

**ADULTS**
*Correlate between screen and globe*
*See where I’m looking, area/region*
*Can look at it longer, globe moves fast*
*Words with it, static picture, both sides of sphere*
*More visual person, tune out guy talking*
*Big screen has no labels: small does*
*Gives general overview of what’s being shown up there*
*Gave clear explanation with color guide*
*Tells you it’s hurricanes*
*Provided more info on temperature stuff*
*Description of what colors refer to*
[KIOSK, continued]

KIDS
Shows area labels of places that are important
Shows the bar and it says cooler or warmer
It gave an explanation
Just a smaller version of big globe
If you couldn't see in the big globe you could see it here
Because it wasn't moving and had a key
Told where the hurricanes are
Color key, it's not moving as rapidly
I understand different movements
Described it more, but not great detail
Because it's not moving around
Color key
Color key, more info than globe

Sample of answers: How did the TRACKBALL help?

ADULTS
Being able to zoom in on hurricanes and such
More words, instead of just audio
Words, explanations
Shows things clearly
Explained descriptively definition of El Nino and different temperature readouts
Gave me an idea of larger display and what other planets are like
Specifically what El Nino is
Distracted me from big sphere
Not enough information
If I had a question on the big globe I could find it here
Narration has biggest impact

KIDS
Can't tell what colors are on globe
Gave idea of what it's about and big globe shows movement
Could see and read instead of just listening
Has a key, easier to tell what's what, takes less time get information
Tells more information
Understand what kind of weather and how it's changing
Globe shows temperatures; screen shows in depth
Small gave easy words to understand
Words
Could see it more closely
Could read it
Analysis of understanding based on open-ended questions

OVERVIEW: Again, the analysis of open-ended responses yields a similar pattern of results as visitors’ self-report: the vast majority of visitors showed an improved understanding of the sphere after using the computers. Among those who didn’t understand the sphere initially, 86% of kiosk users and 74% of trackball computer users showed improvement (this difference is not statistically significant).

Now, what’s the big globe showing?

<table>
<thead>
<tr>
<th>Among those who didn’t understand initially</th>
<th>Kiosk (n=28)</th>
<th>Computer (n=31)</th>
</tr>
</thead>
<tbody>
<tr>
<td>understood after using computer</td>
<td>57%</td>
<td>55%</td>
</tr>
<tr>
<td>improved understanding, some idea</td>
<td>29%</td>
<td>19%</td>
</tr>
<tr>
<td>still didn’t get it</td>
<td>14%</td>
<td>26%</td>
</tr>
</tbody>
</table>

Understood = El Nino, changing ocean water temperatures, formation or movement of hurricanes
Some idea = weather patterns, changes in the atmosphere, temperature, storms
Didn’t get it = the world, the wind, solar system, places, global warming

Sample of answers showing improved understanding: KIOSK
(What’s the globe trying to show? What’s the small screen about? Now, what’s the globe showing?)
Weather, where certain snow storms are and intensity; Shows areas El Nino affected most; Areas of El Nino, weather warmer/cooler over time
The world; El Nino; Different temperatures over a period of time
Weather patterns warmer/cooler; Water temperatures in average year;
That’s what it is, going through years 1980-1998
The warmer and cooler air around the earth; Hurricanes; Where it’s moving
Water is blue; Hurricanes; The hurricanes
The weather; Average year is normal and during El Nino it’s got warmer;
Hurricanes, how they are moving like hurricane Daniele
Temperature or rain; Show you where hurricanes form in Atlantic, direction and wind movement;
Direction of weather patterns, strength of weather patterns
The currents, wind; Hurricane in Florida; Average year, sea surface temperature
How warm the world is; the surface temperature of seas and how one got hotter;
Time span from one to another how you get from one to the other

Answers among those who were still unclear or vague
The heat of it; It tells you about the storm that’s called El Nino or something; it was showing heat, like I said before, heat waves and cool waves
Temperature of earth; Cloud temperatures; Cloud temperatures
Try to show where places are on earth, what’s liquid and what’s rock; Where the oceans and land are and when it was made up; These places with those places to compare
Global warming; Different colors and how cool and warm parts of the earth are getting; Showing these colors
Like the weather; Like the temperature of disasters; Exact same thing on big globe
Sample of answers showing improved understanding: TRACKBALL
Facts about future and what has happened; Hurricanes in 2004 coming from Africa and hitting Florida; Building over the ocean
Lots of colors; Tell about planets; Hurricanes
Different objects in the solar system; El Nino, comparing to no El Nino;
It's going together with big globe
The movements of clouds and temperature of clouds; Helps you understand what speaker is saying and sphere is showing; Hurricanes moving
Weather; About the whole globe; About hurricanes that hit the east
Which parts of the earth are there and where it is; About the water that is warmer;
Tells you what's warmer, where El Nino is, blue is colder, red is warmer
Colors are temperatures of the earth; El Nino; Different temperatures and El Nino
Environmental changes, temperature changes; Different aspects of country and earth
Earth and changes on it; Basic patterns on Mars, Earth; El Nino patterns
Trying to show what's happening in different years and colors are changing;
Mars and Earth; showing an event called El Nino that floods different parts of California

Answers among those who were still unclear or vague
Different pattern, how it all ties together; Science of the planet; How unique our planet is, how some things are constant, some different
Where the continents and oceans and different land forms are; Gives information on globe; Everything small screen shows combined
Where the sun is; Different planets and how they're working; Big shows ideas little doesn't
Storms; World in different views; Don't know Weather; Helps explain which one it is; Weather climates over time
A political agenda; Described your various conditions of Earth, Mars; Depth of ocean, temperature, bigger view, more defined view
Just showing what would happen if we don't do good to the earth; It has all the different earth globes; If we could make sure the world is cleaner we could have more water
The world's changing every second of the day; It's to see how good you know the colors on globe; Changes of weather because it's really cool in 1992, keeps changing weather
The wind; It's telling you about El Nino; Just the same changing colors from this to that.
B. Reactions to the Kiosk and Trackball computers

This section focuses on people’s opinions of the computers – what visitors’ liked and disliked about them, and their ratings of the appearance, the informational content, and ease of use. Some of the key findings are:

- **Kiosk** users liked the colorful, easy to understand graphics and the way it clarified what was being shown on the sphere (especially the key that explained the ocean temperature variations). Their suggestions for improvements included: labels for the oceans and continents, more information, and more interactive. Other complaints included: the images were static and the screen was blurry (dirty with fingerprints perhaps?).

- **Trackball** computer users liked the interactivity and that you could choose what topics to explore. The main complaint was that it was hard understand how to use it at first (in part due to children’s unfamiliarity with the term ‘cursor’).

- Both types of computers received high ratings for appearance, clear and easy to understand graphics, and interesting information. Children gave significantly lower ratings than adults for the ‘ease of use’ of the trackball computer.
B.1. What people liked most

OVERVIEW: Visitors liked that the kiosk had good colorful graphics and a color key, and that it was easy to understand and clarified the sphere. Visitors liked that the touch screen computer was interactive and had a variety of things to look at.

What do you like best about this screen?

<table>
<thead>
<tr>
<th>Kiosk</th>
<th>Trackball</th>
</tr>
</thead>
<tbody>
<tr>
<td>(n=52)</td>
<td>(n=47)</td>
</tr>
</tbody>
</table>

- 27% 11% good visuals, colorful, bright
- 27% 0 the color key, shows warmer and colder
- 10% 11% easy to understand
- 10% 4% clarifies sphere
- 8% 17% shows hurricanes, El Nino, night lights, etc.
- 6% 0 labels
- 4% 9% gives additional information
- 0 30% interactive, you can choose what to look at
- 0 28% has a variety of things to look at
- 6% 13% blank, no answer

Sample of answers: KIOSK

ADULTS
- It enriches the information on the sphere
- Easy to understand
- Colorful
- Examples they give you
- Explains well what El Nino is
- You can see where the warm water is and how cool Atlantic is relative to normal
- Difference in color
- Very detailed, explains things easily
- It's very clear and colorful
- Very easy to read, well lit
- Like El Nino globe because it's more relevant, shows more
- Shows other weather related events in the world

KIDS
- Lots of colors on it
- There's not lot of red, the air's kind of in middle of cold and warm air
- Gives you more interactive learning about what's going on up there
- Colorful
- Labels for hurricanes and Florida
- Good special effects, easy to understand
- It has the key and shows cooler and warmer
- The colors

Research Report by People, Places & Design Research
The map part
Because it labels where things are and what things are
Shows us warm places and where it's cold
That stands still so you can look at one spot, don't worry about changing
Shows average years, colors show cooler and warmer
Very clear; you can see everything

Sample of answers: TRACKBALL

ADULTS
It peaks your interest
Interactive
Simple; look at different areas
Zooms in on parts of earth
Seeing different views
I don't know that it did anything really
Hurricanes, the in motion tracking
Available information quickly
Most interesting thing is showing storm movements
It's easy to navigate
Nice that it illustrates different perspectives interactive aspects
Nothing particular

KIDS
Shows hurricane, kids want to see
Moves globe and lets you choose what part you want to see details about
Shows different things about different parts of world
Patterns, maps, solar system
Shows that planets move and colors
Night lights; could click and see stuff, it's interactive
So many options
How you could see more parts by rolling around than looking at big thing
Shows a lot of different views in a lot of different times
It has the colors and our world
Showing you where El Nino is and what it is
The different globes and you can learn more
You could look at land, weather and different kinds of things, temperature
B.2. What people didn’t like

OVERVIEW: About two-thirds of kiosk and trackball users were able to think of something they didn’t like about the component they had used. Kiosk users wanted more labels of continents and oceans, more information, and more movement or interactivity. Trackball users also said they would like more information, but their biggest complaint was that they weren’t sure how to use it at first (some kids were confused by the word “cursor” and thought a touch screen would be easier).

What did you like least about it?

<table>
<thead>
<tr>
<th>Kiosk (n=52)</th>
<th>Trackball (n=47)</th>
</tr>
</thead>
<tbody>
<tr>
<td>13%</td>
<td>4%</td>
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<tr>
<td>13%</td>
<td>0</td>
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<tr>
<td>8%</td>
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<td>23%</td>
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<td>15%</td>
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<tr>
<td>38%</td>
<td>34%</td>
</tr>
</tbody>
</table>

What you like least: KIOSK

ADULTS

Static picture, no interaction
Might be effective to have temperature numbers along with color scale
Have to look straight at it (groups would have a hard time)
No animation
Could be bigger
Too simple, doesn't explain how temperature affects hurricanes
Little out of focus, would be nice to have temperature scale
Doesn't do anything
I’d put pictures on top, words on bottom
Looks okay, descriptive
Slant could be greater, chart reading level for kids lower than adults
Could be multi media with motion
Pretty dirty on the screen
You have to sit and pay attention
If it had more explanation of what El Nino is that would be better
Was expecting something more exciting
Could be enhanced with contours of continents
KIDS
See something, earth different on each graphic so hard to find same areas
Part of the earth is black, and so is this (background) so it's hard
 Doesn't change
All the red
Hard to understand, like if somebody didn't understand it's about temperature
Not moving like that one (points big globe)
Needs more information
Can't see where everything would be like where water is, where continents are
Label both oceans, shows Atlantic but should also show Pacific
Don't like that area is getting warmer
How everything is warm in most of the world
The globe isn't colored
I don't get the colors
Not something to choose
Should've put more things in it to make it more interesting
Can't see other parts of globe

Answers: TRACKBALL

ADULTS
Kind of simple
Not enough information especially for an inquisitive adult
Doesn't guide to other places, what they have to show?
Took a minute to figure out what to do
Confused in beginning, thought there was more to it
Wasn't focusing on correct sphere to match
Sitting down you can't see the screen
Main display talking about El Nino, I was on other side looking at Indian Ocean
I rolled over this one like on the one up there, it didn't do anything so went back
Needs more explanation, what each sphere one is before you start
I clicked on globe w/ night lights and not all places bright were labeled
Mars, it's out of character; all others about earth
On first screen should put names on globes not just click here
Should be more information for example with Mars and Olympus video
Information wasn't in depth enough
No numbers on earth's climate color bar to tell you temperature exactly

KIDS
Wasn't sure what to do
Didn't have instructions of what to do; was a little confused
Didn't like night lights
Not enough info
Didn't show where I live, not big enough
Just very limited things to do, just read it
Kind of hard to figure out instructions, move cursor?
Confusing to move the mouse

Research Report by People, Places & Design Research
I couldn't change the picture (of the big globe)
When you get it right it keeps asking the same thing
Don't get it like it says roll the cursor, I don't know what that is
Not enough information
B.3. Appeal of the computers

OVERVIEW: The two different types of computers were similarly appealing – 79% of visitors said they like the looks, 70-75% said the graphics are clear, and 81-84% said the information is interesting. However, children were less likely than adults to think the kiosk was interesting. The vast majority of adults thought the trackball was easy to use (88%) but only 55% of kids agreed.

Your opinion about some different aspects of the screen:

<table>
<thead>
<tr>
<th>I like the way it looks</th>
<th>KIOSK</th>
<th>TRACKBALL</th>
</tr>
</thead>
<tbody>
<tr>
<td>definitely</td>
<td>79%</td>
<td>79%</td>
</tr>
<tr>
<td>a little</td>
<td>17%</td>
<td>19%</td>
</tr>
<tr>
<td>not really</td>
<td>4%</td>
<td>2%</td>
</tr>
</tbody>
</table>

The graphics are completely clear and easy to understand

| definitely | 75% | 70% |
| a little   | 23% | 28% |
| not really | 2%  | 2%  |

The information is interesting

| definitely | 84% | 81% |
| a little   | 14% | 17% |
| not really | 2%  | 2%  |

I think it’s easy to use

| definitely | n/a | 72% |
| a little   |     | 26% |
| not really |     | 2%  |

** a. Adults were more likely than children to think the trackball computer was easy to use (88% vs. 55%)

** Adults were more likely than children to think the kiosk information was interesting (96% vs. 74%)
OVERVIEW: Visitors frequently referred to the colors when asked what they liked about the computer components.

What part do you like (about the way it looks?)

<table>
<thead>
<tr>
<th>Kiosk</th>
<th>Trackball</th>
</tr>
</thead>
<tbody>
<tr>
<td>(n=52)</td>
<td>(n=47)</td>
</tr>
<tr>
<td>42%</td>
<td>38%</td>
</tr>
<tr>
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<td>6%</td>
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<td>8%</td>
<td>4%</td>
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<tr>
<td>4</td>
<td>10%</td>
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<tr>
<td>4%</td>
<td>9%</td>
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<tr>
<td>0</td>
<td>6%</td>
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<tr>
<td>13%</td>
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<tr>
<td>13%</td>
<td>23%</td>
</tr>
</tbody>
</table>

Sample of answers: KIOSK

**ADULTS**
Nice graphics, details
Contrast of colors; see big picture
Clear; quickly read; multi-user in sync with globe
Bright; easy to read
Colors
Colors, black background/white letters
Screen
Colors, white letters on black
Color distribution, showing data
Layout easy to read
Colors attract everyone
Simplicity
Ease of reading
Very clear, colors showing what you should look at
Ergonomically positioned, colors are very good

**KIDS**
The red part
Shows overall idea, good because it's confusing at first
Size of font and colors (realistic)
It's 3-D so the way it's laid out
Two different worlds one relating to big sphere
Shows the globe and different parts of Florida (labeled)
Shows the world and facts about it
Color scheme
Really bright colors that are easy to understand
I like that they show the world
The states, the colors
Gives you more info than globe
Color key

Sample of answers: TRACKBALL

ADULTS
Different images with choices
Neat, attract attention
Sleek looking
Good size and nice black frame
Whole set up moves easily, color differences
Size of screen, color, easy to read
Like light at night
Good presentation
Pictures are great, might be better as touch screen
Graphics are nice, very simple
Colors
Everything changing like very multi media
Colors are clear and show distinction between land and water
It's visually stimulating, colors are very clear
Very colorful informative

KIDS
Colors
Earth's climate
The information and rotating the earth, geography
Whole thing
The way its set up
Different colored globes
How opening screen is set up
Screen, visual-colors on globe
Easy to follow with key at the bottom
Main menu, colorful and can move your cursor
Shows different ways we can more understand about earth
I like the colors
Colorful and how on the big thing it shows the time
Colors and moving around on different globes
OVERVIEW: Visitors cited a variety of things that interested them about the computers. Among kiosk users this included learning in general (new information), seeing how hurricanes form, learning about El Nino and how different colors represent different temperatures. Trackball computer users cited learning about hurricanes, an interest in the topic (especially weather), new information in general, and seeing changes over time.

What’s interesting about it?

<table>
<thead>
<tr>
<th>Kiosk (n=52)</th>
<th>Trackball (n=47)</th>
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</thead>
<tbody>
<tr>
<td>13%</td>
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<td>4%</td>
<td>0</td>
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<tr>
<td>2%</td>
<td>9%</td>
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<tr>
<td>0</td>
<td>4%</td>
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<tr>
<td>8%</td>
<td>17%</td>
</tr>
<tr>
<td>10%</td>
<td>21%</td>
</tr>
</tbody>
</table>

Sample of answers: KIOSK

ADULTS

Overall picture of flow of weather
Learn more about what’s on globe (with audio too)
Already interested in weather
New info to me
Gives big picture fun to watch El Nino develop
All affects us
I'm interested in global climate change
What happens with weather, effects on US and South America
Because it's in the news
How the storms form
Explains an event on news, this more descriptive
Watching the changes of patterns throughout years
Vast difference between two globes (El Nino)

KIDS

Shows activity of storms
Can show where hurricanes form & what their name was, how it happened
Didn’t know any of this stuff before, new to me
Didn't know what El Nino was, more detail than my history book
How it shows the storms and keeps info patterns over the years
It shows you what's going on and colors you want to figure out
Telling you about the places like the Pacific Ocean
Shows the different hurricanes and weather that happens
Just that it's interesting how it's warm at the equator
To learn about the different stuff like continents, color, years
Our planet
It's cool, it's informational
I'm learning about El Nino in earth science
How the wind forms the hurricanes

Sample of answers: TRACKBALL

ADULTS
On climate one, temperatures in 2010 as opposed to now
We are too detached from our surroundings and weather impacts all
Projecting of the planet, hurricane tracking
Enjoy the subject and perspective
Global warming and how atmosphere changes
Look at different areas; some are similar some different
I'm a science person, trying to find something I don't know
Shows earth from view that we can't see
Can see action, makes you aware that there is continuous action in atmosphere
Interested in earth, geology
How the hurricanes begin and end up on land or not if pick up speed
Watching hurricanes from sky where I can't see it
Mars- I didn't know anything about it before
Know a lot about earth but also had mars which very limited
Like different views and weather and you can see differences in each
Like watching storm track, brings hurricane season to life, pictures are interesting

KIDS
Hurricanes through the years
You can go to any you want
Tells about world and what can happen in the future
Giving interesting facts about earth
Shows different colors and tells a lot of stuff
Interest in weather, earth in general
Class is doing something with journey north, tracking butterflies
Tells you like the history of the hurricanes
How global warming would change because of pollution, how much water...
Tells you what happens and happened in the past
Exploring the unknown
Tells you stuff you don't know yet, next time you can learn more
C. Visitors’ Suggestions for ‘Science on a Sphere’

This section presents visitors’ top-of-mind suggestions for making the SOS exhibit easier to understand, more interesting, and for any additional questions they have about it. These results are summarized as follows:

- The most frequent suggestion for making it easier to understand was to add labels of oceans, continents, and countries to the globe. Some people mentioned having arrows point to the place to which the narrative is referring.

- To make the sphere more interesting, visitors suggested a variety of things, including labels, more color, photos of hurricanes, and having the sphere rotate like the earth.

- Visitors are most curious about the technology behind the sphere – they want to know how the images are projected, how the sphere is suspended, and if it’s a hologram.
C.1. What could make the sphere easier to understand?

OVERVIEW: When asked what could make the sphere easier to understand, the top answer was “labels” (mentioned by 30% of visitors). Other suggestions included arrows to indicate the area being talked about, if it rotated so you didn’t have to walk around it, and the kiosk. About one-quarter of the visitors had no suggestions.

What could make the globe easier to understand?

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Suggestion</th>
</tr>
</thead>
<tbody>
<tr>
<td>30%</td>
<td>labels (continents, names of hurricanes), a key, symbols</td>
</tr>
<tr>
<td>9%</td>
<td>arrows showing where narrative is talking about</td>
</tr>
<tr>
<td>6%</td>
<td>not having to walk around it, if it rotated so you could see everything</td>
</tr>
<tr>
<td>6%</td>
<td>this kiosk</td>
</tr>
<tr>
<td>5%</td>
<td>graphics not always clear, blinking</td>
</tr>
<tr>
<td>4%</td>
<td>if it moved more slowly</td>
</tr>
<tr>
<td>4%</td>
<td>text, more explanation, hand-outs</td>
</tr>
<tr>
<td>4%</td>
<td>years, latitude and longitude lines hard to see</td>
</tr>
<tr>
<td>9%</td>
<td>other</td>
</tr>
<tr>
<td>27%</td>
<td>blank, don’t know, it’s fine</td>
</tr>
</tbody>
</table>

ADULT answers:

Handouts with information, especially a classroom guide
Voice over and date and time
Longitude and latitude lines
Names of continents
If had more labels, broken down
Draw an equator line around globe
Maybe if slowed down a little
Time in sync with voice?
Labels, designate areas that audio is referring to
Label storms
Lower height, not a good height for kids
Have to rotate with globe, bad for lazy person
Breaking up the continents
If image was smoother, data dropouts, jittery
Continents listed, you can tell from the shape, but maybe not everyone
Weather effects on land
Too fast, little slower, year hard to see
Letters, or a way to pinpoint info, instead of just audio
Need something to stand at and read, paragraph of what’s going on, also color chart
Pointers to look at Pacific Ocean when El Nino is showing
If it rotated you could see more, you’re trying to track what he’s saying...
You could put in the black areas, the name of continents ...show N, S, E, W
Maybe some people need names of Africa or whatever
Kiosk does the job
Pretty easy, what seasons were being displayed and what happens during hurricanes
Should be some explanation that draws your attention to what talking about
The kiosk labels, if labeled sphere would be cluttered, timeline pertinent...
Doesn't explain what El Nino is, hard to see year, show effects of El Nino...
No, very well executed, maybe slow down rate, too fast-weather changes
Would be nice if there was good way to represent time scale as they travel

KID answers:
Labels
Symbols on it
Tiny source of information for people to read
If everything was labeled
If you could only sit in certain section, so you don't have to walk around
If you show little bits of warm weather and cool weather at a time
Put the bar on (colder/warmer key)
Maybe if it moved in a circle
Read this kiosk then look at globe
Could have, like, more labels, arrows with labels
Arrows and circles
A little smaller so everyone could see it
If part of globe would write down what they're saying
Putting words on it
Larger, more clear, more islands and geographic features
Have words
Graphics make images more clear (hurricanes)
More interactive somehow globe to touch and light up maybe
Wanted to see other side and said nothing
Make it rotate so you could see all of it
Latitude and longitude lines could be bigger
Labels
Put words on countries
Blinking sometimes is hard to understand
Write the place on it so we'd know like where is the Pacific Ocean?
Make like the present colors colored and past colors black & white
Label it or something like what's happening
Saying what the thing on it is explaining - the wind or whatever
Make years a different color because you can't read them
Put some of the names of the continents on there
No, think it's pretty good but it's kind of blinking (animation)
Probably you could show the color down so you know what's going on
Put more labels on it
Hurricane part- in certain parts it goes dim and flashes, disturbing
If it could rotate so you could see the south pole and north pole
Tells what the things are things that are moving
Most kids don't know continents so you could label them
Could put in different spots where more hurricanes are
Put a key, surface temperature key on globe
If it showed directions when it's moving
C.2. What could make the sphere more interesting?

OVERVIEW: When asked what could make the sphere more interesting, 42% of the visitors made suggestions, such as labels, more colorful, photos of hurricanes, and if it rotated like the earth.

What could make the globe more interesting?

<table>
<thead>
<tr>
<th>%</th>
<th>Suggestion</th>
</tr>
</thead>
<tbody>
<tr>
<td>8%</td>
<td>labels</td>
</tr>
<tr>
<td>7%</td>
<td>more colorful</td>
</tr>
<tr>
<td>6%</td>
<td>photos of hurricanes, show effects of El Nino on land</td>
</tr>
<tr>
<td>5%</td>
<td>if it rotated like the earth</td>
</tr>
<tr>
<td>3%</td>
<td>more planets, other shows &amp; images</td>
</tr>
<tr>
<td>2%</td>
<td>more text, explanation</td>
</tr>
<tr>
<td>2%</td>
<td>lower the sphere, too high</td>
</tr>
<tr>
<td>1%</td>
<td>if it spun more slowly</td>
</tr>
<tr>
<td>8%</td>
<td>other</td>
</tr>
<tr>
<td>58%</td>
<td>blank, don’t know, it’s fine</td>
</tr>
</tbody>
</table>

ADULT answers:

It's good
Addition of major cities (names) along coast and on continents
Wish it spins
Less flickering in hurricane show
Keeping data more up to date (referring to 2004 hurricane data set)
Spinning slowly
Show storms actually hitting (like a TV)
Also show effect of El Nino on land
Name continents
Don't want to add anything, it would detract from it
More relevant to our own area, how El Nino affects Maryland, east coast
More intuitive what you were looking at, not having to guess what image represents
If it moved, spun around
If it had some color in the background
If it moved/spun like earth normally does
Have basic info written on sphere as we do with MSC logo before live show
It’s quite interesting if it wasn’t so gray it would be better
More instructive, add titles of S. Africa and America
More real time pictures
Seen a lot of the same shows as a member and want to see different planets
Could have different shows playing instead of same ones
I think it's pretty cool, compelling
Put in info that's relevant to what's here; woman's voice would be more inviting
What could make the globe more interesting?
KID answers:

Labels
If there was some pink on it
Make it a little lower, can't see top
How hot was it in that area?

More 3-D objects
Show pictures of what happened with hurricane they're showing
Pause and see fast fact about the earth
Giving more color to it

More different colors
To understand better, having it written down instead of just listening
Big continents could be named, globe could be lower

More color not just gray
You could label the continents
Make water blue and different places different colors, because kids like colors
When it's over you could do a quiz
You could label the places so you know where hurricanes are
Maybe match the way the globe is going on the big globe
Add the rest of the solar system
It is very interesting you could make the world spin
Put kiosk on bigger screen and hang in gallery
I think it's pretty cool
C.3. What else would you like to know about the sphere?

OVERVIEW: About one-third of the visitors expressed curiosity about the technology behind the sphere: how are the images projected? how is it suspended in the air? is it real or is it a hologram? Only a small proportion of people wanted to know more about the content of the program.

Is there something else you would like to know about what you’re seeing here?

- 17% how does it project? is it a hologram, projector inside or outside?
- 8% more about El Nino, hurricanes, other content
- 6% how is the sphere suspended in the air?
- 7% other questions about the technology of how the sphere works
- 4% other

ADULT questions:
How does it project, a little blurb for people to read?
How they get it on there, is it a big screen?
Trade winds? History of mariners? Equator/meridians
Is it an image? Or solid?
Name of exhibit and what you’re supposed to be learning
What's controlling the sphere? Is it a hologram?
Maybe have a longer time line
Where data came from, what time period? Displays/globe hard to read
Possibly visualize weather effects on land, instead of just showing black
How it affects weather in US, droughts, where? has nothing about land mass, only water temps
Curious how it projects
How is it mounted? How created? Maybe have a sign explaining this
Would like to see plate tectonics, to make it interactive that way
How it works, assuming its internal projection, but don't know
Is the photography coming from outside or inside? Is it the same image on other side?
If I could hear and might have some questions
Where do you get information from?
How did they make the globe look like that like a hologram?
Is it the different projectors? Is it a holograph?
Where is the projector and is it outside or inside?
Is it all lasers or an actual sphere with wires?
Fascinated by how they managed to project spherical image

KID questions:
How often El Nino/Nina occurs
What will happen in the future? (hurricanes? Katrina?)
How is it floating? What happens if you touch it?
Is it all one picture?
How they get the globe up there
What's inside the ball?
Is it holographic?
How do the colors change?
Little bit more about other planets none specifically
Is it real? What do colors represent?
Nothing, I can tell it is taken from satellites
How the picture is getting on the globe
Is it a hologram?
How it changes and what do the different pictures show
Like what makes the colors
Don’t know what button on screen is and what is the cruiser?
How does it float like that?
Not really, like is there just a ball hanging on or is it a hologram?
How the projectors make globe image
D. Characteristics of the Samples

Demographic characteristics of the 99 adults and children who participated in this study are summarized separately for the two samples (kiosk and trackball), including experience with MSC, gender, age, and education level (of adults). The two samples are fairly comparable – some differences but not statistically significant.
D. Characteristics of the Samples

OVERVIEW: Overall, about half of the adult participants had visited the Maryland Science Center before, a majority of the groups included children, about three-quarters had college degrees, and the proportion of men and women interviewed was fairly equal. The two samples (kiosk users and trackball users) were similar in terms of visitors’ familiarity with MSC, group composition, and ages of participants. Some apparent differences (more men, higher level of education among kiosk users) were not statistically significant with the small sample sizes.

<table>
<thead>
<tr>
<th>ADULTS</th>
<th>Kiosk (n=24)</th>
<th>Trackball (n=25)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Familiarity with MSC</td>
<td>first-time visitor</td>
<td>50%</td>
</tr>
<tr>
<td></td>
<td>repeat visitor</td>
<td>50%</td>
</tr>
<tr>
<td>Group composition</td>
<td>adults-only</td>
<td>33%</td>
</tr>
<tr>
<td></td>
<td>family with children</td>
<td>62%</td>
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<tr>
<td></td>
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<td>Education:</td>
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<tr>
<td></td>
<td>some college</td>
<td>17%</td>
</tr>
<tr>
<td></td>
<td>college graduate</td>
<td>25%</td>
</tr>
<tr>
<td></td>
<td>graduate school</td>
<td>54%</td>
</tr>
<tr>
<td>Gender:</td>
<td>man</td>
<td>61%</td>
</tr>
<tr>
<td></td>
<td>woman</td>
<td>39%</td>
</tr>
<tr>
<td>Age:</td>
<td>20’s</td>
<td>32%</td>
</tr>
<tr>
<td></td>
<td>30’s</td>
<td>20%</td>
</tr>
<tr>
<td></td>
<td>40’s</td>
<td>28%</td>
</tr>
<tr>
<td></td>
<td>50’s</td>
<td>8%</td>
</tr>
<tr>
<td></td>
<td>60+</td>
<td>12%</td>
</tr>
</tbody>
</table>
OVERVIEW: A majority of the children who participated in this study were first-time visitors to the science center and there were slightly more girls than boys. About two-thirds of the children were ages 8 to 11, while one-third were older.

<table>
<thead>
<tr>
<th>KIDS</th>
<th>Kiosk (n=27)</th>
<th>Trackball (n=22)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Familiarity with MSC:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>first-time visitor</td>
<td>59%</td>
<td>64%</td>
</tr>
<tr>
<td>repeat visitor</td>
<td>41%</td>
<td>36%</td>
</tr>
<tr>
<td>Age:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8-9</td>
<td>30%</td>
<td>23%</td>
</tr>
<tr>
<td>10-11</td>
<td>41%</td>
<td>41%</td>
</tr>
<tr>
<td>12-13</td>
<td>22%</td>
<td>27%</td>
</tr>
<tr>
<td>14-15</td>
<td>7%</td>
<td>9%</td>
</tr>
<tr>
<td>Gender:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>boy</td>
<td>52%</td>
<td>32%</td>
</tr>
<tr>
<td>girl</td>
<td>48%</td>
<td>68%</td>
</tr>
<tr>
<td>Group composition:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>family with children</td>
<td>89%</td>
<td>95%</td>
</tr>
<tr>
<td>school/larger group</td>
<td>11%</td>
<td>5%</td>
</tr>
</tbody>
</table>