

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

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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?

	<u>Overall</u> (n=99)	<u>Adults</u> (n=50)	<u>Kids</u> (n=49)
			**
Very	38%	56%	20%
Somewhat	47%	40%	55%
Not so easy	14%	4%	25%

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 alreadyADULTS 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 alreadyKIDS 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?

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

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?

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

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?

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

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?

	<u>Kiosk</u> (n=52)		<u>Trackball</u> (n=47)
definitely	67%	++	51%
a little	29%		40%
not really	4%		9%

(if definite/little) How did it help?

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

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?

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

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?

<u>Kiosk</u> (n=52)	<u>Trackball</u> (n=47)	
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

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?

<u>Kiosk</u> (n=52)	<u>Trackball</u> (n=47)	
13%	4%	hard to tell where continents & oceans are, need labels
13%	0	static, no animation
8%	11%	need more information, explanation
6%	2%	visibility, blurry screen
6%	2%	not interactive enough
4%	0	I don't understand the point
2%	2%	boring
0	23%	instructions unclear, not sure what to do
15%	21%	other
38%	34%	blank, no answer

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: TRACKBALLADULTS

*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*

*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:

	<u>KIOSK</u>	<u>TRACKBALL</u>
I like the way it looks		
definitely	79%	79%
a little	17%	19%
not really	4%	2%
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% ^b	81%
a little	14%	17%
not really	2%	2%
I think it's easy to use		
definitely	n/a	72% ^a
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?)

<u>Kiosk</u> (n=52)	<u>Trackball</u> (n=47)	
42%	38%	colors
13%	6%	easy to understand
13%	2%	easy to read, font, white letters on black background
8%	4%	more details, labels (compared to sphere)
4	10%	physical size, height, set-up, etc.
4%	9%	pictures, images, graphics
0	6%	variety of choices
13%	15%	other
13%	23%	blank, no answer

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?

<u>Kiosk</u> (n=52)	<u>Trackball</u> (n=47)	
13%	11%	educational, informative, new to me
12%	15%	hurricanes, how they form
12%	2%	different colors, temperatures
12%	0	El Nino
10%	6%	relevant topic, in the news, (e.g., global warming)
8%	4%	global perspective
8%	13%	I like the topic (e.g., weather, earth science)
4%	2%	how everything is connected, how it affects us
4%	0	more detail about what you see on sphere
2%	9%	seeing changes over time
0	4%	Mars
8%	17%	other
10%	21%	blank, no answer

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?

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

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?

8%	labels
7%	more colorful
6%	photos of hurricanes, show effects of El Nino on land
5%	if it rotated like the earth
3%	more planets, other shows & images
2%	more text, explanation
2%	lower the sphere, too high
1%	if it spun more slowly
8%	other
58%	blank, don't know, it's fine

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.

ADULTS	<u>Kiosk</u> (n=24)	<u>Trackball</u> (n=25)
<u>Familiarity with MSC</u>		
first-time visitor	50%	48%
repeat visitor	50%	52%
<u>Group composition</u>		
adults-only	33%	44%
family with children	62%	43%
school/ larger group	5%	13%
<u>Education:</u>		
high school	4%	12%
some college	17%	12%
college graduate	25%	44%
graduate school	54%	32%
<u>Gender:</u>		
man	61%	46%
woman	39%	54%
<u>Age:</u>		
20's	32%	29%
30's	20%	25%
40's	28%	25%
50's	8%	17%
60+	12%	4%

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.

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