

# **Evaluation of Science On a Sphere® Live Presentations**

at

**Whitaker Center for Science and the Arts**



**Research report prepared by:  
People, Places & Design Research**

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Science On a Sphere®  
Live Presentations  
at  
Whitaker Center for Science and the Arts  
Harrisburg, Pennsylvania**

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## Executive Summary

This study was conducted to evaluate visitors' perceptions of two live presentations developed by the Whitaker Center for Science and the Arts to complement and enhance the visitor experience of *Science On a Sphere*® (SOS). This study, the development of these presentations, and Whitaker Center's installation of SOS were all supported by a grant from NOAA. These 15-minute programs were designed to explain how storms are formed using SOS images of the sun, ocean temperature, clouds, and hurricane paths during the 2005 season. The goal of these programs was to increase public understanding of and interest in earth systems science and to increase awareness of NOAA's role in weather forecasting and education. This research was planned to assess visitors' enjoyment of the presentations as well as their understanding of key concepts.

The first program, "Recipe for a Storm," had a lively narrator but minimal opportunities for audience participation. The second program, "Storm Chef," was designed to be more interactive, with a presenter dressed like a chef who demonstrated properties of wind and water vapor using volunteers from the audience and created a touchable storm cloud using hot water and liquid nitrogen.

### Method

Before each show, short response forms on clipboards were passed out to collect e-mail addresses from one adult in each visitor group and any children in the target age range of 9 to 14, explaining that they would receive a link to a brief survey so they could give feedback about the program. As an incentive, one free pass for the IMAX theater was offered. Parents signed a permission form indicating consent that their children could participate. Links to the survey were e-mailed to participants 2-3 days after their visit to the Harsco Science Center. The response rate for adults was good (~48%) and for children it was somewhat lower (~36%). Most people completed the online questionnaire within a week of seeing the presentation. A total of 200 surveys were completed.

### Highlights of the Results

Enjoyment: Visitors enjoyed the "Storm Chef" program – about 60% of adults and children rated it highly ('9' or '10' on a 1-10 scale). Only 18% of adults gave high ratings to "Recipe for a Storm," apparently because some were not interested in the topic or felt it wasn't engaging enough for their younger children. About one-quarter of families with preschool children didn't stay for the entire "Recipe for a Storm" presentation (probably because competing interactive elements in the *Forces of Nature* exhibition drew some young children away from the program). However, the 9-14 year old children gave higher ratings than the adults to "Recipe for a Storm" (40% rated it '9' or '10').

Interest: About half of the audience of both shows said their interest in learning about “global climate patterns” increased as a result of seeing the live presentations. Visitors cited the visualization on the sphere of the 2005 hurricane season as the most interesting part of the first program, “Recipe for a Storm.” The highlight of “Storm Chef” was the demonstration at the end involving the creation of a miniature storm cloud. The visuals on the sphere were less memorable to visitors who saw this program with the “extra” live elements such as the funny presenter and volunteers from the audience getting sprayed with water.

Interpretive Messages: Both of the live presentations were successful in starting with the familiar phenomenon of stormy weather and taking visitors to a deeper level of understanding about the process of storm formation. Although some people said they were already aware of the information, 40-60% of adults and kids came away with new ideas such as: ‘when there is more water vapor from warm oceans there is more potential for storms,’ ‘water holds heat better than land,’ and ‘when it’s summer in the US, storms form just north of the equator.’ There were some differences between the two programs in people’s perceptions of the main message: more visitors in the “Storm Chef” format expressed the main message in an open-ended question (about half did, vs. one-third of visitors who saw “Recipe for a Storm”), although some visitors described “Recipe for a Storm” using more global terms such as ‘how weather in one area of the world can affect weather in a completely different part of the globe’. This is a reflection of the way the “Recipe” program presenter focused more on the sphere’s visuals while the “Chef” program focused more on science demonstrations.

Awareness of NOAA: About 75% of visitors recalled hearing during the program that NOAA runs the National Weather Service. One-quarter of adults and 12% of kids reported that they knew this before.

### **Implications**

The ‘live presenter’ programs were well received – visitors packed the small seating area to watch them. The presentations helped to attract and expose more people to the SOS exhibit, including children ages 9-14. Therefore, continuation of these programs is warranted.

Both of these ‘live presenter’ programs enhanced audiences’ interest in global climate patterns, especially among people who indicated any interest in the topic. The content level seemed equally appropriate for both adults and children in the target age range because their perceptions of interpretive messages were similar. In other words, children were just as likely as adults to come away with a reasonable understanding. Therefore, if ‘live presenter’ programs are developed at other SOS installations, those sites would be wise to consult Whitaker Center’s scripts of these programs as a model of how content can reach children as well as adults.

## **A. Opinions about the Program**

This section of the report explores visitors' perceptions of the presentations, including their ratings of interest, what was most interesting, whether their curiosity about weather patterns increased, and visitors' suggestions for improving the programs. The key findings are:

- Visitors expressed moderate interest in learning about global climate patterns, in general. About half of the audience said their interest increased as a result of seeing the live presentations.
- “Storm Chef” was rated highly by adults and children (~60% “high” ratings), compared with “Recipe for a Storm” (only 18% high ratings among adult viewers, and 40% high ratings among children in the target age range).
- According to visitors, the most interesting aspects of “Recipe for a Storm” were the visualizations on the sphere, especially the 2005 hurricane season. The highlight of the “Storm Chef” program was the demonstration that created a miniature storm cloud.
- Disappointments about “Recipe for a Storm” included that it was not engaging enough for young children and that it had visibility issues. Suggestions for “Storm Chef” included more audience participation and more explanations.

## A.1. Did people watch the entire show?

OVERVIEW: Nearly everyone who responded to the survey had watched an entire presentation.<sup>1</sup> However, there was one exception – among viewers of “Recipe for a Storm,” parents with preschool-aged children were somewhat less likely to stay for the entire show. Young children sometimes wandered off to interact with nearby exhibits during the program.

### *Did you stay to watch the entire presentation?*

	Combined Audiences (n=200)	<i>RECIPE FOR A STORM</i>		<i>STORM CHEF</i>	
		<u>Adults</u> (n=52)	<u>Kids</u> (n=43)	<u>Adults</u> (n=62)	<u>Kids</u> (n=43)
yes	93%	86%	93%	98%	93%
no	7%	14%	7%	2%	7%

### Who watched the entire show: “Recipe for a Storm”?

++ 79% of adults with preschoolers  
96% of adults without preschoolers

### Who watched the entire show: “Storm Chef”?

(No significant differences or trends)

96% of adults with preschoolers  
100% of adults without preschoolers

(\*\*) Asterisks indicate statistically significant differences ( $p < .05$ ) between sets of figures. (There are no examples on this page; on the next page there is a significant difference between the 3 categories depicted in the graph.)

(++) Plus signs are used in this report to indicate patterns of differences which are not quite statistically significant (milder differences, which may have occurred by chance), but which suggest a trend and may have some intuitive value in some circumstances.

<sup>1</sup> The fact that some people responded to the on-line survey even though they didn’t watch the entire show is a good indicator that the sample more closely represents the overall audience, and reflects some diversity of opinions (not just visitors who liked it and who typically are more likely to give feedback).

## A.2. Interest in learning about climate

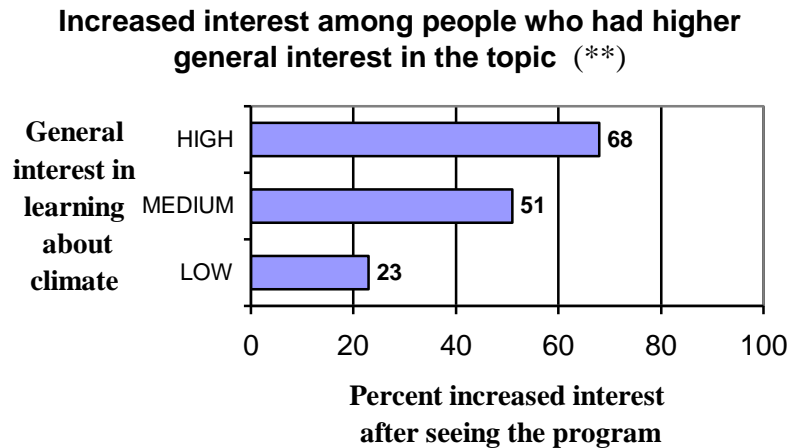
OVERVIEW: Most adults and children in the target age range of 9-14 said they had moderate interest in the topic of global climate patterns, in general. About half of the visitors (53%) reported that their interest increased as a result of seeing the presentation. The greatest increase was seen among those who had high interest initially (see graph below). The patterns of results for the two programs were similar; there were no statistically significant differences between the programs or between adults and children.

*In general, do you have high, medium, or low interest in learning about global climate patterns?*

	Combined Audiences (n=200)	<i>RECIPE FOR A STORM</i>		<i>STORM CHEF</i>	
		Adults (n=52)	Kids (n=43)	Adults (n=62)	Kids (n=43)
high	26%	17%	26%	29%	35%
medium	65%	65%	70%	64%	60%
low	9%	17%	5%	7%	5%

*Has your interest in global climate patterns increased, decreased, or stayed the same as a result of seeing the presentation with the big sphere?*

	Combined Audiences (n=200)	<i>RECIPE FOR A STORM</i>		<i>STORM CHEF</i>	
		Adults (n=52)	Kids (n=43)	Adults (n=62)	Kids (n=43)
increased	53%	38%	54%	58%	63%
stayed the same	47%	62%	46%	42%	37%
decreased	0	0	0	0	0



### A.3. Ratings of the presentations

OVERVIEW: The overall/combined ratings for these SOS live programs indicate that they were well-received. The “Storm Chef” program received higher ratings than “Recipe for a Storm.” About 60% of visitors gave the highest ratings (a ‘9’ or ‘10’) to “Storm Chef” while “Recipe for a Storm,” received low-to-moderate ratings, especially from adults. Only 18% of adults thought it was highly interesting, while 40% of kids felt the same way. General interest in the topic was a factor in the ratings; those with high interest gave higher ratings.

*On a scale of 1 to 10, how interesting was the presentation?*

	Combined <u>Audiences</u> (n=200)	<i>RECIPE FOR A STORM</i>		<i>STORM CHEF</i>	
		<u>Adults</u> (n=52)	<u>Kids</u> (n=43)	<u>Adults</u> (n=62)	<u>Kids</u> (n=43)
high (9-10) <sup>2</sup>	44%	18% **	40%	55%	65%
medium (7-8)	40%	55%	30%	42%	28%
low (1-6)	16%	27%	30%	3%	7%

#### Analysis of combined ratings by general interest in the topic (\*\*)

Ratings:	<i>General interest in global climate</i>		
	<u>High</u>	<u>Medium</u>	<u>Low</u>
high (9-10)	57%	43%	12%
medium (7-8)	31%	44%	35%
low (1-6)	12%	13%	53%

<sup>2</sup> Interpreting visitors’ ratings on 10-point scales is based on years of experience with museum visitors, using follow-up questions to ask what their ratings mean, or why they gave a particular number. Consistently over time and a variety of settings, we have found that ‘9’ or ‘10’ means an excellent experience which is completely positive, a ‘7’ or ‘8’ means a moderately positive rating which can be accompanied by some misgivings or not-so-enthusiastic support, and a ‘6’ or lower number indicates a disappointing experience or one with substantial misgivings. The highest ratings we’ve seen (national award winning, or very popular among visitors) have been in the range of 75%-80% nines and tens.



#### A.4. Most interesting aspects of the programs

RECIPE: The most interesting parts of “Recipe for a Storm” were the visuals on the sphere, especially watching the 2005 hurricanes Katrina and Rita as they formed and moved across the sphere. These results indicate that this program was primarily focused on the sphere, while the presenter had the role of explainer.

CHEF: The most interesting part of the “Storm Chef” presentation was the “cloud explosion” at the end. Aside from that, people also liked the visuals on the sphere, the chef, and the audience participation, such as using volunteers for the air-blowing demonstration. These results indicate that this program was less focused on the sphere because the presenter’s role was more salient, including acting like a chef and doing physical demonstrations.

#### *What part was most interesting for you?*

##### *RECIPE FOR A STORM*

<u>Adults</u>	<u>Kids</u>	
58%	72%	watching the formation of 2005 hurricanes
<u>25%</u>	<u>22%</u>	other visuals on the sphere (sun, ocean temp, etc.)
81%	91%	<i>Total for visuals on the sphere</i>
4%	5%	Forces of Nature exhibits (Tornado, other elements)
6%	2%	other
12%	2%	blank, don’t know

##### *STORM CHEF*

<u>Adults</u>	<u>Kids</u>	
39%	42%	<i>visuals on the sphere</i> (sun, ocean temp, hurricanes, etc.)
73%	93%	demo: making the cloud, the cloud explosion at the end
34%	9%	the presenter, Chef Cass
18%	12%	engaging for kids, asking questions and getting volunteers
11%	14%	demo: leaf blower and water
10%	7%	the information, learning
3%	9%	other (cooking show format, everything)
2%	2%	blank, don’t know

Note that these columns add to more than 100% because “Storm Chef” viewers were asked to give two answers. The reasoning for this is that we expected many “Storm Chef” viewers to cite the liquid nitrogen demonstration as a highlight, so the only way to get information about other aspects of this show was to ask for two answers.

<< Sample of answers on the next page >>

**Sample of adult comments: Recipe for a Storm**

*Seeing hurricane Katrina and Rita form and move across the globe*

*The sphere*

*I enjoyed seeing the past storms and what they looked like on the globe*

*The closing portion which allowed the audience to follow the major storms of 2005*

*How the film was projected onto a ball*

*Where the white showed activity on the globe*

*The globe thing*

*Forces of Nature, the Hurricane and Tornado*

*Seeing the hurricanes move across the Atlantic*

*The pictures on the globe were the most interesting*

**Sample of children's comments: Recipe for a Storm**

*The hurricane season part*

*The method of presenting – the sphere was cool*

*Showing how storms form*

*The hurricane machine*

*Picture of the sun*

*When he was showing the different red spots*

*Seeing the different hurricanes that happened*

*We got to see the movements of different hurricanes from 2005*

**Sample of adult comments: Storm Chef**

*The man who did the presentation did a great job and things moved quickly. I had six children from the age of 4-11 and he was able to keep everyone's attention*

*Learning how storms are created, the presentation storyline*

*The globe of actual satellite pictures, the creation of the "storm"*

*The guy's funny personality and enthusiasm, he made it interesting*

*Theme of cooking up a storm, involving the children*

*The cloud the chef created with hot water and liquid nitrogen and the blower with the misting water was funny too*

*Demo that air is cooler when moisture is added, fog bucket*

*They got to touch a cloud*

*The host, audience participation*

*How our boys were mesmerized when the chef created the clouds*

**Sample of children's comments: Storm Chef**

*How he used the volunteers to show wind & water. The cloud in the bucket.*

*Making the cloud, and seeing the map on the globe*

*The cooking show setup - the "storm" created at the end*

*When he made the clouds. When he was trying to figure out how to make the storm.*

*When the storm clouds were created! The globe and how it showed the storms in the world*

*The cool globe and when the chef sprayed the kids with water.*

*To see how a storm is made, the liquid nitrogen*

*Clouds formed*

*The explosion, the globe map*

## A.5. Suggestions for improvements

**RECIPE:** About 80% of adults and children offered suggestions for improving the presentation “Recipe for a Storm.” The most frequent suggestion, offered by both adults and children, was to make it more interactive and child-friendly. Negative comments by adults were that the presenter wasn’t “smooth” with the verbal presentation and use of technology, that the sphere was too high up, that audience members couldn’t see the part on the globe that was being discussed, and they hoped the program would be longer. Children said they would like to see more of the details of the storms, and see other types of weather events such as tornados.

**CHEF:** About half of the visitors offered suggestions for improving the “Storm Chef” program, including more audience participation, more explanations, more seating, and that it could be longer. Some children thought the chef was too silly.

***Tell us something we could change or improve to make the presentation better:***

### *RECIPE FOR A STORM*

<u>Adults</u>	<u>Kids</u>	
21%	26%	more interactive, more engaging for younger kids (ages 5-7)
17%	0	speaker not smooth, technical difficulties
18%	14%	globe too high, hard to see, couldn’t see place being discussed
8%	21%	slow down 2005 storms, show more details, photos of damage
8%	5%	too short, thought it would be longer
8%	0	more explanation, detailed information, emphasize main idea
6%	2%	hard to hear
0	12%	show other types of storms, tornados
0	5%	more seating
6%	12%	other
23%	19%	blank, nothing

### *STORM CHEF*

<u>Adults</u>	<u>Kids</u>	
13%	12%	more interactive, more volunteers & audience participation
11%	5%	more explanation, detailed information, emphasize main idea
8%	0	more seating
6%	0	hard to hear
5%	5%	too short, could be longer
5%	0	post signs telling when the shows are so we can plan visit
3%	2%	more visuals, show details of storms
0	9%	chef was too silly, childish
0	5%	do more experiments with liquid nitrogen
10%	5%	other
44%	58%	blank, nothing

<< Sample of answers on the next page >>

## **RECIPE FOR A STORM**

### **Sample of adults' suggestions:**

*Even though the presenter had a strong voice, a microphone would have been helpful to enhance the experience*

*If you could slow down the movements of the presentation*

*A little more kid-friendly. I know it was hard for my five year old to get the whole idea of the presentation*

*There was a glitch in the presenter's remote unit*

*It was very slow getting going during which time my seven year old lost interest. If it had been more engaging, I think he would have stayed which would have enabled me to watch it, which I really wanted to!*

*Let the guests know the age range for the presentation. I had a five and eight year old and I think it was too much for them to comprehend*

*Rotate the sphere so each of the six groups of people can see Katrina, we missed it twice.*

*Maybe tilt the globe down more - it was hard to see the effects on the U.S.*

*I think the presentation was a bit short but I loved it*

### **Sample of children's suggestions:**

*Make it more interactive*

*Maybe you could show tornados and other storms too*

*The presenter was boring*

*Louder, interactive, let me touch it*

*The earth was too high - my neck hurt after sitting there looking up to see things.*

*An arrow that points to the hurricanes*

*More types of weather in the presentation, or show an experiment that kids could do at home*

*Have the kids do more*

*It would be cool to show some pictures of real storms*

*Add more facts about hurricanes like what speed their winds can go up to and maybe how much damage they can cause*

## **STORM CHEF**

### **Sample of adults' suggestions:**

*Have signage indicating the times of the presentation*

*A little more amplification of the host's voice would have been good, there is a lot of background noise and it was hard to hear at times*

*Suggest the smaller children sit down front on the floor so that they can see*

*Make it longer*

*The term "weatherman" is out-dated, there were a lot of girls in the audience and I'd like to encourage them to pursue science, not leave them thinking that weather is just for boys*

*More child involvement*

*More visuals on the globe*

*The three ingredients for weather could be written on the globe*

*More hands-on*

*Explanation of more complicated terminology*

*Provide adequate lighting for presenter, he was lost in shadows much of the time*

### **Sample of children's suggestions:**

*Maybe use a scientist instead of a chef to do the presentation*

*Maybe make the presentation a little bit longer.*

*Nothing, just keep the guy that was the chef - he was excellent.*

*Explain a little better what was happening on the globe.*

*More kids getting a chance to participate.*

*More volunteers*

*More experiments*

*Show more about liquid nitrogen*

## A.6. What else would visitors like to see in the program?

OVERVIEW: Most visitors offered ideas about what else they would like to see in these SOS presentations. Adults would like to see more information about global warming (pro and con) and see more details about specific hurricanes. Children who saw “Recipe for a Storm” also wanted to see more about specific hurricanes, as well as other dramatic natural phenomena such as tornados and tsunamis, and see more thermal imaging data. Kids who saw “Storm Chef” seemed to be mostly interested in seeing dramatic natural disasters like tornados and tsunamis.

*What else would you like to see in the Science On a Sphere presentation relating to climate, the oceans or the atmosphere?*

### RECIPE FOR A STORM

<u>Adults</u>	<u>Kids</u>	
13%	2%	effects of global warming, more evidence
10%	12%	more details/detailed views of specific storms
6%	5%	more information, specific questions
4%	12%	other events such as tornados, tsunamis
4%	5%	winter weather, snow, blizzards
4%	0	El Nino and La Nina
4%	14%	more on temperatures of oceans and land
4%	9%	more about the atmosphere, different layers
6%	14%	other (sun, rain, lightning, diagrams)
50%	35%	blank, don't know

### STORM CHEF

<u>Adults</u>	<u>Kids</u>	
13%	2%	more details about storms
10%	7%	effects of global warming, more evidence
8%	0	more visuals
6%	5%	more information, specific questions
6%	5%	more on ocean temperatures, currents
3%	30%	tornados, tsunamis, other weather events, disasters
3%	5%	more on wind, air currents, layers of atmosphere
3%	2%	winter weather, snow, blizzards
3%	0	local weather patterns
0	7%	more with liquid nitrogen
10%	7%	other
39%	37%	blank, nothing, don't know

**Sample of adults' answers: Recipe for a Storm**

*A comparison of how global warming has decreased the size of the ice formations of the world*

*The effects of pollution on global warming*

*I would like to learn about tornados and tsunamis*

*Weather patterns specific to this part of Pennsylvania*

*Just how much of our current global warming is due to normal cyclic occurrences and how much can really be charged to man made causes*

*More information in regards to the winter season*

*I would like to see more about El Nino and La Nina, and more information about the hurricanes and the damage they can do. I would like to see how the warmth of the water contributes to the strength of the storms*

*Close-up images of examples of types of storms*

*More talk about the specifics we are seeing*

*Knowing what makes up the earth's atmosphere*

**Sample of children's answers: Recipe for a Storm**

*Tornados*

*I would like to see some of the different temperatures on Earth*

*More about hurricane Bill*

*I would like to see the atmosphere because they already showed the ocean currents – that was a very cool part of the presentation!*

*Maybe some information about fronts and snowstorms and Nor'easters*

*More thermal images*

*More about actual storms*

*How fog is formed*

**Sample of adults' answers: Storm Chef**

*More about the arctic thawing*

*I would be interested in learning how heat patterns affect currents, for example the creation of El Nino*

*Why do storms form circular patterns?*

*We would love to hear more about tornados, we were visiting from the Midwest and we have them a lot here*

*Hurricane information maybe*

*Information on snow formation*

*Something visual, such as video*

*More demonstration on the globe*

*Effects of global warming*

*What creates wind?*

*Anything the kids can see and touch*

**Sample of children's answers: Storm Chef**

*How underwater volcanoes make islands.*

*Tornados - how they are formed; more things with liquid nitrogen - that was AWESOME!*

*See ocean temperatures at different months*

*I would like to learn more facts about natural disasters*

*I would like to hear more about tornados and blizzards and hurricanes*

*The atmosphere*

*Some facts about so called global "warming"*

*I would like to see a tornado or something that moves.*

*Tsunamis*

*More experiments*

*Water tunnels*



## **B. Understanding Interpretive Messages**

This section contains the findings about visitors' perceptions of the main message of the presentation, their recall of the "ingredients" for a storm, and their awareness of other specific content presented in the program. The key findings are:

- About one-third of people who saw "Recipe for a Storm" recalled the main idea of 'how storms are created' and about one-half of "Storm Chef" viewers got this idea.
- Most people were able to recall all three ingredients for a hurricane: water, air and solar heat. A few children (14%) got the misconception that liquid nitrogen is an ingredient of real storms after seeing the "Storm Chef" cloud demonstration.
- Most adults and children felt that they were already familiar with much of the content in the presentations, especially "Storm Chef". The topic of weather and storms feels like a familiar subject. But people also learned some new things about earth system processes: the relationship between warm oceans and water vapor, how water absorbs heat, and why hurricanes form just north of the equator during northern summer.
- Only one-quarter of the adults and fewer kids were aware of the National Oceanic and Atmospheric Administration before seeing the program. A majority of visitors said they found out about NOAA from the presentation.

## B.1. Perceptions of the main idea

RECIPE: About one-third of the adults and children recalled that the main idea of the “Recipe for a Storm” presentation was how storms are formed. About one-third thought that it was about weather. Some kids mentioned hurricanes but not ingredients. Some adults got the concept of global weather patterns or the interactions of oceans, atmosphere and sun.

CHEF: About half of the visitors who saw “Storm Chef” got the idea of “how to create a storm”, and another 15% referred to the creation of a cloud, but not a storm. About one in five visitors gave the general answer of ‘weather.’ Very few people mentioned global patterns or interactions of oceans, atmosphere and the sun.

### *What was the main idea of that presentation?*

<i>RECIPE</i>		<i>CHEF</i>		
<u>Adults</u>	<u>Kids</u>	<u>Adults</u>	<u>Kids</u>	
37%	33%	58%	47%	how storms are created
35%	37%	18%	23%	weather
0	0	15%	16%	how to make a cloud
19%	7%	3%	5%	global weather patterns and interactions
17%	0	0	0	effects of sun, oceans, atmosphere on weather
0	16%	2%	7%	storms, hurricanes
4%	0	0	0	effects of global warming
4%	0	0	0	visualization of earth
4%	7%	5%	7%	other

### **Sample of adults’ answers: Recipe for a Storm**

*How weather in one area of the world can affect the weather in a completely different part of the globe*

*How extreme weather forms, particularly the weather patterns that cause hurricanes*

*How weather is made*

*How climate is affected by global warming*

*To demonstrate how meteorologists predict the weather*

*Weather patterns and events around the world*

*Global weather patterns*

*How weather and the earth work together to create storms*

*Storms are caused by interactions of water, wind and heat*

*How various factors come together to create storms*

*The way weather and the sun affect our environment*

**Sample of children's answers: Recipe for a Storm**

*Show how meteorologists use satellite images to track storms and storm "ingredients"*

*Active weather systems on Earth*

*To show what makes up storms*

*The currents of air and water, also the storms*

*Weather of the Earth and hurricanes*

*Storms*

*It was a global show – I liked the part about the hurricanes*

*Showing weather patterns*

*How storms are made and what they look like*

**Sample of adults' answers: Storm Chef**

*What influences the weather on earth and makeup of various weather systems*

*Chef Cass taught the children about how weather is formed, particularly rain and clouds.*

*My kids loved being in the cloud at the end*

*The main idea was that storms are formed when warm moist air comes in contact with cool air, creating condensation, clouds and rain*

*How differing temperatures in the atmosphere create storms*

*Show how storms form*

*How storms are created*

*Factors that create storms*

*Teaching kids about the weather*

*The kids got to see how a cloud is made and feel it*

*Science and weather*

*Catching children's curiosity and motivating more interest in science*

**Sample of children's answers: Storm Chef**

*To see if he could cook up a storm*

*How storm clouds are formed*

*How the weather changes and how it affects our world*

*To teach us more about weather*

*What the "ingredients" for storms are*

*It was mostly about making clouds and the air*

*How to make a storm*

*What it takes to make different kinds of weather*

## B.2. Recall of the three ingredients for a storm

OVERVIEW: Slightly more than one half of kids and adults were able to name the three ingredients for a hurricane - water, air, and heat from the sun - after seeing these presentations. Recall of the third ingredient, heat from the sun, was slightly lower than recall of the first two ingredients. The “Storm Chef” program emphasized the interaction of hot water and cold air in the demonstration, so some visitors focused on the need for different temperatures (hot and cold) to create a storm. After seeing this demonstration, 14% of children came away with a misconception that liquid nitrogen is one of the key ingredients for a storm.

*According to the program, what are the 3 ingredients needed to create a storm?*

<i>RECIPE</i>		<i>CHEF</i>		
<u>Adults</u>	<u>Kids</u>	<u>Adults</u>	<u>Kids</u>	
54%	60%	50%	53%	named all three ingredients
83%	86%	95%	98%	water
83%	74%	85%	95%	air, wind
65%	67%	60%	56%	sun, heat, energy
0	0	15%	5%	cold air, cold temperature
4%	9%	19%	12%	different temperatures, hot air and cold air
0	0	3%	14%	liquid nitrogen
8%	5%	6%	5%	clouds, vapor, humidity
8%	12%	8%	7%	other: land, earth, fronts, gravity
10%	9%	0	2%	don't know

### B.3. Familiarity with the content / any new information?

OVERVIEW: In general, weather feels like a familiar topic, and most visitors, both adults and children, indicated that they were already familiar with at least half of the information in the presentations. However, visitors felt that “Recipe for a Storm” had more new information than “Storm Chef”. About 40% said they were familiar with most of the content in “Recipe for a Storm” compared to almost 60% for “Storm Chef” viewers.

When asked about specific pieces of information (see data on the next page), it’s clear that visitors are more familiar with some things than others. Nearly everyone said they already knew that ‘70% of the earth’s surface is water’ and that ‘different places are getting the most heat from the sun at different times of the year.’ Most visitors didn’t know - and credited the program with teaching them - that ‘storms form just north of the equator when it’s summer in the U.S.’ or that ‘The National Oceanic and Atmospheric Administration runs the National Weather Service.’

*What percentage of the information in the presentation was already familiar to you?*

	<i>RECIPE FOR A STORM</i>		<i>STORM CHEF</i>	
	<u>Adults</u> (n=52)	<u>Kids</u> (n=43)	<u>Adults</u> (n=62)	<u>Kids</u> (n=43)
90-100%	6%	9%	19%	21%
70-80%	35%	30%	44%	32%
50-60%	33%	30%	26%	26%
30-40%	27%	23%	10%	14%
10-20%	0	7%	1%	7%

(dashed-line boxes indicate high familiarity)

***For each of these pieces of information, was it something that you already knew before seeing the program or was it something you found out from the program?***

	<i>RECIPE FOR A STORM</i>		<i>STORM CHEF</i>	
	<u>Adults</u> (n=52)	<u>Kids</u> (n=43)	<u>Adults</u> (n=62)	<u>Kids</u> (n=43)
<i>70% of the earth's surface is covered with water</i>				
found out	2%	9%	3%	7%
knew already	98%	88%	92%	91%
don't recall	0	2%	5%	2%
<i>At different times of year, different places on Earth are getting the most heat from the sun</i>				
found out	4%	9%	2%	7%
knew already	96%	86%	98%	86%
don't recall	0	5%	0	7%
<i>Where there is more water vapor from warm oceans, there is more potential for storms</i>				
found out	47%	40%	26%	42%
knew already	51%	51%	69%	53%
don't recall	2%	9%	5%	5%
<i>Water holds heat better than land</i>				
found out	54%	49%	45%	60%
knew already	44%	37%	42%	35%
don't recall	2%	14%	13%	5%
<i>When it's summer in the US, storms form just north of the equator</i>				
found out	63%	65%	52%	53%
knew already	33%	21%	24%	26%
don't recall	4%	14%	24%	21%
<i>The National Oceanic and Atmospheric Administration runs the National Weather Service</i>				
found out	n/a	n/a	69%	79%
knew already	n/a	n/a	24%	12%
don't recall	n/a	n/a	7%	9%

## **C. Characteristics of the Samples**

This section of the report summarizes the demographic characteristics of the samples, including visitors' residence, gender, age and level of education. Additional information is presented about familiarity with Whitaker Center's Harsco Science Center (and with SOS) and about how much time elapsed between seeing the program and responding to the on-line survey. The key findings are:

- The samples for the two programs were substantially similar, so differences in the results can be attributed to the different programs rather than different audiences.
- Nearly all of the respondents are Pennsylvania residents who visited the science center in family groups.
- The adult participants were more likely to be women and well-educated (80% with college degrees).
- Among children, there were equal proportions of boys and girls. Nearly half of the child participants were aged 9 or 10.
- Most of the visitors have been to the science center more than once and some had seen the SOS exhibit before, especially those who saw the second program, "Storm Chef".
- Most visitors responded to the on-line survey within a week of visiting the science center.

## C.1. Demographic characteristics

OVERVIEW: The visitors who participated in this study are primarily Pennsylvania residents. Nearly all were family groups with children (higher than the 80% in a previous visitor study).<sup>3</sup> There were more women than men (consistent with previous study), but equal proportions of girls and boys. About three-quarters of the adults have college degrees.

	<i>RECIPE FOR A STORM</i>		<i>STORM CHEF</i>	
	<u>Adults</u> (n=52)	<u>Kids</u> (n=43)	<u>Adults</u> (n=62)	<u>Kids</u> (n=43)
<u>Residence:</u>				
Harrisburg	27%	n/a	30%	n/a
other Pennsylvania	63%		60%	
other U.S. states	10%		10%	
<u>Group Composition:</u>				
adult-only	2%	n/a	11%	n/a
family with children	98%		89%	
any preschoolers	56%		45%	
any 6-12 year olds	73%		69%	
any teens	25%		19%	
<u>Gender:</u>				
male	33%	56%	15%	51%
female	67%	44%	85%	49%
<u>Age:</u>				
<u>Kids:</u>				
9-10		43%		51%
11-12		33%		35%
13-14		24%		14%
<u>Adults:</u>				
18-24	8%		3%	
25-34	17%		19%	
35-44	46%		60%	
45-54	15%		15%	
55-64	6%		3%	
65+	8%		0	
<u>Education:</u>				
high school	10%	n/a	7%	n/a
some college	17%		5%	
college graduate	42%		53%	
graduate school	31%		35%	

<sup>3</sup> The previous study was an Analysis of Visitor Perceptions (2006). Family groups may have been more likely to attend the SOS presentation or to be invited to participate in the survey since children were a target audience.



## C.2. Prior experience with Harsco Science Center and SOS

OVERVIEW: “Recipe for a Storm” was presented during the summer tourism season, so this sample audience was somewhat less familiar with Whitaker Center’s Harsco Science Center compared to those who viewed “Storm Chef” in the fall. Only a small proportion of summer visitors (8-9%) said they had seen the *Science On a Sphere* exhibit on a previous visit, whereas the proportion increased to ~20% in the fall.<sup>4</sup> The amount of time that elapsed between seeing the presentation and completing the online survey varied: some did it within three days and some took a week or more to respond.

	<i>RECIPE FOR A STORM</i>		<i>STORM CHEF</i>	
	<u>Adults</u> (n=52)	<u>Kids</u> (n=43)	<u>Adults</u> (n=62)	<u>Kids</u> (n=43)
<u>Familiarity with science center:</u>				
first-time visitors	44%	35%	27%	30%
repeat visitors	56%	65%	73%	70%
<u>Last Visit:</u>				
within 6 months	21%	17%	34%	33%
within a year	8%	14%	23%	21%
1-2 years ago	4%	24%	3%	9%
more than 2 years ago	23%	10%	11%	7%
<u>Seen SOS before?</u>				
yes	8%	9%	18%	21%
no	92%	91%	82%	79%
<u>How many days since visit?</u>				
1-3	29%	30%	23%	56% <sup>5</sup>
4-6	36%	28%	39%	21%
7+	35%	42%	39%	23%
<u>Response rate:</u>				
(number of survey responders divided by number of e-mail addresses collected)	43%	34%	52%	39%

<sup>4</sup> Only one “Storm Chef” viewer had also seen the live presentation “Recipe for a Storm.”

<sup>5</sup> Note that this category includes 13 kids who completed surveys at the museum on the day of their visit.