



A Summative Evaluation for the Sciencenter, Ithaca, NY

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Executive Summary

During the summative evaluation process in August-September 2012, *Ocean Bound!* was installed at the Sciencenter on the second floor in a 2,400-square-foot room. The main message of the exhibition was: *What we do on land not only affects the local environment, it affects the ocean as well. A healthy watershed means a healthier ocean.* Eleven freestanding exhibit units were arranged in a nonlinear pattern, and guests could use them in any sequence.

The 267 adult guests who were observed or interviewed for the summative evaluation studies in *Ocean Bound!* were casual, unguided visitors to the Sciencenter. The vast majority attended in groups of three or four people, and most groups consisted of adults with children. More than half of the adults were female. Roughly one-quarter of the participants in the studies were members of the Sciencenter. The majority were making their first visit to *Ocean Bound!*, and a minority (roughly 20%) had some special interest, knowledge, or training in how watersheds affect the ocean.

There were four study methods used in this summative evaluation: unobtrusive tracking; a pre-visit interview; a post visit questionnaire, and a post-visit activity. Each method provided a different, complementary approach for gathering evidence about visitors' use of the exhibition and the impact of the exhibition on them. Data collectors were trained by the evaluator (Beverly Serrell) and the exhibit designer (Tim Scott) to carry out the protocols for the four evaluation methods, which involved electronic, photographic, and paper evaluation forms.

Overall, the findings were very encouraging. The average time spent by the sample of 101 visitors who were tracked and timed in the gallery was 9 minutes. Visitors were observed to be actively involved at many of the exhibit elements. They spent a relatively long time at some of the units, the Submersible in particular. Specific content from seven of the 11 exhibits was mentioned in new things they'd learned. They understood and related the main ideas of the exhibition to their lives. And, most people showed evidence of intentions to carry out new conservation-related behaviors.

The most popular exhibits were Submersible, Flow or Settle?, and What's a Watershed? Roughly one-half of the guests stopped at them. The next most popular were Where Does Your Water Go?, Clubhouse, and Guide Water to the Sea, which were used

by approximately one-third of the guests. Tied to the Sea, Giant Ocean Garbage Patches, and Stop! Think! caught the attention of around 15%. Fewer than 10% of the visitors stopped at Dead Zones and Science Saves the Day.

The potential to engage in different behaviors varied with the exhibit. Overall there was a lot of using, talking, reading, pointing, video watching and sitting. Less common were the behaviors of calling over, reading out loud, and goofing off. There were three exhibits with flip labels. More people flipped labels at Giant Ocean Garbage Patches—75% of the people who stopped there—than at Flow or Settle? and Tied to the Sea, where just over 40% of the guests flipped the labels.

Visitors' comments in written feedback were encouraging. Some statements were strong and complete, resonating with the main concepts. Others contained parts of the key ideas; a few were brief or general, but none of the answers were wrong. When people were asked an open-ended question, "Overall, thinking about what you saw and learned here today, finish this sentence: 'I would like to remember...'," three categories emerged from the data: They wanted to remember something about the *experience* of being there; they wanted to remember something about the *content*; and, they wanted to remember to do something—personal *behavior* or action. The category that was represented by the most comments was Content, and people most often talked about interconnectedness, impacts, and pollution.

Whether people will actually do new conservation behaviors will be investigated as part of the long-term study. We hope that the strong positive feedback we saw in visitors' responses to the questionnaire will be maintained and reinforced in the time following a person's visit to *Ocean Bound!*

Quotes

The purpose of Ocean Bound is to make people stop polluting water systems and think about our actions.

I didn't know that garbage pooled up in one area of the ocean.

I never realized how actions of people far from the ocean can impact the ocean.

I want to remember to further educate our children on composting, recycling and reusing, and the why.

I want to remember how beautiful the ocean is.

We live in Ithaca! We are all affected by the water.

It reminded me what we owe the ocean.

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About the Exhibition

During the summative evaluation process, *Ocean Bound!* was installed at the Sciencenter on the second floor in a 2,400-square-foot room. The main message of the exhibition was:

*What we do on land not only affects the local environment, it affects the ocean as well.
A healthy watershed means a healthier ocean.*

Eleven freestanding exhibit units were arranged in a nonlinear pattern, and guests could use them in any sequence.

- What's a Watershed?
- Where Does Your Water Go?
- Flow or Settle?
- Submersible
- Tied to the Sea
- Guide Water Safely to Sea
- Science Saves the Day
- Giant Ocean Garbage Patches
- Dead Zones
- Stop! Think!
- Clubhouse

Four additional units are planned—an introduction, Balancing Act, Storm Drain Downers, and Chemical Diagnosis. These will be part of the complete traveling exhibition.

The exhibition was funded by a grant from the National Oceanographic and Atmospheric Administration (NOAA).



Figure 1. Eight of the 11 exhibits

Top photo (left to right): What's a Watershed?, Flow or Settle?, and Tied to the Sea

Bottom left: Guide Water Safely to the Sea (in foreground), Science Saves the Day, Garbage Patches, and Clubhouse (in background)

Bottom right: Submersible and the back of Guide Water Safely to the Sea

About the Audience

The 267 adult guests who were observed or interviewed for the summative evaluation studies in *Ocean Bound!* were casual, unguided visitors to the Sciencenter (see fig. 1).

The vast majority attended in groups of three or four people, and most groups consisted of adults with children. More than half of the adults were female.

Roughly one-quarter of the participants in the studies were members of the Sciencenter.

The majority were making their first visit to *Ocean Bound!*, and a minority (roughly 20%) had some special interest, knowledge, or training in how watersheds affect the ocean.

Of those who did have a special interest in watersheds, many claimed a general interest:

I find it interesting.

I just like learning about the ocean.

A few people had a special interest because they lived near the water:

Grew up on Long Island Sound.

Lives in Southampton near the ocean.

Vacation in watershed habitat areas.

Others had some educational background or a job that was related to the topic:

I have a degree in environmental science.

I'm a forester and interested in the environment.

My mom is an environmental engineer.

Two people had very specific special interests: One person was a watershed planner; the other taught watershed curriculum and "collaborated with the Merrimack River watershed counsel."

	Pre-Follow	Pre-Post	Pre-Behaviors	T&T
N=	78	51	37	101
Adults + kids	97%	96%	92%	95%
Adults only	3%	4%	8%	5%
Females	76%	54%	70%	53%
Males	24%	46%	30%	47%
First-time	78%	77%	76%	nd
Repeat visitors	22%	23%	24%	nd
Special interest	22%	16%	22%	nd
Members	36%	26%	19%	nd

Figure 2. The demographics of the guests who participated in the four different summative evaluation studies, for a total of 267 visitors. N= the number of samples in the individual studies; group composition (adults only or adults with children under 18); gender; first-time or repeat visit to *Ocean Bound!*; members of the Sciencenter. Three studies involved a short face-to-face interview as guests entered the exhibition. Data collectors remained unobtrusive for the tracked-and-timed sample (T&T), and those visitors were not interviewed.

Study Methods

There were four study methods used in this summative evaluation:

1. Interviews were conducted with guests as they entered to collect demographic information and feedback on three pre-visit questions.

The primary goal was to get e-mail addresses for a follow-up online survey.

Referred to as the **Pre-Follow** data set.

2. Interviews were conducted with guests to collect demographic information, and a self-administered questionnaire was handed out after participants had viewed the exhibits. The primary goal was to gather evidence for visitors' understanding of the exhibit ideas and thoughts about their experiences.

Referred to as the **Pre-Post** data set.

3. Interviews with guests before they viewed the exhibit and a behavior-choices activity afterward gauged visitors' level of water-conservation behaviors and gathered evidence of possible positive changes in their behaviors—to be investigated in the follow-up online survey.

Referred to as the **Pre-Behavior** data set.

4. Unobtrusive observations were made of visitor behaviors in the exhibition including time spent, exhibit units engaged with, and exhibit-related behaviors, such as reading, pointing, and talking.

Referred to as the Tracking-and-Timing or **T&T** data set.

Each method provided a different, complementary approach for gathering evidence about visitors' use of the exhibition and the impact of the exhibition on them.

Additional information about the protocol for each method will be discussed below.

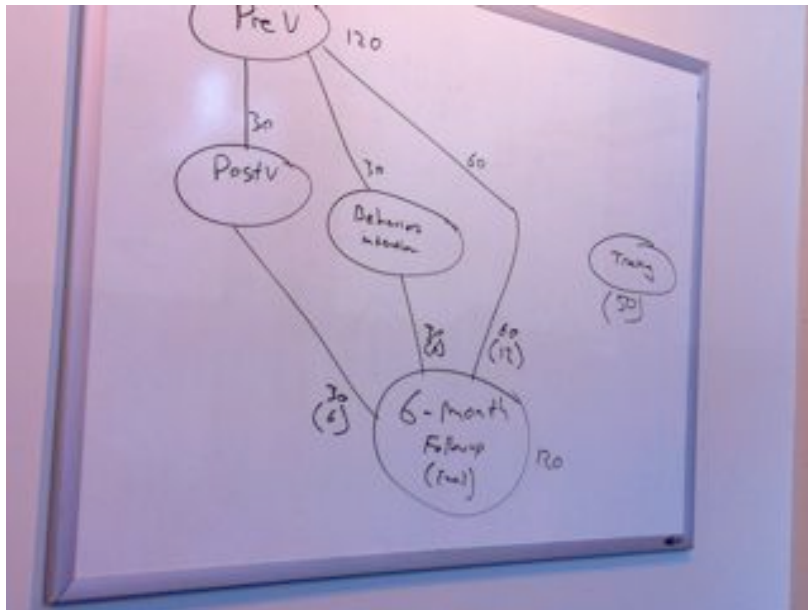


Figure 3. A planning diagram of the evaluation strategies and the quotas for the four summative evaluation methods, leading to goal of having a sample of 120 e-mail addresses for the long-term follow-up study. (See page 31 for more discussion about getting e-mail addresses.)

The original quotas we hoped to get for the four methods for gathering data were:

Pre-Follow	n=60	
Pre-Post	n=30	
Pre-Behavior	n=30	
T&T	n=50	Total = 120

The actual totals, which exceeded our expectations, were:

Pre-Follow	n=78	
Pre-Post	n=51	
Pre-Behavior	n=37	
T&T	n=101	Total = 267

Data Collector Training

Data collectors were trained by the evaluator (Beverly Serrell) and the exhibit designer (Tim Scott) to carry out the protocols for the four evaluation methods, which involved electronic, photographic, and paper evaluation forms:

The Pre-Follow, Pre-Post, and Pre-Behavior interview forms were electronic, using iFormBuilder on an iPad. The T&T was also an electronic form on an iPad.

The “post” part of the Pre-Post method was a paper form given to participants, who filled out the questionnaire on their own. The data collectors transcribed written data into an Excel spreadsheet.

The behavior activity that was part of the Pre-Behavior group involved sorting laminated cards with photos and topics of water-conservation-related behaviors. Data were collected by taking a photograph with the iPad of the visitors’ final layout of the cards on the table.

All of the forms, protocols, and raw data are included in the electronic Appendices filed with this report.

Data collectors intercepted and recruited visitors at the top of the stairs leading into *Ocean Bound!* with this greeting:

“Hello, welcome to the Ocean Bound exhibition. Is this your first visit to these exhibits? Today we are doing a special evaluation of the exhibits here. Would you mind taking a few minutes before you go in to answer a few questions? It will only take a couple of minutes.” On the iPad, data collectors recorded an ID# from his/her personal number assignment list; input initials, selected date and time; visually observed data on gender and membership status of the target adult (noting stickers given out at entrance desk) or asked about membership status. Other data were filled in as the guest responded to the data collector’s questions:

“How many people in your group today—How many adults? Kids under 18 years old?”

“Do you have any special interest, knowledge, or training in how watersheds affect the ocean?” If yes, they probed for what, and typed in the information.

Study Findings

In this section, we will discuss the following questions and findings:

Engagement: What did visitors do in the exhibition?

Impacts: What did visitors say about it? (Think, understand and learn)

Outcomes: Any new conservation-related intended behaviors?

Overall, the results are very encouraging. Visitors were observed to be actively involved at many of the exhibit elements. They spent a relatively long time at some of the units, the Submersible in particular. Specific content from seven of the 11 exhibits was mentioned in new things they'd learned. They understood and related the main ideas of the exhibition to their lives. And most people showed evidence of intentions to carry out new conservation-related behaviors.

● **Engagement: What did visitors do in the exhibition?**

How much time did people spend?

The average time spent by the sample of 101 visitors who were tracked and timed in the gallery was 9 minutes. In an exhibition space of 2,400 square feet with 11 exhibit elements, 9 minutes is a relatively long time.

What was the sweep rate?

The sweep rate index (SRI = square feet of exhibition divided by average time) was 267. The lower the SRI, the more time visitors are spending in the exhibition. An SRI of less than 300 indicates that the exhibits are holding visitors' attention for a relatively long time. According to a large database of tracking and timing that compares hundreds of exhibitions (Serrell 1998) many science center exhibits had an SRI of more than 300, indicating that visitors were moving faster. Thus, Ocean Bound's slower SRI compares favorably.

How were the time data distributed?

The time spent ranged from 1 minute to 32 minutes: 39 people spent less than 6 minutes; 51 people (50% of the sample) spent between 6 and 18 minutes; and nine people spent more than 18 minutes.

How many stops did they make?

Out of a possible 11 stops, the average was three; the minimum was one and the maximum was nine. No one stopped at everything. Many people stopped at only one or two exhibits. Three stops out of 11 equals an average of 27%. On average across a wide range of exhibits in the T&T database, it is typical for visitors to use only one-quarter to one-third of the available exhibit elements.

What percentage of the people were "diligent visitors"?

A diligent visitor (DV) is a person who stops at more than half of the elements in an exhibition. In *Ocean Bound*, six of the 101 visitors who were tracked stopped at more than five of the 11 exhibits. Thus, the DV was 6%, which is low but not uncommon for science centers.

Was there anything unusual about the T&T data and what people did?

There was an unusually large variation in the amount of time that visitors spent per stop in *Ocean Bound*! Typically people tend to stay roughly the same length of time at each exhibit. But in this exhibition, some exhibits held visitors' attention for an exceptionally long time. For example, at *Submersible*, a yellow walk-in "submarine," people sat and watched the underwater video; at *Guide Water to the Sea*, they repeatedly attempted to get the ball through the maze; or they spent a long time at a special activity in the room, which was not part of the 11 exhibits. Data collectors commented:

- * Visitor spent extended amount of time in *submersible* then left.
- * There was an activity run by 3 volunteers that attracted her attention and she took the kids there to make a bracelet about the water cycle with the children. She was a teacher busy chatting with everyone about her grandchildren. The man with her had no interest and sat down to rest.
- * She enjoyed using *guide water to sea* with young girl. I think she's used it before.



Figure 4. Front end of Submersible

Some people made many stops, stayed longer times, and also included the Submersible in their visit. Data collectors commented on the many-stops visitors:

- *They sat in the submersible doing the activity for a long time.
- *Visited "Submersible" twice and spent majority of time there.
- *The whole group was very involved and discussed ocean trash.
- *Man was very involved and reading out loud to his children.

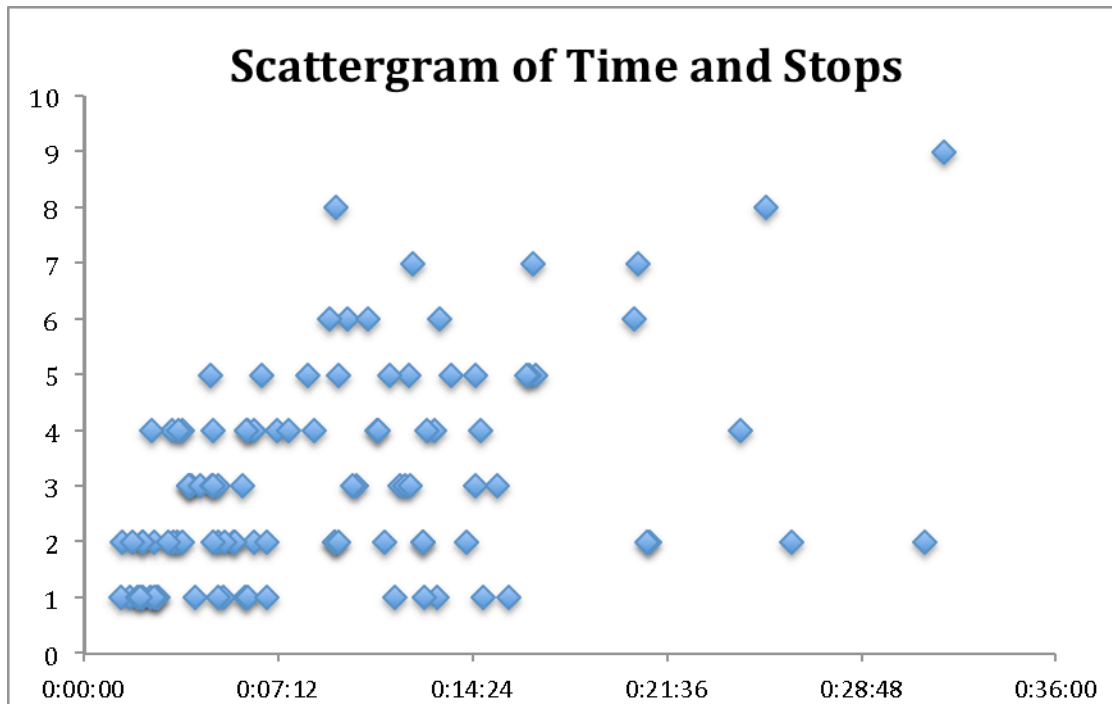


Figure 5. Tracking-and-timing data shown as a scattergram. Each point on the scattergram represents the time-and-stops data for one visitor. Total N=101. The average time was 9 minutes; average stops = 3.

The variability in the amount of time spent per stop resulted in a wide scatter of data points for *Ocean Bound!* (On many T&T scattergrams, the data points are more tightly clustered from the lower-left portion of the graph to the upper-right quadrant.)

The eight visitors who spent more than 20 minutes in the exhibition (on the right side of the scattergram) were diverse, including males and females, with children in groups of two to five, on different days of the week and times of day. All used Submersible at some point in their visit; three people visited the sub and only one other exhibit. The person who spent the longest time (32 minutes) also made the most stops (using nine of the 11 exhibits).

Which exhibits were used most, and how did visitors use them?

Submersible, Flow or Settle?, and What’s a Watershed? were the most popular exhibits. Roughly one-half of the guests stopped at them. The next most popular were Where Does Your Water Go?, Clubhouse, and Guide Water to the Sea, which were used by approximately one-third of the guests. Tied to the Sea, Giant Ocean Garbage Patches, and Stop! Think! caught the attention of around 15%. Fewer than 10% of the visitors stopped at Dead Zones and Science Saves the Day.

Data collectors noted what visitors were doing when they stopped at an exhibit. The 10 noted behaviors were: read label, read out loud to someone, use interactive, talk among group members, point, call someone over, goof off, sit down, watch video, and flip labels.

The potential to engage in different behaviors varied with the exhibit. Overall there was a lot of using, talking, reading, pointing, video watching and sitting. Less common were the behaviors of calling over, reading out loud, and goofing off. There were three exhibits with flip labels. More people flipped labels at Giant Ocean Garbage Patches—75% of the people who stopped there—than at Flow or Settle? and Tied to the Sea, where just over 40% of the guests who stopped flipped the labels.

	Submersible	Sat, talked, watched video
	Flow or Settle?	Used, flipped, read, ROL
50%	What's a Watershed?	Used, pointed and talked
	Where Does Your Water Go?	Used, pointed and talked
	Clubhouse	Talked and sat
30%	Guide Water Safely to Sea	Used and talked
	Stop! Think!	Sat and watched video
	Giant Ocean Garbage Patches	Flipped and read
15%	Tied to the Sea	Watched video, flipped
	Dead Zones	Read silently
<10%	Science Saves the Day	Read, looked at video

Figure 6. Attracting power of the exhibits (percent of visitors who stopped), from most to least, and the common behaviors engaged in by guests at those exhibits

● **Impacts: What did visitors say about Ocean Bound?**

With the Pre-Post study method, people were recruited before they looked at the exhibits and asked to talk to the data collector after their visit to answer a few open-ended questions. The questions were:

What is the main purpose of the displays in this Ocean Bound exhibition?

What is one new idea you are taking away with you?

Overall, thinking about what you saw and learned here today, finish this sentence: "I would like to remember..."

Anything else?

To get some "ideal answers" against which to assess the visitors' responses, six Sciencenter staff members filled out the questionnaire themselves. Their answers about the purpose of the exhibits included:

*It was to show how we are all connected to the ocean no matter where we live.

*It was to show that inland waterways are connected to the ocean and that what we do locally affects the health of the ocean.

*It was to make people consider how their actions might affect the ocean, no matter how far away from it they are.

*It was to make people aware that they have an effect on ocean health, and to hopefully make them change behaviors that negatively affect the ocean.

All of the staff members' answers resonated positively with the main idea of the exhibition, which was: *What we do on land not only affects the local environment, it affects the ocean as well. A healthy watershed means a healthier ocean.*

Key words used in the staff members' answers included: connected, ocean, land, water/waterways/watersheds, choices, impacts, actions, pollution, protect, and think.

Many of the visitors' answers to the same question about the purpose of the exhibits also contained many of the same key words used in the staff responses and resonated with the main idea to some degree.

Some were strong and complete, and others contained parts of the key ideas; a few were brief or general, but none of the answers were wrong.

Examples of the many visitors' answers that contained several key words in response to the prompt, "It was to show...":

...life in the ocean and how water moves through the ocean, rivers, sky, etc. to continually supply necessary places with water

...how the ecosystem is affected by humans and how dependent we are on the water system

...how water flows to the ocean and trash gets into the ocean

...the importance of keeping the environment healthy

...the damage we can cause to our earth and water systems without even realizing it and to show us what else we are affecting by the decisions we are making

Examples of the minority of visitors' answers that did not contain any key words:

It was to show how animals live in different watery environments

It was to show the marvels of nature

It was to show ecological problems

Most of the visitors' answers about the purpose of the exhibits were about becoming more aware, or concerned, or thinking about the issues. In response to the prompt, "It was to make people..."

...aware of how our actions can affect the water at every step along the way

...aware of their part of destruction or impact of ocean resources

...realize that their choices have consequences

...more conscious of how their lives are affected by the health of the oceans

Staff answers were more focused on doing, e.g., changing behaviors, taking better care of the waterways, making choices. Some visitors' answers were also about what people could do:

Be more careful with trash and use less plastic

Learn how to take care of our water

Minimize impact to ecosystems

Stop polluting water systems and think about our actions

Guests who participated in the Pre-Post study were also asked, after they were finished viewing the exhibits, “What is one new idea you are taking away with you?” There were two prompts for answers: “I didn’t know... I never realized...” Often it was possible to tell from their answer—because it was very specific—just where in the exhibition visitors learned the new idea they’d mentioned. When the six Sciencenter staff members answered this question, three of them made a comment about the Giant Ocean Garbage Patches exhibit, using key words such as “garbage,” “trash,” and “gyres.” Surprisingly, this was true for the visitor feedback as well: There were more specific references to Garbage Patches than to any other exhibit. For example, they’d never realized...

- ...that trash pooled up in one area or how much trash is in the ocean*
- ...how badly polluted the ocean was with trash and that 80% of garbage came from land*
- ...about the places trash collects in the ocean*
- ...so much garbage was discharged by ships*
- ...how much plastic is in the ocean*



Figure 7. Flips at Giant Ocean Garbage Patches

Other exhibits where people found memorable content (“I never knew...”) that was specifically related to a particular exhibit included:

Where Does Your Water Go?

how much the waters surrounding the US branch into the country as a water source
the watersheds of Hudson valley gets water so far away
how the watersheds were divided on the NA continent

Flow or Settle?

how different materials settled in the water
many pollutants sink!

Tied to the Sea

how many medicines came from the sea
there are many research studies on many ocean animals/coral reef, etc. to help cure cancer and
develop new forms of medicine

Dead Zones

about the dead zones, they are reversible
the source of dead zones was an overabundance of bacteria
that fertilizer use was so destructive

Submersible

quite how many fish were in the creeks and rivers
facts about specific fish
that different fish and animals live in different types of water

Other answers seemed more general, related to the exhibit theme but not a particular place in the exhibit:

how actions of people far from the ocean can impact the ocean
that different fish and animals live in different types of water
that water could be so polluted

Otters were mentioned in regard to what visitors saw in the video and graphics but nothing about the scientific research.

People were asked a final question, "Overall, thinking about what you saw and learned here today, finish this sentence: 'I would like to remember....' " Their answers were surprisingly rich and varied.

Three categories emerged from the data: They wanted to remember something about the *experience* of being there; they wanted to remember something about the *content* on a general-impact level; they wanted to remember to do something—personal *behavior* or action.

Some examples of their answers, in those categories:

Experience

the ocean and submarine sounds
the different water bodies
the separation of oil and how it looked
how much fun my kids had

Content

how deeply interwoven our connections to each other and the environment are
just how much the water systems affect everybody and everything
all water on earth is connected and precious
how dangerous and damaging polluting water can be to us and the animals in the water
the impact I have on the oceans even though I don't live right at the ocean

Behavior

to use my cloth bags at the store more often
to teach kids about taking care of our oceans
not to buy plastic
to further educate our children on composting, recycling and reusing and the why
to pick up trash I find left by others

The category that was represented by the most comments was Content, and people most often talked about interconnectedness, impacts, and pollution.

● **Outcomes: What evidence was there for new conservation-related intended behaviors?**

The answers to the last prompt on the post-visit questionnaire (“I would like to remember...”) provided tantalizing evidence for a positive impact of the exhibition on people’s intended changes in behavior—which was one of the goals of the exhibition. Whether people will actually do these behaviors will be investigated as part of the long-term study.

Further evidence for intended behaviors included in this report can be found in the data from the Pre-Behavior activity. Thirty-seven guests participated in a card-sorting exercise after viewing the exhibits. The nine cards were statements and images of conservation-related behaviors:

Prevent car from leaking oil	Use cloth shopping bags	Pour grease down drain
Use fertilizer	Litter	Use phosphate-free detergent
Use pesticides	Clean up pet waste	Recycle plastic

Sitting at a table, visitors were asked to sort these cards into two groups, under these headings:

I do these things:

I don’t do these things:

After the initial sorting, they were presented with three new headings, and asked to rearrange any of the cards to them:

I will improve doing these things:

I will start doing these things:

I will stop doing these things:

Thus, if they were already doing some of the positive behaviors, they could improve. If they were not doing some positive behaviors they could start, and if they were doing some negative things, they could intend to stop.

Data collectors took a photo of the final arrangement of cards on the table with the visitor’s ID number and asked for her or his e-mail address. “I’m going to take a photo of your choices. Can I e-mail it to you as a reminder? What is your e-mail address? May we also contact you for a brief follow-up survey in a couple of months?”

Data from the Pre-Follow study that asked visitors (n=78) three prior-knowledge questions indicated that most visitors did not have a general concept about watersheds.

The three questions, and the most common key words in their answers, were:

1. When you turn on the water faucet at home, where does your water come from?
well, water treatment plant, reservoir, creek, stream, lake
2. When you flush the toilet at home, where does the water go?
septic system, sewer, water treatment plant, river
3. When it rains, where does the rain go?
ground, garden, earth, soil, pond, creek, stream, river, lake, storm drain, sewer

As we learned in an earlier front-end study for *Ocean Bound!* (then called "Here to the Ocean"), when people were asked for a definition of a watershed, most could not provide one. Instead of asking for a definition in the summative evaluation interview we wanted to see if people had an idea about water use—it comes from a nearby source, is used by people, and ends up downstream and ultimately in the ocean. Again we heard very few references to "watershed," although a few people were more specific:

- | | | |
|----------------------------|---|--|
| 1. <i>Cortland aquifer</i> | 2. <i>Waste water treatment plant</i> | 3. <i>To the river</i> |
| 1. <i>Six mile creek</i> | 2. <i>Water treatment plant, then Cayuga lake</i> | 3. <i>The ground and the watershed</i> |

Most people had only a general notion of where water comes from and they see it going somewhere, but "to the ocean" was only mentioned by three visitors.

We have evidence from the Pre-Post study questionnaire that after seeing the exhibits, half of the people used the word "ocean" and many got the main idea. We'll see if these thoughts are still with them in what they say in the follow-up study.

Discussion and Recommendations

- **It Works**

Overall, visitor response to *Ocean Bound!* was very positive. The amount of time spent, the behaviors visitors engaged in while they used the exhibits, and the things they said about it provide evidence of the exhibition's effectiveness and success.

- **Highlights: The Four Most Popular Exhibits**

One of the highlights of the exhibition was the very popular **Submersible**, a big yellow "submarine" that people could step inside and sit down at two media exhibits. One was a 35-minute underwater video that took you on a trip from a mountain stream to a lake, down a river, out into an estuary and eventually into the ocean. Along the way you encounter numerous aquatic animals and plants. Operated with a trackball Spinbrowser, you could go forward or backward, fast or slow. There is no narration, but a little map (a "you-are-here" dot marked the spot on a stylized graphic) and the visuals carry the story. The other media piece was an interactive touch screen "field guide" identification of many of the animals seen in the video. The main message in the submersible was about the diversity of aquatic animals and habitats, which visitors seemed to get, and the video was very, very cool. The only drawback is that some visitors apparently spent most of their time in Submersible and missed seeing the other exhibits and the exhibition as a whole and so failed to learn about watersheds.

Flow or Settle? was an eye-catching blue that attracted visitors during some point of their visit and enticed them to flip the large liquid-filled cylinders and maybe read some flip labels. Putting only words under a flip label is not a very reinforcing experience, and Tim planned to add some graphics to spice them up.



Figure 9. Flow or Settle? cylinders

What's a Watershed and **Where Does Your Water Go?** provided guests with fun and tangible ways to connect with the concept of watersheds, although most visitors ended up calling them "water systems." Maybe they didn't feel comfortable with the technical term. What would it take for them own it?

- **Other Exhibits with High Holding Power**

The **Clubhouse** and **Guide Water to the Sea** were two other exhibits besides Submersible that held some visitors' attention for a long time. Parents with small children sat together and read books in the Clubhouse, and the challenging "pinball" game of Guide Water had some visitors glued to it for exceptionally long stay times.

- **To Flip or Not to Flip**



Figure 10. Flow or Settle? flip labels

Flip labels were used at three of the 11 exhibits. **Flow or Settle?** had five with question marks on them; **Tied to the Sea** had six with one-word topics (e.g., Medicine, Oxygen); and **Giant Ocean Garbage Patches** had six, each with a question (e.g., How much trash is in the ocean?, How much of this trash comes from land?). Flips were used to hide more text information, and some visitors were motivated to search underneath for at least some of it—as evidenced by their "text echo" of what they read, e.g., "phytoplankton produce 80% of oxygen"; "there are many research studies on many ocean animals/coral reefs, to help cure cancer and develop new forms of medicine"; "80% of garbage came from land." Clearly the novelty of the garbage patch idea and the questions on the flips worked to make a memorable experience for the visitors who stopped there. The fact that gyres are not visible may not have been successfully communicated, because the word "patches" suggested something very physical.

- **Dead Zones and Otters: Too Much Text?**

Dead Zones and **Science Saves the Day** were the least popular exhibits. Neither had interactive elements, although Science Saves the Day had a nice video of otters in their natural habitat. While one would think otters are irresistible, this exhibit did not attract much attention. Visitors who did comment about it made reference to what they saw in the video or main graphics (e.g., “I didn’t know otters liked snow,” “I didn’t know there were river otters in New York”). No one quoted the research.



Figure 11. Text for Science Saves the Day

Although Dead Zones was not very popular, there was evidence that at least two visitors found the information memorable, as they quoted the fact about the reversibility of dead zones. No one quoted from the labels on the back of Guide Water to the Sea.

- **Not Much Reading Out Loud**

Reading aloud to others in a group was noted occasionally by data collectors, but it was not a common behavior. It happened more at Flow or Settle? and at Guide Water to the Sea—perhaps in relation to what to do, e.g., “Rotate the tubes” and “Guide this blue ‘drop of water’....” Perhaps a more conversational tone to some of the labels text could encourage more intra-group reading.

- **There Were Two Unusual Problems**

Data collectors and visitors noted that fingers were pinched in the wheel that turned Flow or Settle? and the weird rubber smell emanating from Submersible was distracting and unpleasant. The pinching problem was being fixed, and the outgassing of the rubber mat in the Submersible will hopefully diminish over time (and before the exhibit travels).

- **There Was One All-too-common Problem: Lack of Orientation**

The boundaries of the exhibition were not clear. A data collector noted: "She was confused about what was in the exhibit and what wasn't." There were three entrances/exits to the space and other exhibits were located nearby, creating an interrupted traffic flow into and through the area. The lovely video exhibit **Stop! Think!** was located behind Submersible, making it seem disconnected to the others, and it was further separated by traffic coming and going from another room's exhibits. During the data collection time there was no introductory label. Hopefully and ideally when it travels to other museum sites, the exhibition will be installed in a room by itself.

- **Excellent Judges Assessment**

As part of the critical review of *Ocean Bound!*, the evaluator and 11 Sciencenter staff members participated in an "Excellent Judges" (EJ) exercise, assessing the exhibits with the Framework for Assessing Excellence (see Serrell 2006) before summative evaluations started. Fifty-six percent of the ratings were "Very Good" or "Excellent"; and 43% were "Good" or "Acceptable." The main aspect that seemed to keep the EJs from rating the criteria even higher was that they felt there was too much text. Visitor-behavior data concurred: The four exhibits with the most text attracted the fewest visitors. But even the least-used elements were memorable to some. Another EJ suggestion was to have more objects. For example, at the Garbage Patches, some real debris would be eye-catching.

Next Steps

- **Follow-up Survey**

The long-term follow-up study to be conducted online will be completed by the Sciencenter. The findings from the summative evaluations in this report include some options to explore regarding people's behaviors, their understanding of water systems, and the endurance of the concepts they learned or had reinforced by *Ocean Bound!* These options include (but are not limited to):

- The photos from the Pre-Behavior study provided evidence of intended positive behaviors that evaluators can refer to in the follow-up online survey. The trends we saw in the most commonly mentioned behaviors, e.g., use cloth shopping bags instead of plastic, use phosphate-free detergent, stop using pesticides and fertilizer, can provide direction for the questions on the survey about their current behaviors and any changes. The ID numbers will let us track an individual's intentions.
- In addition, if we want to reuse the questions asked in the Pre-Follow study, they can be modified to help respondents think more broadly. For example:
 1. When you turn on the faucet at home, where did the water come from before it got into the well or the water treatment plant?
 2. When you flush your toilet at home, where does the water go, eventually, after it leaves the septic system or sewage treatment plant?
 3. When it rains, where does the water go, eventually, after it seeps into the ground or runs into the gutter, creek, river, or lake?
- We can ask them to recall the exhibition's purpose and the exhibition's impact on their learning about watersheds and water systems in their post-visit experiences.

We hope that the strong positive feedback we saw in visitors' responses to the post-visit questionnaire in the Pre-Post study will be maintained and reinforced in the time following a person's visit to *Ocean Bound!*

● Notes about Getting E-mail Addresses

After the interview, activity, or questionnaire was completed, guests were asked: "Can we contact you later for a brief e-mail survey about your experiences in the Ocean Bound exhibit?" The goal was to obtain enough e-mail addresses to provide a resource for the follow-up study. The quota was to get a total of 120 samples from the Pre-Follow, Pre-Post, and Pre-Behavior groups. (T&T subjects were not asked.)

The way the question was asked proved to be important in the success of getting the address. Although in the end we got 118 addresses, some methods worked much better than others:

- The Pre-Follow group was asked at the beginning of the exhibition, before they'd seen it, and they were asked personally by the data collector. Of the 78 subjects, 70 (90%) complied.
- After Pre-Behavior group visitors had completed the sorting activity, they were asked by the data collector for their e-mail addresses. Of 37 guests, 22 (60%) provided the information.
- In the Pre-Post group (n=51), 26 people (51%) filled in their address on the questionnaire form.

It seemed like the best time to ask was at the beginning, before visitors had encountered the exhibit experiences and while they were still feeling fresh and friendly. After looking at the exhibits, doing the behaviors activity, or filling out the questionnaire, they were less willing to be contacted. Why? Some people (a small percentage) don't have an e-mail address or just don't want to share it. But perhaps they were intimidated: The exhibits had lots of text; maybe the card sorting was challenging; perhaps the questionnaire was daunting for some people.

Furthermore, they might have seemed willing to give the address, but may not have given the correct information. The bounce-back rate when the follow-up surveys are sent out will be interesting to note. In addition, once they get the online survey, experience tells us that the response rate is likely to be low.

These are all cautionary thoughts for the next steps and other future long-term evaluation planning.

- **Remediations Post Summative Data Collection**

During the data collection period, not all of the planned exhibit elements were in place. The introduction panel and the exhibits called Balancing Act, Storm Drain Downers, Plastic Diagnosis, and Chemical Diagnosis were still in the shop. Tim Scott, the exhibition designer who participated in the evaluations, made some important changes to *Ocean Bound!* soon after the initial critical review of the exhibition with Beverly Serrell in August 2012. He will make more remediations before the exhibits travel.

Tim reports on the changes:

Immediately following the critical review, we began implementing minor yet significant changes to some of the exhibits. Within a few days, every interactive flip panel on Flow or Settle?, Tied to the Sea, and Floating Ocean Garbage Patches had stunning images displayed underneath the panel in order to connect a visual with the text of each answer. Also, many of the answers beneath each panel were rewritten to be more concise and focused. Instruction text was also reworded for Guide Water Safely to Sea and Where Does Your Water Go? to better facilitate user interaction.

In addition to these quick initial changes, we began implementing major exhibit design changes and enhancements that will be completed prior to the exhibition going on tour in early 2013. For instance, we will be constructing a ramp for the large submersible so it can be wheelchair-accessible; this was always part of the plan but wasn't implemented in time. We will be replacing the TV in What's a Watershed? with a backlighted ghost image depicting the number of watersheds in the model. Storm Drain Downers was put back on display shortly after the evaluation for more testing and tweaking. We finished the entrance kiosk and Chemical Diagnosis and are currently finalizing Balancing Act.

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