An Evaluation Proposal of Messaging and Exhibits at the Monterey Bay National Marine Sanctuary (MBNMS) Exploration Center

Lisa Peterson
Jennifer Bundy
Stephanie Chang
M.A. in Education: Learning, Design, and Technology

June 11, 2012
EDUC332X: Theory and Practice of
Environmental Education with Prof. Nicole Ardoin

Contents

Appendices

EXECUTIVE SUMMARY

In planning for the opening of the Monterey Bay National Marine Sanctuary Exploration Center, we have prepared an evaluation plan to assess the effectiveness of exhibit messaging. In particular, we looked at assessing the following goals of the Exploration Center, as stated in the SEC brochure:

1. Involve and educate visitors about the sanctuary's unique and fascinating coastal and marine natural resources.
2. Instill in visitors a sense of personal stewardship with regard to the sanctuary and an understanding of how to help protect it.

Meeting the needs of the Exploration Center are at the forefront of the project. We wanted to make each tool feasible to use and non-intrusive on the visitor experience. Although pre-visit and post-visit methods are included, the forms of assessment are activity-based and welcoming. Since the evaluation is likely to be administered by volunteers, and taking into consideration the amount of time staff would have to dedicate to evaluation, we have also made everything as easy as possible to administer and analyze.

Content Knowledge Tool: Watersheds Concept Mapping Activity

The watersheds tool is a concept map where guests determine the flow of water from both runoff and household wastewater by placing pictures on a board and drawing arrows to indicate the water flow. Conducted as a pre-visit/post-visit comparison, this tool shows whether guests learn more about water's path to the ocean as a result of visiting the Exploration Center.

Content Knowledge Tool: Biodiversity Identification Activity

The biodiversity tool uses an iPad application to assess visitor perception on biodiversity. Guests identify animals they recognize in a specific area of the ocean, such as the intertidal zone, and circle those animals on the iPad picture. Conducted as a pre-visit/post-visit comparison, this tool shows whether guests learn more about number of animals in different zones of the ocean as a result of visiting the Exploration Center.

Messaging Tool: Pledge Board

The Pledge Board is an interactive tool found at the exit of the exhibit gallery. Using either Twitter or a physical sticky note, guests are asked to respond to the prompt "What has your visit to the Exploration Center taught you?" Pre-determined categories from pilot testing help simplify the analysis of this information, particularly the differences between knowledge-based and behavior-based responses.

Tracking-and-Timing Tool: Exhibits Observation

The tracking-and-timing tool is an observation protocol where a visitor is tracked through the exhibit space. This tool gives the Exploration Center a baseline of data to see where visitors spend the most time and how they are interacting with each of the exhibits. The data can also be used to compare the results of the content knowledge tools or the pledge board analyses to the time visitors spend at these exhibits.

RATIONALE AND GOALS

The Monterey Bay National Marine Sanctuary Exploration Center opens on July 23, 2012. Over the past seven years, the staff at the Exploration Center has worked to create interactive and hands-on exhibits, immersive experiences and relevant messaging in order to connect with people who visit the Monterey Bay National Marine Sanctuary. Located in the heart of Santa Cruz, the Exploration Center anticipates an estimated 200,000 visitors annually (Monterey Bay National Marine Sanctuary Exploration Center, n.d.).

The stated goals of the Exploration Center are to:

1. Involve and educate visitors about the sanctuary's unique and fascinating coastal and marine natural resources.
2. Instill in visitors a sense of personal stewardship with regard to the sanctuary and an understanding of how to help protect it.
3. Provide orientation for visitors as they enter the sanctuary, so they will use and enjoy it in a responsible and sensitive manner.
4. Construct an environmentally sensitive building that will demonstrate the advantages of sustainability (Monterey Bay National Marine Sanctuary Exploration Center, n.d.).

In moving forward with the anticipated opening, assessing the stated goals and messaging of the Exploration Center is helpful to attract additional funders, expand programming opportunities, and improve exhibits. With free admission, it is anticipated that the Exploration Center will rely on donations and grant-based funding. Having tools to assess the effectiveness of the exhibits provides evidence of their impacts and can be used to inform potential volunteer interactions.

In designing evaluative tools to assess the impact of the Exploration Center on the visitor's knowledge and awareness of the Monterey Bay National Marine Sanctuary, we were interested in creating welcoming, integrated activities that could be embedded into the visitor's experiences, instead of relying solely on traditional surveys situated at the beginning and end of the visits. As integrated activities, the evaluations feel less like high-stakes tests and more like learning experiences; this approach may enable a larger percentage of visitor interest and participation as well.

The available resources that the Exploration Center has to implement an evaluation plan were another driving factor in the tools that were developed. Since the day-to-day floor operations of the center are run primarily through volunteers, being able to conduct the evaluations with minimal training is essential. Likewise, we wanted to have an easy method of analysis. Although qualitative data might give deeper insights as to how the messaging of the center is coming across to guests, quantitative data is easier to evaluate and see general trends. The tools themselves may be used in either way, but this proposal highlights the quantitative methods of using the tools and possible analysis.

The goals of the proposed evaluation plan are to:

1. Determine the impact of the Exploration Center's messaging and goals on visitors,
2. Utilize evaluation tools that are welcoming and integrated seamlessly into the Exploration Center, and
3. Develop tools and methods that are easy to administer and analyze.

EVALUATION QUESTION

The evaluation question we are seeking to answer is: what messages are visitors taking away from their experience at the Exploration Center?

The collected data will answer this question in two ways. First, it will compare the knowledge base of visitors before and after coming to the Exploration Center to assess whether the content of individual exhibits is learned. Second, the data will indicate how visitors perceive their own actions and relationships with the Monterey Bay National Sanctuary after viewing the exhibits.

PROPOSED DESIGN

The overall evaluation is summative, although the information gathered may be used to inform potential volunteer facilitation and thus, visitor understanding and take-aways. Depending on where -- along the expected visitor path -- the interactive evaluations take place, volunteers may also use the collected information to alter visitor perceptions and deepen understandings as guests proceed through the Exploration Center. In this sense, the evaluative activities can be considered formative.

In order to triangulate data, we propose a combination of three stages:

- Pre- and post-content knowledge assessments
- Post-visit messaging assessment (ongoing)
- Visitor tracking through volunteer observations

While individual impacts may be assessed at any stage, the combination of the three data collection methods will yield insights as to how the Exploration Center exhibits as a whole are impacting the visitors. The time spent at individual exhibits as related to the potential gains in content knowledge and perceived behaviors/interactions with the sanctuary may inform what the strongest messages are for visitors. The data may also show if the messages and knowledge acquired are aligned with the Exploration Center's intentions.

CONTENT KNOWLEDGE TOOLS

The assessments for gains in content knowledge are a quasi-experimental design with nonequivalent groups that undergo pre- and post-tests. The assessments would be conducted for large numbers of people prior to entering the exhibits to establish baseline data. Then, they would be conducted again for large numbers of different people post-visit as a comparison group.

As determined by an online sample size calculator, for an anticipated annual audience of 200,000 visitors and at confidence level of 95% with a confidence interval of 5, the sample size for the pre- and post-visit groups would have to be at least 383 people. (Creative Research Systems, 2012, http://www.surveysystem.com/sscalc.htm#one).

The interactive assessments designed to determine content knowledge acquisition take from 2-10 minutes to facilitate, depending on the guest. Because it is a lengthy interaction, potential participants should be asked if they are willing to take part in a 5-10 minute activity. Facilitators should approach the visitors as they come in the door. The first visitor group that comes through as soon as the facilitator has completed a prior interaction should be asked. If possible, the facilitator should be bilingual to allow for Spanish-speaking guests to take part in the activity.

Watersheds Concept Mapping Activity

Goals
The watershed exhibit emphasizes the fact that watersheds are all around us—no matter where we live—and whatever goes into the watershed eventually flows into the ocean. The goal of the watersheds evaluation activity is to determine if visitors learn the path of water from sources such as fertilizer runoff, street gutters, and wastewater from homes and if they realize that not all water is treated before it flows directly into the ocean.

Process
The evaluation activity will take place either before the visitor enters the exhibit (pre-test) or after the visitor has exited (post-test). The facilitator will greet the visitor and asks them to place cards on a magnetic white board and then draw arrows to indicate the relationships between the cards. (See Appendix for facilitation techniques and tool)

Data Collection and Analysis
After visitors have completed the activity, the facilitator would record the visitor information and check off whether the visitor correctly identified the flow of water or if he or she had a misperception regarding the flow (see Appendix for data collection sheets). Ideally the facilitator would also take a picture of the board so that the scoring could be verified by an independent evaluator to establish inter-rater reliability. Then the facilitator would thank visitors for their participation and clarify any misperceptions.

The watersheds concept map provides a structured evaluation tool with specific answers, but it can also be used to initiate conversations with visitors that can be used as qualitative or anecdotal evidence.

For analysis, data can be entered into the attached Excel sheet for both pre- and post-visit and then analyzed numerically by finding averages. For more detailed analysis, the center may choose to utilize an evaluation tool such as SurveyMonkey or Zoomerang, that allows Exploration Center employees to quickly gauge trends of visitor knowledge, both before and after their visit.

Possible Results
Indications that visitors are learning about the flow of water to the ocean would include an increase in the number of error-free flow charts from pre-visit evaluations to post-visit evaluations.

Sanctuary Exploration Center staff could also use information about common misperceptions both pre- and post- visit to modify volunteer interactions with visitors in the exhibit.

Possible Challenges
The main challenge of this activity is that people may place the cards on the board in several different possible configurations. Therefore some training would be required for facilitators to identify which configurations correspond to a correct solution and which correspond to common misperceptions. In addition, visitors will likely want to know if they got the activity “right”. Some sensitivity will be required as facilitators gently correct common misperceptions.

Biodiversity Identification Tool

Goals
One of the main goals of the Exploration Center is to "involve and educate visitors about the sanctuary's unique and fascinating coastal and marine natural resources". A number of the exhibits introduce the various animals that can be found in the intertidal zone, kelp forest and deep-sea canyons. The goal of this portion of the evaluation is to determine if visitors have a better understanding of the quantity of animals found in different locations in the sanctuary after viewing the exhibits.

Process
The evaluation takes place either before or after the visitors enter the exhibit space. The facilitator takes the visitor, or a small group of visitors, through a series of three pictures of an ocean environment on an iPad. The visitor is asked to circle and identify any animals they recognize or know that live in that environment. The facilitator records the number of animals that the visitor names or circles and whether the identification is correct or not. See Appendix for specific procedures, including setting up the iPad.

Data Collection and Analysis
The facilitator collects data as they show visitors the pictures of the ocean environments. The facilitator takes snapshots of the screens to be able to reference later which animals are identified. At the end of the interaction, the facilitator checks off which animals are correctly identified, which are only circled or incorrectly identified and which are mentioned after the pictures are shown. The facilitator can also make note of whether animals are identified by specific names.

The biodiversity activity has specific answers for the volunteers to look for, but is also open to extended conversations with the visitors that can be used as qualitative or anecdotal evidence.

The analysis involves a count of the check marks for each specific category. For analysis, data can be entered into the attached Excel sheet for both pre- and post-visit and then analyzed numerically by finding averages. For more detailed analysis, the center may choose to utilize an evaluation tool such as Survey Monkey or Zoomerang, that allows Exploration Center employees to quickly gauge trends of visitor knowledge, both before and after their visit.

We recommend that data collection be used on the intertidal zone only. Due to less density of animals in the kelp forest and deep-sea canyon, appropriate pictures are more difficult to find. The intertidal zone also has a wider variety of animals discussed in the exhibit, whereas the kelp forest and deep-sea canyon variety comes primarily in different types of fish. Additionally, if different zones were used, the sample size of 383 surveys for both pre- and post-visit would still need to be reached for each zone.

Possible Results
Indications that visitors are learning about biodiversity in the sanctuary would include the following changes from pre-visit evaluations to post-visit evaluations:

- Increase in number of animals identified correctly, across all categories
- Increase in number of specific names used

Other analysis may come by breaking down numbers based on visitors':

- Previous experiences with the ocean
- The number of people in the group or the type of group

- The types of animals that are commonly identified

Possible Challenges
The main challenge is discerning whether the post-visit evaluation is measuring knowledge gain or recall. Particularly if the evaluation takes place immediately after the visitors go through the exhibits gallery, they may be recalling what they had just seen. Ideally, the evaluation would happen with a time buffer, perhaps after the visitors come out of the gift store area. Another concern would be that people are in a hurry to leave and may not want to stay to do an additional task.

Additionally, in pilot testing we found out the difficulty of free recall of animals that visitors might know of but are not shown in the pictures. Finding three pictures that show all of the animals that the exhibits reference is difficult, if not impossible for some of the ocean environments due to the scarcity of animals in general. We had hoped that just the act of showing visitors pictures of the environment would get them in the right mindset and be able to also free recall animals that were not pictured. However, during the pilot testing, even the individuals that had a lot of experience with touch tanks were not able to recall many animals that were not in the pictures directly.

MESSAGING TOOL: Pledge Board

The assessment for perceptions of behavior is a non-experimental design. As an ongoing part of the Exploration Center, the pledge board has the potential to collect large quantities of data, related to the most compelling messages that visitors take away from their visit as they exit the exhibits. These pledges may be content-oriented, related to factual statements of knowledge, or they may be action-oriented, related to the next steps that they can take in regard to the Monterey Bay National Marine Sanctuary.

Goals
To determine what visitors learn after their visit through the Exploration Center; specifically, to determine if the learning is primarily knowledge-based, or viable action-oriented behaviors that visitors may take, related to their enjoyment and protection of the Monterey Bay National Marine Sanctuary. The opportunity to make a pledge digitally on Twitter elevates the pledge from a personal, private commitment to a public one, in which pledges can spark interest and actions in others, can be re-Tweeted or referenced, and can exist in an online, social medium that encourages reinforcement and feedback.

Process
After their tour of the Exploration Center and before exiting, visitors stop and engage with the pledge board (either through physical sticky notes or via the Twitter feed) by leaving a note about their experience and possible next steps. The prompt is "What has your visit to the Exploration Center taught you?" Visitors can reference pledges from past visitors by reading the physical sticky notes posted around the digital display screen or the Twitter messages on the screen itself. Volunteers may help to encourage and facilitate these pledges. See Appendix for how to set up the Twitter account and feed, create the physical pledge board, and suggested prompt(s).

Visitors will choose to:
- make a pledge
- make a pledge via digital or physical means
- leave a pledge of content knowledge and/or action-oriented steps

Data Collection and Analysis
Data would be collected through both a digital and a physical means. Pledges that visitors make via the Exploration Center's Twitter feed can be gathered and analyzed digitally. Pledges that visitors make via physical sticky notes can be collected via daily photographs of the pledge board. Coding could be based on categories of topics, broadly divided into pledges related to "knowledge" and pledges related to "action," then subcategories within each. See Appendix for additional information on suggested categories and subcategories, as well as recommendations on collection and analysis of data.

Possible Results
The content of the visitors' pledges will demonstrate the key points that the Exploration Center is successful at conveying. Visitors will most likely leave a note about their strongest or most compelling learnings from their visit of the Exploration Center.

Possible Challenges
Visitors may be uninterested in participating and making a pledge, particularly if the Exploration Center is crowded, or the pledge area is busy. The opportunity to make a pledge using one's own cell phone may help alleviate the need for multiple visitors to crowd around one kiosk.

Visitors may not want to make a pledge using Twitter. Demographics and comfort with technology will certainly play a role in determining how successful the digital medium is for visitors. Despite any hesitation to use Twitter, visitors should still be encouraged to pause and think about what they have learned on their visit, no matter how much time they have spent, how much prior knowledge they have, and what reasons they have for visiting. This opportunity should be one encouraged by the staff and volunteers of the Exploration Center, as visitors who take advantage of the chance to retrieve their learnings -- and possibly summarize them -- will reinforce their memory of the visit.

TIMING-AND-TRACKING TOOL: Exhibits Observation

Research has shown a positive relationship between time spent at museum exhibits and learning (Borun, et al., 1998). For any learning to take place, attention must be spent on the subject. A tracking-and-timing component to this evaluation will allow the Exploration Center to see where visitors spend the most time within the exhibit space and how that correlates to the findings from the pledge board, watershed or biodiversity assessments.

The subjects should be randomly chosen, as determined by the observation protocol (see Appendix). If a visitor becomes aware that they are being tracked, the observer should move onto another visitor and void the data.

As determined by an online sample size calculator, anticipating an annual audience of 200,000 visitors and to get a confidence level of 95% with a confidence interval of 10, the sample size for each pre- and post-visit group would have to be at least 96 people (Creative Research Systems, 2012, http://www.surveysystem.com/sscalc.htm#one).

Goals
To determine whether the data collected from the pledge board, watersheds and biodiversity assessments are representative of the learning that may be taking place in the Exploration Center, or if the visitors are drawing primarily on prior knowledge.

Process
An observer covertly tracks a visitor as they travel through the Exploration Center. The observer should find a position in each exhibit zone where they can clearly see the exhibits for that area. The observer records on the data collection sheet when the visitor stops at an exhibit, communicates with others about the exhibits or engages with it on their own, as determined by the observation protocols sheet (see Appendix).

Although ideally the same visitor would be tracked through their entire visit, it may become too difficult, depending on how much time groups tend to spend in the center. A modification may be to track visitors within one area of the center. In this case, the same observation protocol would apply to each distinct area, as set up on the Exploration Center map. All coders would have to be aware of the boundaries of the area. The number of visitors would also have to increase to 96 tracked per area.

Data Collection and Analysis
An observer tracking a visitor through the center collects data. The observer uses a physical spreadsheet to record which exhibits the visitor stops at and what activities they engage in. The data could then be entered into either a survey analysis program or a program such as Excel (see attached file). The Exploration Center will be able to see what the average time at each exhibit is and what the different interaction are that take place.

Possible Results
Ideally, we would expect to see correlations between the time spent at exhibits and the data collected from the other components of the evaluation. Specifically:

- Pledge board comments reflect messages from exhibits where people spend the most time
- Gains in knowledge at the watersheds or biodiversity exhibits are accompanied with relatively high amounts of time spent at those exhibits.

Additionally, if higher amounts of time are spent at other exhibits, the Exploration Center may choose to adjust the methods to focus on these exhibits instead.

Possible Challenges
Several logistical challenges exist with a tracking-and-timing study. Many visitor groups tend to split up as they visit the exhibits. Although addressed in the observation protocols, the observers would need to make sure to follow the same protocols when this happens. Additional challenges are:

- Visitors becoming aware they are being tracked
- Observers having trouble determining if conversations are exhibit-related, particularly during crowded times
- Broken or overcrowded exhibits distorting data

NEXT STEPS

For the content knowledge tools, in addition to using them for summative evaluation purposes, the center could use the activities on an ongoing, formative basis as a part of volunteer facilitation of the exhibits. These activities reinforce the learning and messaging of the center and provide a quick way for volunteers to gauge whether visitors have misconceptions that could be clarified during their visit to the Exploration Center.

Although we considered creating biodiversity interactions for additional ecosystems besides the intertidal zone, we recommend focusing solely on the intertidal zone because of the density of animals in pictures. While looking for pictures of the kelp forest and deep-sea canyon, most pictures only captured one to two of the animals listed for the exhibits in any given picture whereas pictures of the intertidal zone tend to include multiple animals. In pilot testing, we found that people had trouble thinking of animals that they knew lived in the intertidal zone when they weren't in the pictures. Due to this issue, there is a strong possibility that doing this activity with additional zones will not yield strong results.

The Exploration Center may be interested in offering incentives to visitors who not only make a pledge but also tweet about it again within 6 months of their visit. The follow-up message would have all the advantages of existing in an online, public forum and show that the learning can have a longer-term impact. In this case, a follow-up message may also show maintained situational interest (and perhaps budding individual interest) in topics related to their visit of the Exploration Center.

These evaluation tools were developed for volunteers to be able to easily conduct evaluations with visitors. We would recommend that the Exploration Center integrate techniques for the facilitation of the tools into the volunteer handbook or training prior to conducting these evaluations.

Finally, we understand that the Exploration Center may want to modify some of these tools in order to apply them to other exhibits. If the tools are modified, we highly recommend pilot testing with visitors before implementing a formal evaluation.

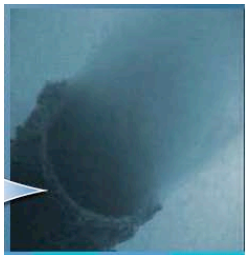
APPENDICES

Watersheds Preparation

Materials needed:

- Large magnetic whiteboard (35” x 22”)
- Magnets
- Dry erase markers
- Cards with pictures and labels in English and Spanish
- Evaluation sheet
- Camera (ideally)

Sample Cards:

Waste water from homes Las aguas residuales de los hogares	Water treatment plant Planta de tratamiento de agua	Pumped through pipes into the ocean Bombeado a través de tuberías en el océano	Drains into the ocean Desemboca en el Océano
			
Runoff with fertilizer Escorrentía con el fertilizante	Trash in the gutter La basura en el arroyo	Storm Drain Drenaje pluvial	
			

Prior to interacting with guests

- Write prompt at the top of the whiteboard “Where does it go?”
- Place ‘wastewater from homes’, ‘runoff with fertilizer’, and ‘trash in the gutter’ cards underneath the prompt to start the concept map.

Watersheds Facilitation Script

Volunteer: We would love to have you take part in a study that will help us make the center better. Would you be able to help us out by doing this activity? It should take about five minutes.

(if they say 'yes' proceed)

Volunteer: Thank you so much. Your participation will help us make the Exploration Center even better! This board shows the beginning of a flow chart. Can you place these additional cards on the board and draw lines to show how they are connected to the concepts at the top?

(Give the visitor time to put the pieces in place, and draw connecting lines. Note any questions on the evaluation sheet)

Volunteer: Thank you for your help! We hope you enjoy/ed your visit at the Exploration Center!

Correct flow: Trash, & fertilizer should pass through storm drains into the ocean (but not through the treatment plant). Wastewater should flow through the treatment plant, and pumped through pipes into the ocean (see sample on Watersheds Data Collection Sheet).

Data Collection
Fill out the Watersheds Data Collection Sheet. Please see category explanation:

- **All Correct** – Placed all cards on the board with correct arrows indicating the flow of water.

- **Incorrect flow of trash/fertilizer to treatment** – Did the visitor incorrectly direct water from either the "trash in the gutter" or the "runoff with fertilizer" to the water treatment plant? If so, record a 1 for 'yes', if not, record a 0 for 'no'.

- **Incorrect flow of wastewater** - Did the visitor incorrectly direct wastewater from homes to the ocean without passing through the water treatment plant? If so, record a 1 for 'yes', if not, record a 0 for 'no'.

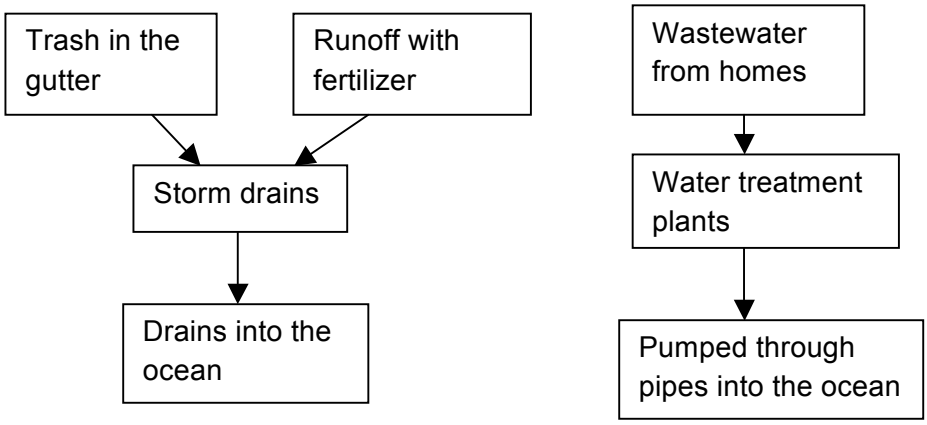
- **Links missing** - Are there any connections missing between the concepts on the board? If so, record a 1 for 'yes', if not, record a 0 for 'no'.

- **Other misconceptions** - Were there any additional misconceptions represented by the visitor's flowchart? If so, record a 1 for 'yes', if not, record a 0 for 'no'.

Add in any additional notes or comments on the back of the data collection form.

Watersheds Data Collection Sheet

Correct response



Enter codes for each facilitation.

Pre- or post? Pre=1; Post=2	**Number of people in group (enter number)**	**Child=1; Teen=2; Adult=3; Family=4**	**All Correct? No=0; Yes=1**	**Incorrect flow of trash or fertilizer to treatment? No=0; Yes=1**	**Incorrect flow of waste-water (un-treated)? No=0; Yes=1**	**Links missing? No=0; Yes=1**	**Other mis-perceptions? No=0; Yes=1**	**Comments?**

Watersheds Data Analysis

At regular intervals data should be entered into the Excel spreadsheet for analysis (this can be done daily, weekly, or at other intervals that are convenient for the Exploration Center).

Enter Data into Excel Sheet
Open Excel sheet for tracking-and-timing data analysis.

For each data collection sheet:

1. Record on the data collection sheet the Evaluation number from the Excel sheet that indicates the row you will be recording in.
2. Fill in the codes under the corresponding columns from the data collection sheet into the Excel sheet.

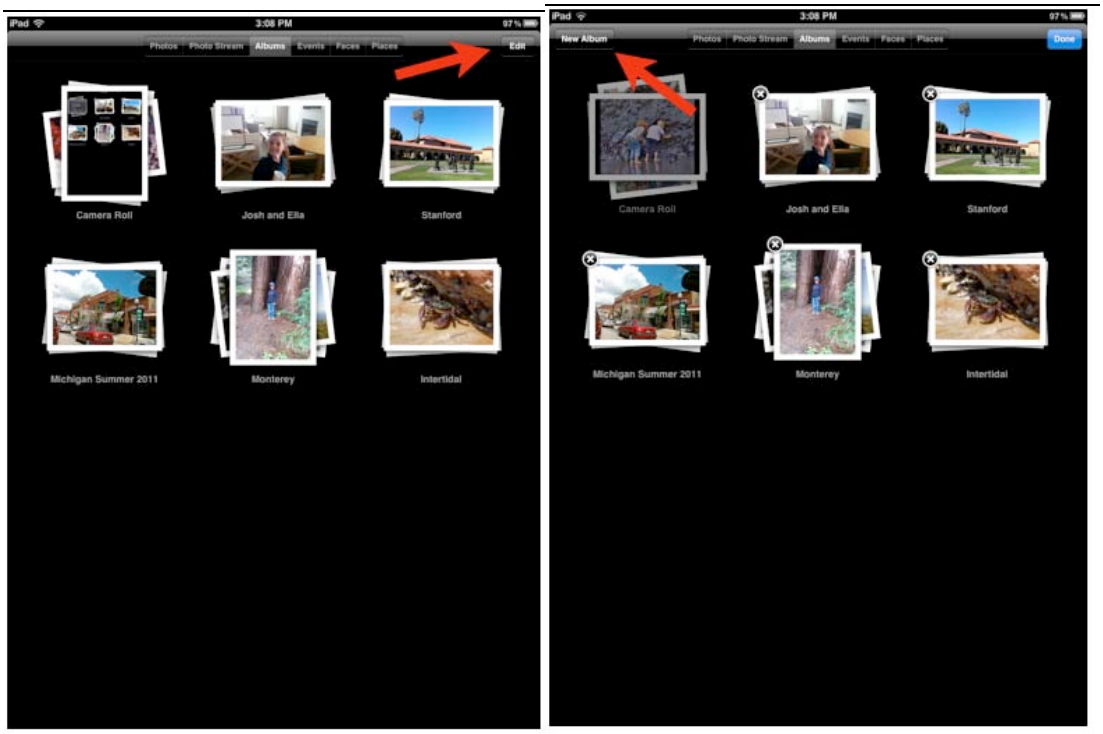
Analysis
Calculating the averages of each column will give the following information:

- Average number of people in a group
- Percentage of visitors that correctly modeled the flow of water.
- Percentage of people with a misperception about the flow of trash / fertilizer runoff.
- Percentage of people with a misperception about the flow of wastewater from homes.
- Percentage of people with other misperceptions.
- Percentage of people who had links missing.

Biodiversity Identification Preparation

Preparing the iPad - One Time Only

1. Download the “Draw on Slides” app or a comparable app that allows you to easily draw on pictures
2. If needed, download appropriate pictures for the Intertidal zone (3 pictures). As much as possible, pictures should include all the types of targeted animals from the exhibits.
3. Place pictures in separate album on “Photos” app
    a. Touch “Albums”
    b. Touch “Edit” and “New Album” (see pictures below)
    c. Name the Album for the Zone



Biodiversity Identification Facilitation

Prior to Interacting with Guests

1. Start the iPad
2. Open “Draw on Slides” app
3. Touch the “Landscape” icon on the bottom right to select an album to show the pictures for the zone you are evaluating (see picture)

Biodiversity Identification Facilitation Script

We would love to have you take part in a study that will help us make the center better. Would you be able to help us out by taking a look at a few pictures? It should take less than five minutes.

As you are preparing the first picture...

Have you been to the Exploration Center before?
> ***If yes, AND the facilitation is for pre-visit knowledge, continue the interaction but do NOT use the data***

Are you from Santa Cruz?
Circle yes if <u>anyone</u> from the group is from Santa Cruz

Have you ever been to a beach or aquarium before?
Circle yes if <u>anyone</u> from the group has been.

Show the first picture.

I'm going to show you 3 pictures taken from the ocean. Take a look at this first picture. Do you see any animals there? Go ahead and circle any animals you recognize and tell me what kind of animal they are. *Show how to circle the picture.*

If possible, record responses as they talk and point. ***Take a snapshot of the photo*** *(see notes below).*

Repeat with second and third pictures, taking snapshots after each.

Do you know which part of the ocean these animals live in? *If needed, prompt with three possible areas (ex: tide pools, kelp forest, or open ocean).*

If no animals identified...
I noticed you didn't see any animals. Do you know of any animals that live in the intertidal area, or tide pools?

If animals identified...
Can you think of any other animals that live there that might not have been in the pictures?

Thank you for your help! We hope you enjoy/ed your visit at the Exploration Center!

As guests leave, prior to starting a new session:
- Go back to the "Photos" app and look at the last three pictures.
- Fill out the data collection form, using the photos as reminders of how the guests responded.
- Delete the three pictures and repeat the process for the next guest.

Notes for Facilitation
Guests may engage in longer conversations as they identify animals. Once they have pointed to an animal and named it, the facilitator may choose to confirm or correct the name or provide additional information.

To take a snapshot of the photo, press the home and power buttons on the iPad together.

Data Collection
Fill out the data collection form. Please see category explanation:

- **Identified Correctly** - Correct identification both verbally (type of animal) and by circling
- **Circled Only** - Able to identify the animal in the picture, but did not know what type of animal it was, OR gave an incorrect name to an animal
- **Specific Name** - Correct identification both verbally and by circling, but gave a specific species name for identification (ex: Ochre Star)
- **Named After Pictures Shown**: Free response not prompted by the pictures

Add in any notes or comments on the back of the data collection form.

Biodiversity Intertidal Data Collection

Circle one: Pre-visit Post-visit

Number of people in group:

Type of group: Individual Family Student

Have been to the beach or aquarium before? Yes No

Resident/s of Santa Cruz? Yes No

Identified area of ocean? Yes No

Check the boxes for each animal identified:

Animal	Identified Correctly	Circled Only / Incorrect	Gave More Specific Name	Named after pictures shown
Barnacle				
Crab				
Limpet				
Mussel				
Sea Star				
Anemone				
Abalone*				
Sea gull**				
Snail**				
Sea Slug**				
Sea Hare**				
Urchin**				
Fish**				
Other:				

**Not pictured in the task*
***Not explicitly mentioned in the exhibit*

Biodiversity Data Analysis

Enter Data into Excel Sheet
Open Excel sheet for tracking-and-timing data analysis.

For each data collection sheet:

1. Record on the data collection sheet the Evaluation number from the Excel sheet that indicates the row you will be recording in.
2. Enter the number of people in the group.
3. Enter whether the primary person was male or female (0 for male and 1 for female).
4. Enter the time they entered the exhibit in military time.
5. Enter the time they left the exhibit in military time.
6. Calculate the total time spent in minutes
7. For each exhibit, indicate what actions were observed using 0 for no and 1 for yes.
8. For each exhibit, record in seconds the amount of time that was spent at each exhibit.

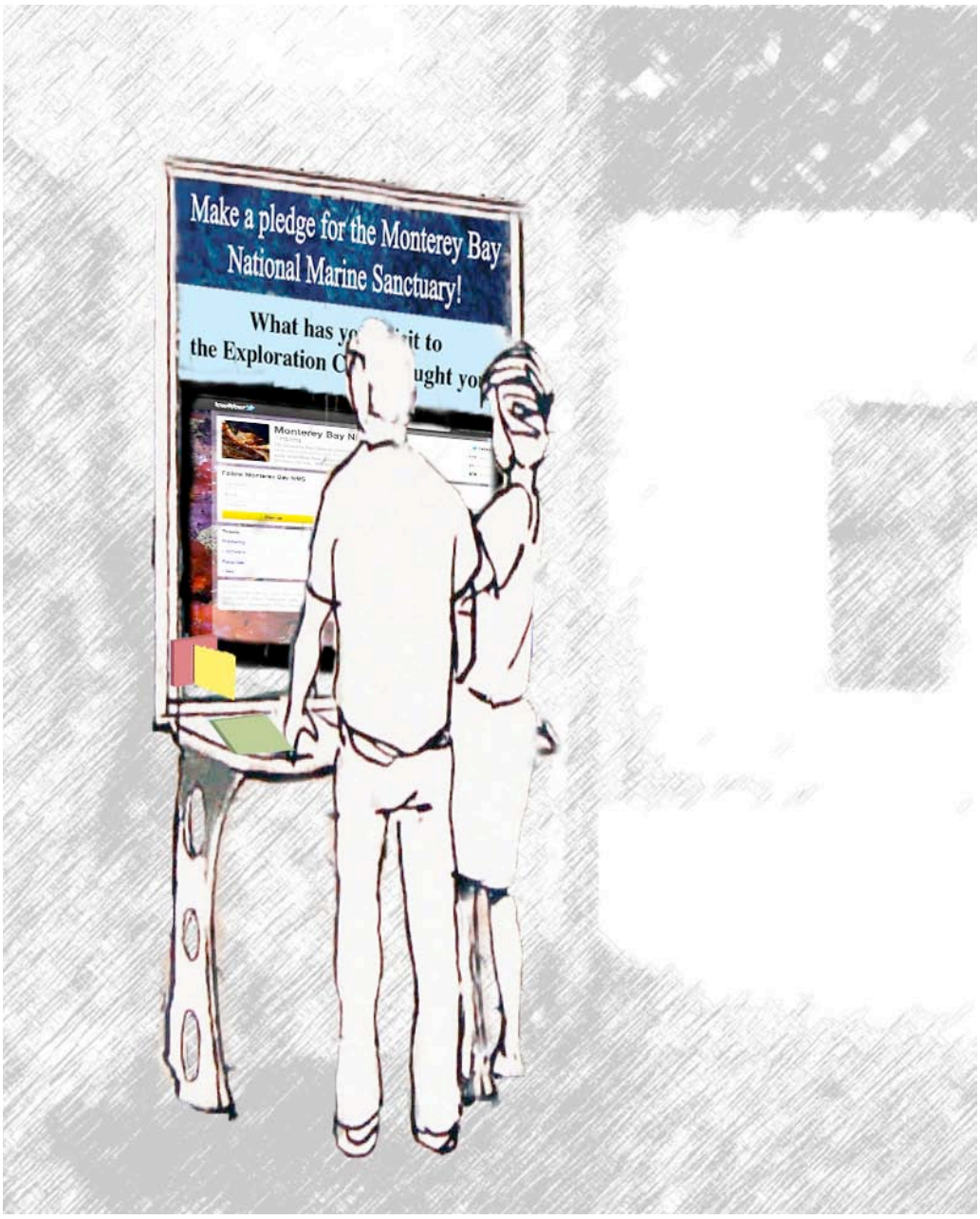
Analysis
Calculating the averages of each column will give the following information:

- Average number of people in a group
- If the majority tracked where male or female (less than .5 = male, more than .5 = female)
- Average total time in the gallery, in minutes
- For each exhibit:
    - Percentage of people that exhibited each behavior
    - Average time spent at each exhibit

Pledge Board Preparation

Materials needed for the physical pledge board:

- Wall space
- Posting board (corkboard) with available posting space as a thick border around the digital display screen
- Push-pins
- Pledge cards (sticky notes, scraps piece of paper, or unlined notecards)
- Pens, pencils, markers, or other writing implements
- Instructions for how to make a pledge



Materials needed for the digital pledge board:

- Wall space
- Digital display screen (24” or larger), ideally mounted on the wall at eye level or higher
- Twitter account for the Monterey Bay National Marine Sanctuary Exploration Center
- iPad (recommended), or computer with keyboard and mouse
- Connecting cords
- Instructions for how to make a pledge

One-time set-up of Twitter account:

1. Sign up for a Twitter account and choose an appropriate hashtag (i.e. #mbnmsec)
2. Customize the account’s main Twitter screen
3. Begin posting!

One-time set-up of pledge instructions:

1. Create a simple list of instructions on how to pledge, whether via physical means or digital means
2. Post the instructions in a convenient place for visitors to reference

Example of pledge instructions:

- Make a pledge and write it directly onto a sticky note! Post it on the corkboard.
- Make a pledge by
    - Signing into your own personal Twitter account via your cell phone. Make a pledge! #mbnmsec
    - Typing directly onto the iPad. Make a pledge and leave your first name! Example: “I am excited to go on hikes along the coast and pick up loose trash to keep the

Monterey Bay National Marine Sanctuary clean and safe for its animals and plants! #mbnmsec --Sally”

Suggested prompts:

- “What has your visit to the Exploration Center taught you?” (recommended)
- “What did you learn from your visit to the Exploration Center?”
- “How will you engage with the Monterey Bay National Marine Santuary in the future?”
- “What actions will you take to enjoy or protect the marine sanctuary?”
- “I will support the marine sanctuary by...”
- “My family will enjoy the marine sanctuary by...”
- “I can take part in supporting ocean health by...”

Possible answers:

- “I learned that runoff from the street flows through storm drains and directly into the ocean”
- “I learned that not everything goes through water treatment plants”
- “I discovered that the ocean has lots of different animals”
- “I found out that the animals living in the open ocean are sometimes different than the animals (like sea stars!) living near the beach”
- “I will make sure not to throw things down the street because they may end up directly in the ocean!”
- “I will reduce my use of disposable plastics, such as single-use grocery bags and water bottles”

Pledge Board Facilitation, Analysis, and Coding

Facilitation
Personnel / labor needed:

- Volunteer to encourage/facilitate interaction with the board (optional)
- Materials stocked
- Moderator for Twitter feed
- Evaluator to compile and categorize pledges and tweets

Analysis and Coding
For data collection purposes, we recommend taking a daily photo of the physical pledges. Depending on the quantity of visitors and pledges made on a daily basis, analysis and coding of both physical and digital pledges can take place daily, once every 2-3 days, or weekly.

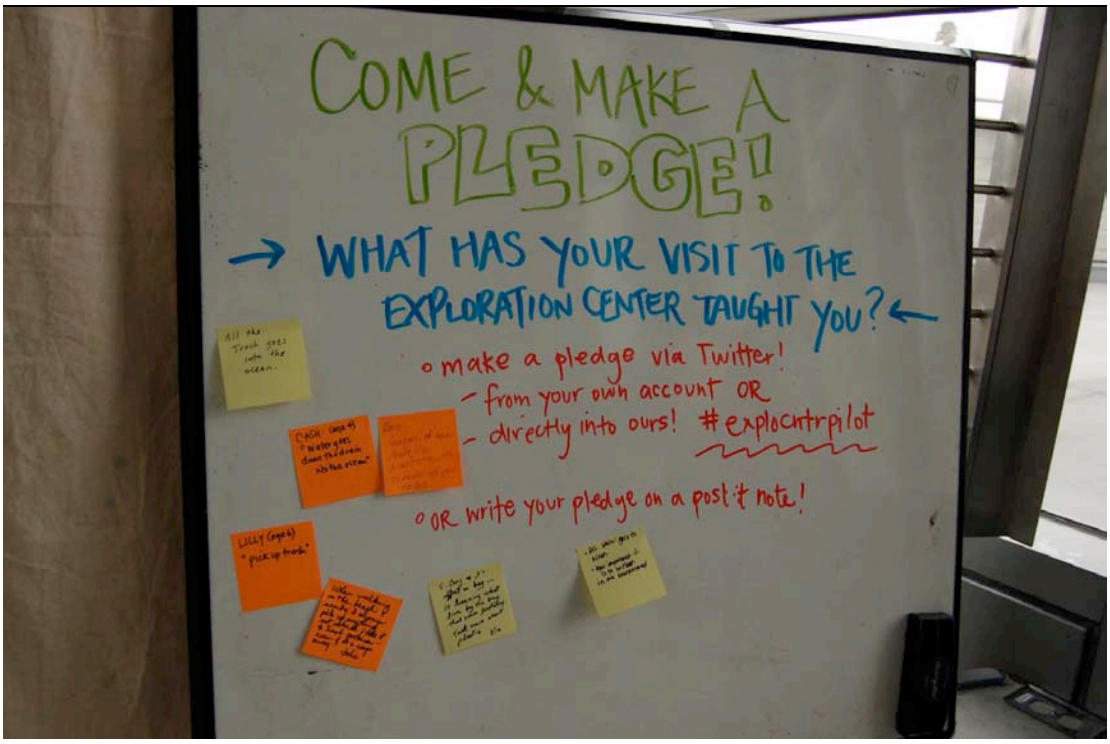
These are suggested categories for grouping pledges made by visitors. For each pledge, tally marks may be made in the applicable categories and columns. It is expected that categories will change upon iteration and actual data collection.

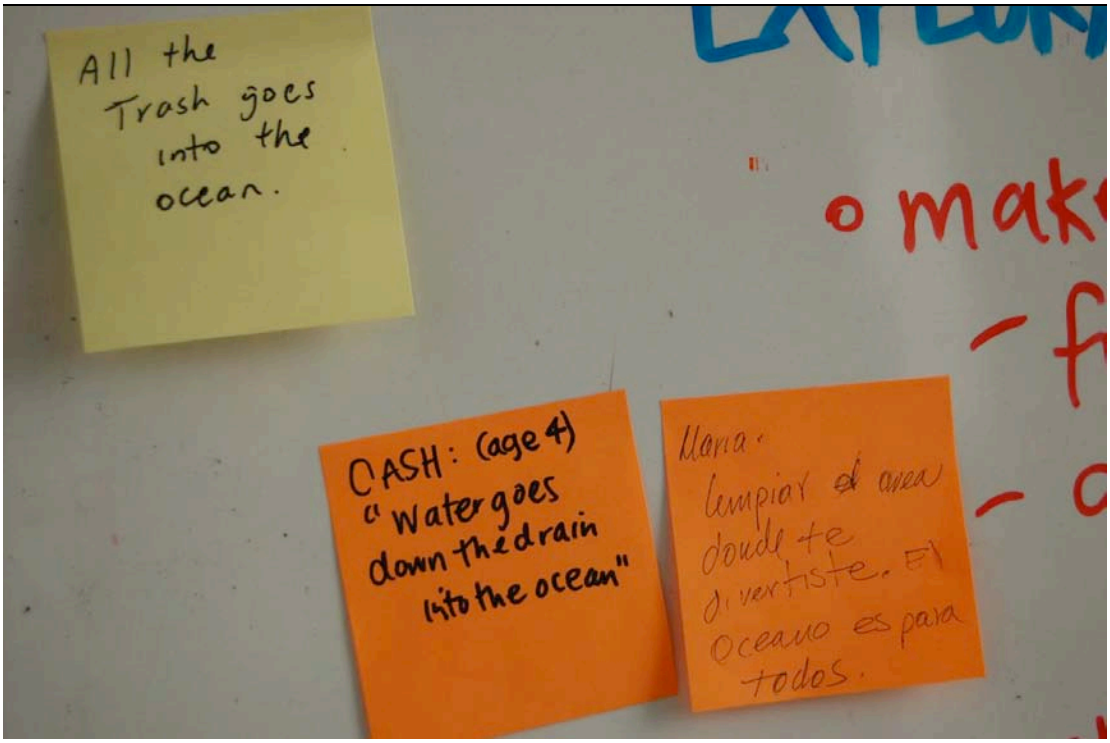
- General broad categories
  - content knowledge vs action-oriented
  - exhibit-based vs non-exhibit-based
  - physical pledge vs digital pledge
  - comments vs feedback and suggestions
- Possible subcategories:
  - categories from above
  - watershed, biodiversity, scientific research
    - trash, plastic, recycling
    - storm drains, runoff
    - animals, such as turtles, sea stars, mola mola, etc
    - sonar, echolocation
  - interactive vs non-interactive exhibits
  - tangible (hands-on) vs intangible (visual only) exhibits
  - enjoyment of MBNMS vs protection of MBNMS
  - English vs non-English

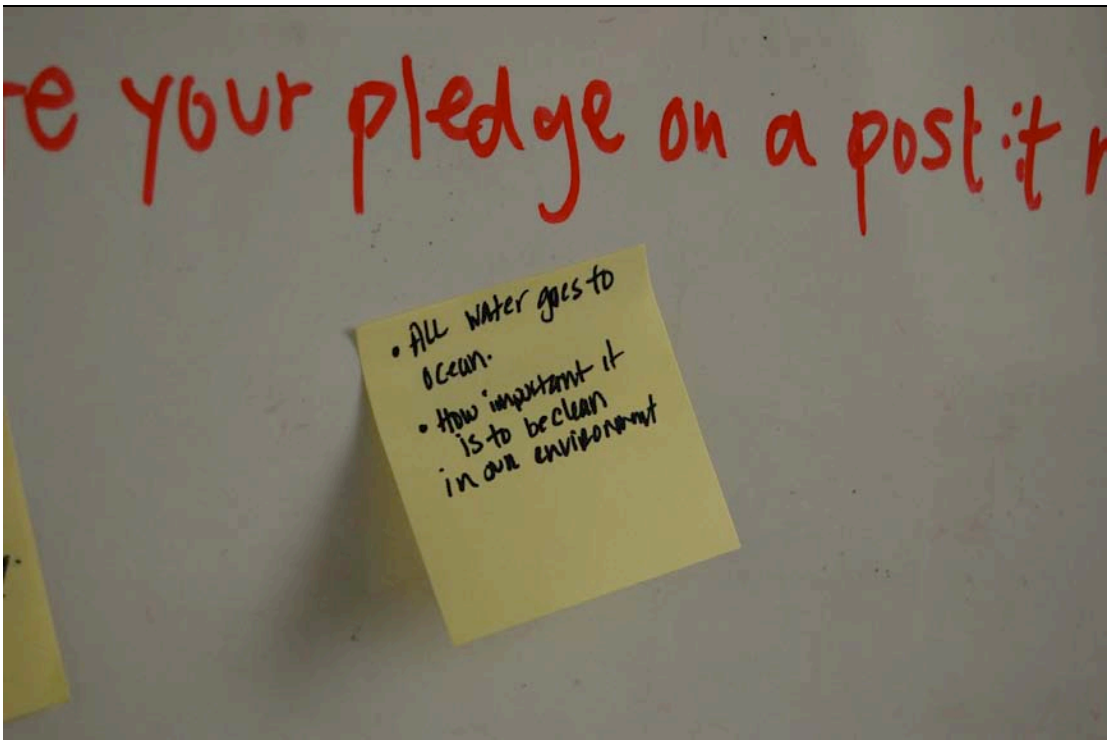
Sample data coding chart:

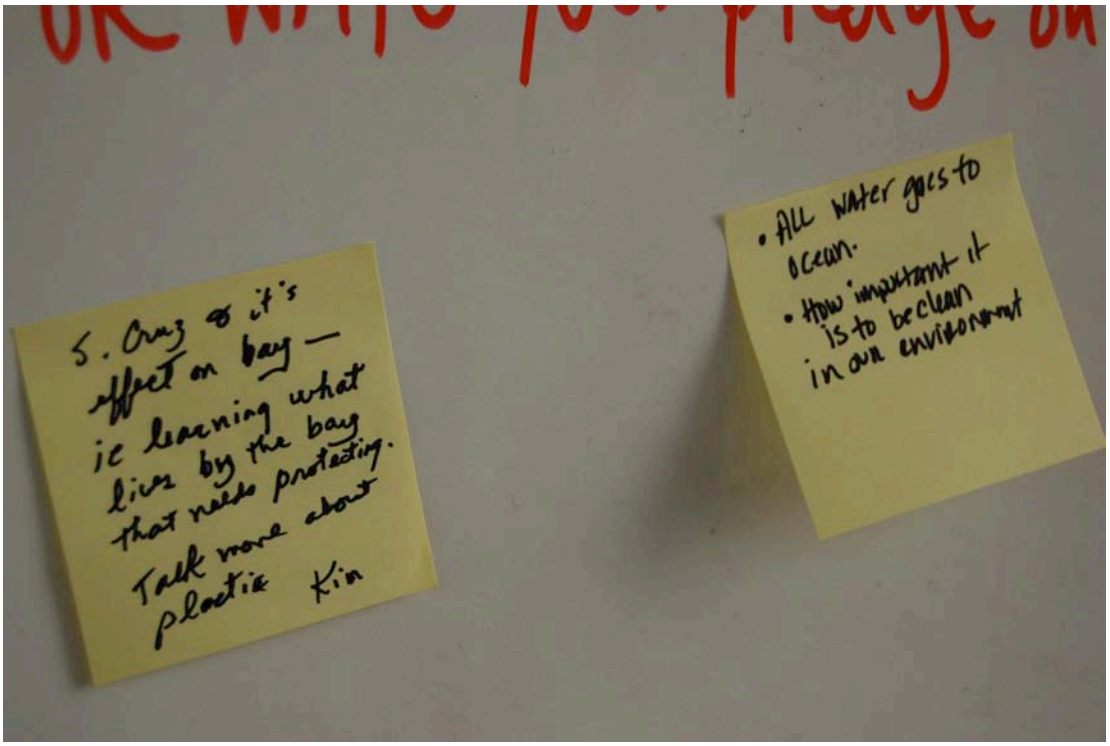
		GENERAL								SPECIFIC							
		digital	physical	content	action	exhibit	non-exhibit	statement	feedback	watershed	biodiversity	research	animals (list specific)	interactive	non-interac	enjoyment	protection
pledge #	1																
	2																
	3																
	4																
	5																
	6																
	7																
	8																
	9																
	10																

Pledge Board Examples of Pledges






e your pledge on a post it
• All water goes to ocean.
• How important it is to be clean in our environment


5. Cruz of it's effect on bay — ie learning what lives by the bay that needs protecting. Talk more about plastic Kia
• All water goes to ocean.
• How important it is to be clean in our environment

Tracking-and-Timing Observation Protocols

Choosing Visitors to Track

1. At the start of the day/shift, the **fifth adult visitor** to cross the top step leading up to the Second Floor should be tracked. Record the time that they cross the step as their "Entrance Time". If the visitor is with a group, note the group size on the data collection sheet.
2. Record the group's "Exit Time" as when the majority of the group members leave the exhibit space via the stairs or elevator.
3. Count **four** more adult visitors to cross the top step coming onto the Second Floor. The next group should be tracked.

Tracking Visitors

After you have found a visitor to track, record their actions on the data collection spreadsheet.

- Make a check mark for each observable behavior (see definitions below)
- If an exhibit stop occurs, record the amount of time the visitor stops at the exhibit using a stopwatch

Definitions

- **Visitor/Visitor Group** - a group of visitors that contains at least one adult that appears to be over 18.
- **Entrance Time** - the time that the guests crosses the top step coming into the exhibit space (if tracking a specific exhibit area, make sure to set a predetermined marker)
- **Exit Time** - the time that the guests start to descend the stairs or go down the elevator (if tracking a specific exhibit area, make sure to set a predetermined marker)
- **Exhibit Stop** - one or more members of the group stop at an exhibit for more than two seconds with their feet or upper body facing the exhibit
- **Time Stopped** - while at an Exhibit Stop, the amount of time the group stops (until the majority of the group leaves the exhibit)
- **Reading** - while at an Exhibit Stop, one or more members of the group are looking directly at a text panel for more than five seconds
- **Interacting** - while at an Exhibit Stop, one or more members of the group touch the exhibit components in a way that gets them towards the end-point or goal of the exhibit (ex: child crawls into the culvert, adult taps an interactive screen)
- **Group Interaction** - while at an Exhibit Stop, two or more members of the group demonstrate social learning around the exhibit by pointing, interacting with each other or talking about the exhibit, or potential relevant topics (ex: home practices) with others
- **Non-relevant Group Interaction** - while at an Exhibit Stop, two or more members of the group discuss a topic that is unrelated to the exhibit they are at (ex: bathroom, where to go next, food break)
- **Pictures** - while at an Exhibit Stop, one or more members of the group takes a picture of the exhibit

Tracking-and-Timing Data Analysis

Enter Data into Excel Sheet
Open Excel sheet for tracking-and-timing data analysis.

For each data collection sheet:

1. Record on the data collection sheet the Evaluation number from the Excel sheet that indicates the row you will be recording in.
2. Enter the number of people in the group.
3. Enter whether the primary person was male or female (0 for male and 1 for female).
4. Enter the time they entered the exhibit in military time.
5. Enter the time they left the exhibit in military time.
6. Calculate the total time spent in minutes
7. For each exhibit, indicate what actions were observed using 0 for no and 1 for yes.
8. For each exhibit, record in seconds the amount of time that was spent at each exhibit.

Analysis
Calculating the averages of each column will give the following information:

- Average number of people in a group
- If the majority tracked where male or female (less than .5 = male, more than .5 = female)
- Average total time in the gallery, in minutes
- For each exhibit:
    - Percentage of people that exhibited each behavior
    - Average time spent at each exhibit

Project Timeline

- April 13 - Email introductions between Lisa Uttal of the Monterey Bay National Marine Sanctuary Exploration Center and Stanford project team members Jen Bundy, Stephanie Chang and Lisa Peterson.

- April 25 – Lisa Uttal and the Stanford project team held a preliminary project meeting and toured the Exploration Center.

- April 30 –Stanford project team emailed a high level project proposal to Lisa Uttal.

- May 9 - Lisa Uttal and the Stanford project team held a phone conference resulting in an adjusted project plan.

- May 9 – Stanford project team consulted with Kathleen O'Connor, Kathayoon Khalil, Rachelle Gould and Nicole Ardoin.

- May 14 – Stanford project team emailed a progress report with revised project plans and an estimated timeline to Lisa Uttal.

- May 16 - Lisa Uttal and the Stanford project team held a phone conference.

- May 21 –Stanford project team emailed a project update to Lisa Uttal outlining the watershed, biodiversity, turtle tracking, and pledge board activities and evaluation tools.

- May 23 - Lisa Uttal and the Stanford project team held a phone conference to confirm activities and scheduling for prototyping and pilot testing on May 26th. Stanford project team prototyped the watersheds evaluation activity with students at Stanford.

- May 26 – Stanford project team prototyped and pilot tested evaluation tools at the Exploration Center. Lisa Uttal and Stanford project team held a debriefing meeting.

- May 28 – Stanford project team reviewed testing day prototypes and pilot tests, made revisions, and fine tuned base categories for analysis.

- May 30 – Stanford project team presented the project in their "Theory and Practice of Environmental Education" class.

- June 4 – Stanford project team met to fine tune client report and other project deliverables.

- June 11 - Final project due.

Biographies

Jennifer Bundy
Jennifer Bundy is a Master's student in the Learning, Design and Technology program at the Stanford University School of Education. She has seven years experience teaching in both classroom settings and informal education settings. Most recently, she was developing school and group education programs at the California Science Center. She can be reached at jbundy17@gmail.com.

Stephanie Chang
Stephanie is a Master's student in the Learning, Design, and Technology (LDT) program in Stanford's Graduate School of Education. With a background in biology and biomedical engineeering, she has 5-6 years of experience in the informal science education sphere, having worked with science and technology camp programs, hands-on "making", and marine science. She is available at shc3@stanford.edu

Lisa Peterson
Lisa is a Master's student in the Learning, Design and Technology (LDT) program in Stanford's School of Education. Her undergraduate degree, also from Stanford, is in Human Biology with a focus on "Decision Making in Education". Lisa spent five years as a docent at Seacliff State Beach and has a passion learning about and caring for the ocean. She can be reached at lpeterson22@hotmail.com.

Annotated Bibliography

Bell, P., Lewenstein, B., Shouse, A.W., & Feder, M.A. (2009). *Learning Science in Informal Environments: People, Places, and Pursuits*. National Research Council, p. 244-248.

The authors discuss informal science learning and its goals. In this excerpt, the authors put forward several principals regarding learning in science environments and point to a number of best practices. They also discuss the criticism of informal learning due to the absence of assessment.

Ernst, J., Monroe, M., and Simmons, B. (2009). *Evaluating Your Environmental Education Programs: A Workbook for Practitioners*. NAAEE: Washington, D.C.

This practical workbook provides a step-by-step guide for conducting an environmental education evaluation. It walks the reader through the process starting with focusing the evaluation, to developing a plan, to data collection and analysis, to communicating the results to others at the end of the project. In addition to excellent narration of the steps involved in creating an evaluation plan, the workbook includes lists, exercises and examples. Finally, worksheets allow readers to create their own plan by filling in the specific information relevant to their own organization.

Gregory, R. (1997). Science through Play. In R. Levinson & J. Thomas (Eds.), *Science Today*. London: Routledge, 192-205.

Science centers are used as an example of a place where people can engage in experiences that challenge misconceptions they may have acquired about science through discovery. Three keys for discovery - hands-on, hand-waving explanations and handle-turning computations - are described as discovery methods that should be developed through science education. These types of interactions are found at the Exploration Center and may influence the type of learning occurring.

Novak, J.D. & Canas, A.J. (2008). The theory underlying concept maps and how to construct and use them. Technical Report. Florida Institute for Human and Machine Cognition. IHMC: CmapTools 2006-01 Rev 01-2008.

This article defines concept maps and describes their use in creative and critical thinking. Concept maps can be used to elucidate student thinking and clarify misconceptions and therefore prove to be powerful tools for both learning and evaluation. Because concept maps explicitly link information together, they can connect to a learner's existing knowledge and can help integrate new concepts their existing cognitive schema. In using concept maps for learning or evaluation, it is useful to have a "focus question" to guide the map as well as an "expert skeleton" to start the map. Then, learners can add pre-selected concepts from a "parking lot" and draw the connections to complete the map.

Paris, S. G. (1998). Situated Motivation and Informal Learning. *Journal of Museum Education, 22:* November 2 & 3, 22-27.

Six motivational processes are defined for informal environments: constructing meaning, choices, challenges, control, collaboration and positive consequences. The author concludes by stating that situated learning experiences are more effective if these processes are taken into consideration. These motivational processes influence the amount of time that visitors attend to an exhibit and thus feeds into their learning.

Steven S. Yalowitz & Kerry Bronnenkant (2009): Timing and Tracking: Unlocking Visitor Behavior. *Visitor Studies*, 12(1), 47-64.

The authors provide a history of the use of timing and tracking studies. They detail methods, challenges and describe how timing and tracking can be used to inform decisions on future exhibit design.

Serrell, B. (1998). *Paying attention: Visitors and museum exhibits*. Washington, DC: American Association of Museums.
A seminal piece comparing visitor behavior data from 110 exhibitions that helped to standardize the process of performing tracking and timing studies. In this evaluation, we use the same definition as Serrell for an exhibit stop.

Taylor-Powell, E., Steele, S., & Douglah, M. (1996). Planning a program evaluation. *Program Development and Evaluation.* University of Wisconsin Extension.
This useful planning guide walks step-by-step through the evaluation planning process, from focusing the evaluation, to collecting the information, to using the information, to managing the actual implementation of the evaluation. Guiding questions and sample worksheets help readers customize the information for their specific environments and program goals.

Additional References

Borun, M., Dritsas, J., Johnson, J., Peter, N., Wagner, K., Fadigan, K., Jangaard, A., Stroup, E., and Wenger, A. (1998). *Family Learning in Museums: The PISEC Perspective*. Philadelphia: PISEC c/o The Franklin Institute.

Cotterill, S. and Richardon, L. (2009). *Can pledging increase civic activity? A literature review on developing community Pledgebanks*. London UK: Institute for Political and Economic Governance (IPEG): University of Manchester.

Creative Research Systems. (2012). The survey system. http://www.surveysystem.com/sscalc.htm#one

Geller, S.E. (1989). Applied Behavior Analysis and Social Marketing: An Integration for Environmental Preservation. *Journal of Social Issues, 45(1),* 17-36.

Monterey Bay National Marine Sanctuary Exploration Center. (n.d.). *Monterey Bay National Marine Sanctuary Exploration Center in Santa Cruz* [Brochure].

Stern, M., Powell, B., and Ardoin, N. (2008). What Difference Does It Make? Assessing outcomes from participation in a residential environmental education program. *Journal of Environmental Education, 39(4),* 31-43.

Stern, M., Powell, B., and Ardoin, N. (2011). Evaluating a Constructivist and Culturally Responsive Approach to Environmental Education for Diverse Audiences. *The Journal of Enviornmental Education, 42(2),* 109-122.