

# Use and Effectiveness of Discovery Carts

**A Summative Evaluation**

**Pacific Science Center**

*New Directions in Audience Research*

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## EXECUTIVE SUMMARY

### **EVALUATION PURPOSE**

The purpose of this evaluation was to determine which visitors are attracted to interpreter-staffed Discovery Carts and what behaviors they exhibit that reflect their learning experience. To do this, 348 observations of unique visitor interactions with Discovery Carts were collected from January 21 to February 17, 2010.

### **KEY FINDINGS**

*What age group is most attracted to the Discovery Carts?*

- Children ages 3 to 10 comprise the majority of visitors to the Discovery Carts.

*Who initiates the interaction between visitors and the cart?*

- The visitor initiates the majority of interactions at the cart rather than staff, although this is not true for every cart or age group.
- Staff initiates most interactions with very young children ages 0 to 2.
- Staff are more likely to initiate interactions at the Nanopalooza, Whales that Walked and Wild About Whales carts. They are least likely to initiate at the Butterfly House and Mesozoic Mysteries carts.

*How long do visitors stay at the carts and what influences length of stay?*

- Visitors on average spend about three minutes at the cart with about 22 percent staying longer than five minutes. Also, 24 percent of visitors spent less than one minute at the carts.
- The youngest (ages 0 to 2) and oldest visitors (ages 50 and above) spend less time than average.
- When staff initiated the cart visit, visitors spent more time at the cart.

*To what extent are visitors exhibiting learning behaviors during their interaction?*

- 63 percent of visitors demonstrate at least one of the six observed learning behaviors, although only about 12 percent demonstrate more than two.
- Wild about Whales cart inspires the most behaviors on average while the Bubbles and Butterfly House carts often inspire the least.
- Answering questions is the most common behavior observed, while verbalizing connections is the least.

## INTRODUCTION

### **PROGRAM GOALS**

The Science Interpretation Program (SIP) “provides personal, interactive, inclusive and fun one-on-one interactions that engage visitors of diverse backgrounds” and encourages visitors to appreciate or pursue STEM topics (Pacific Science Center, 2009). SIP is comprised of a variety of activities for visitors, including ten different Discovery Carts, wheeled carts that contain hands-on activities about a specific topic. SIP uses paid staff and volunteers ranging from high school students to retirees to act as interpreters.

Discovery Carts “allow one-on-one learning and personalized exploration that visitors may not encounter elsewhere at Pacific Science Center. They can provide a useful supplement to material already presented in our regular exhibits, and in some cases they present material not covered elsewhere” (Pacific Science Center, 2009). Other goals of the Discovery Carts are to provide:

- An engaging discourse that facilitates and builds upon visitors’ understanding and appreciation of science.
- A well-prepared and well-informed presentation on a specific science subject.
- A presentation style that can be adapted for a wide range of audiences.

### **EVALUATION FOCUS**

The *New Directions in Audience Research* project at the University of Washington’s Museology Graduate Program aims to prepare a new generation of museum practitioners with an understanding of evaluation. *New Directions* teams conduct evaluations at client museums in the Seattle area, learning and applying every step of the evaluation process.

In this project, four graduate students established a client-evaluator relationship with Pacific Science Center to conduct an evaluation of the Discovery Carts examining visitor use and behaviors at the carts.

This study used observation and timing methods to answer the following questions:

1. What age groups primarily use the Discovery Carts? Are some carts drawing specific age groups? Do some age groups not visit the carts at all?
2. Do visitors approach the carts on their own, or are they invited by the interpreter? Does age or cart topic influence the initial interaction with the cart?
3. Do carts move around the science center or stay in one place? Does a cart's location near or far from a related exhibit affect visitor time at the cart or the number of activities used?
4. How long do visitors stay at the carts? Does cart topic, location, or the visitor's age influence length of time at the cart?
5. Are Discovery Carts contributing to a deeper learning experience for the visitor and can this be demonstrated by visitors' learning behaviors?

This knowledge will give Pacific Science Center the ability to critically evaluate the Discovery Carts and create better visitor experiences by making informed changes to cart activities and staff training.

## **LITERATURE REVIEW**

Science Centers are known for interactive and hands on learning in their exhibits, and Discovery Carts highlight these experiences. It has been established that, “the interactive learner manipulates objects, explores variables and utilizes the evidence obtained in reaching a personal conclusion about the situation investigated. For example, children’s knowledge of the physical world is gathered largely through interaction with real objects (Their and Linn, 1976)”. Discovery Carts support this by offering multiple activities at each cart and the opportunity to touch, experiment and play with objects.

Another important feature of Discovery Carts is the presence of the interpreter. When the live interpreter is compared to the impact of other non-personal interpretive techniques the results tend to reinforce the importance of the human factor (Knapp, 2009). A report from the National Park Service Social Science Program analyzed data from 23 in-depth studies and found that interpreter led programs were ranked higher by visitors in importance and quality than almost all other interpretive media used such as brochures, self-guided exhibits, and audio/visual media. Staffed exhibits appear to be crucial to the visitor’s experience and learning.

Lev Vygotsky, a Russian educational theorist, wrote about the value of collaborative learning. He argued that before individuals have the capacity to go through an internal questioning process themselves, they must learn it through social discourse between themselves and other individuals (Vygotsky, 1978). For example, interpreters who pursue a line of questioning encourage the visitor to think and answer questions. Through this process the individual discovers more about the topic discussed and can later use the same process internally. This type of socially mediated learning becoming an internal process fulfills one ideal of what a museum's goal should be: "to lead people to mastery through appropriation, to help people make ideas their own so they can come to a deeper understanding" (Stanely, 1997). Interpreters are a valuable contribution to visitor experiences and learning, and Discovery Carts, which are always staffed while on the floor, apply these theories of social interaction and discourse.

Data collection for this project used a framework developed by Chantal Barriault that established a method of categorizing learning behaviors at science centers (Barriault, 1999). The assessment framework is intended to function as a tool to understand what visitors are experiencing and to create a profile of this experience. Barriault describes three levels of behaviors that indicate learning, the deepest of which are called "Breakthrough behaviors". This study referenced these Breakthrough behaviors in order to explore if these deepest behaviors occur while visitors are at a Discovery Cart. Barriault explains that assessing visitors' deep learning behaviors will inform the institution of what visitor Breakthrough behaviors are infrequent or missing and can encourage changes that will increase these behaviors to contribute to a richer learning experience (Barriault, 1999).



## **METHODOLOGY**

Between January 21 and February 17, 2010, 348 observations were conducted across 51 hours at ten different Discovery Carts at Pacific Science Center. The majority of observations were collected on weekends when more Discovery Carts are scheduled and the museum has higher attendance. Data collection was executed during two-hour shifts by the four main researchers on weekdays and nine other trained students scheduled across three weekends. An effort was also made to observe the carts at various times throughout the day.

### **SAMPLING**

Science Interpretation Program staff are scheduled throughout the day and if scheduled for a Discovery Cart, spend about one hour facilitating the cart out on the science center floor. Staff members can select which cart they want to present and are free to determine the cart's location. Occasionally, staff shifts overlap and there can be two carts being presented at the same time in different locations.

Data collectors observed the entire one-hour cart shift, if possible, and then moved on to observe the next cart coming onto the floor. They stood far enough away to avoid interfering with the interactions happening but close enough to hear conversation. Single visitor subjects were observed during their time spent at the cart. A systematic random sampling of cart visitors was accomplished by observing the next subject who approached as soon as the last subject had left. If a group of visitors approached at the same time, the data collector would ensure random subject selection by observing the visitor who approached in the right-most position relative to the collector's point of view.

### **DATA COLLECTION**

An observation sheet was developed for each individual cart that was customized to its available activities. A cover sheet allowed the data collector to note day and time and indicate on a simple museum map where the cart was located in relation to nearby exhibits. These instruments are included in Appendix A. Observations recorded on the sheet include the subject's age, gender, and time spent at cart, as well as how the interaction was initiated, which cart activities were presented by staff and which of the specific deep learning behaviors were demonstrated by the subject.

While observations noted which staff members were facilitating the cart and some of their actions, these data were only used in aggregate to draw conclusions about how visitors might best be served and how training might be tailored to staff needs. No part of the data collection and analysis process was meant to evaluate the performance of individual staff members.

## **TERMINOLOGY**

### ***Cart Descriptions and Activities***

Ten different Discovery Carts were observed in this study and they represent a wide range of subjects and available activities. Some relate to exhibits within the science center while others do not. Short descriptions for each can be found in Appendix B.

### ***Science Interpretation Program Training Levels***

The Discovery Carts are facilitated by both paid staff and volunteers, all of whom are part of the Science Interpretation Program. Discovery Cart facilitators can be Science Interpreters (paid staff), Volunteer Science Interpreters (volunteers), or Discovery Corps Members (high school volunteers). Each type of position includes several levels of responsibility and training. Refer to Appendix C for a more detailed description of each position.

### ***Interaction Initiation***

Part of the focus of our research included looking at how the subject approaches the cart. We observed whether the subject was invited or called over by someone, such as the interpreter staff or other visitor, or whether they approached the cart on their own initiative. For the purposes of this study, the ‘interaction’ is referring to the visitor stopping at the cart and ‘initiation’ refers to how that stop was instigated.

### ***Learning Behaviors***

This research was informed, in part, by a framework developed by Barriault (1999) that organizes visitor behaviors observed at exhibits in science centers into three categories that reflect the depth of learning indicated. The complete chart of learning behaviors can be found in Appendix D. This useful tool allows the highly individualized nature of the visitor learning experience to be assessed. Through observations of visitors interacting with exhibits, Barriault suggests that practitioners can determine which of the learning behaviors from the chart are displayed most often in order to assess the level at which visitors are taking advantage of the exhibits’ learning opportunities.

We specifically chose to look at the behaviors listed as Breakthrough behaviors, the deepest learning level of the chart, as reference for the slightly modified list of learning behaviors used in this evaluation. The visitor behaviors observed in this study included: answer a question, ask a question,

share information, refer to an exhibit, refer to past experiences, and verbalize connections of objects, activities, or ideas at the cart. These behaviors acknowledge the relevance and learning gained by the visitor and reflect commitment by the visitor to further explore the ideas being presented. These behaviors also show that a personal level of comfort has been established that allows for these free-flow exchanges enabling real learning to occur (Barriault, 1999).

It is important to note that this type of assessment does not measure cognitive gains, such as specific facts being learned. Because of the highly individualized and free-choice nature of the experience, it would be inappropriate to require all visitors to gain the same learning outcome. Also, this study only looked for six specific deeper-level behaviors. It should not be assumed that other learning behaviors, such as those included in Barriault's first two levels of Initiation and Transition, did not also occur. Barriault did find, however, that while the behaviors can occur in a variety of sequences, there was a broad trend that the visitor behaviors in each subsequent level reflected increased involvement and a deeper learning experience.

## RESULTS

### AVERAGES AND TOTALS

#### *I. Visitor Demographics*

The research team conducted observations of 348 visitors. In this sample, the most common age groups were ages 6 to 10 (39%) and ages 3 to 5 (23%). The complete age distribution can be seen in Figure 1.

Figure 1. How old are visitors to the Discovery Carts?

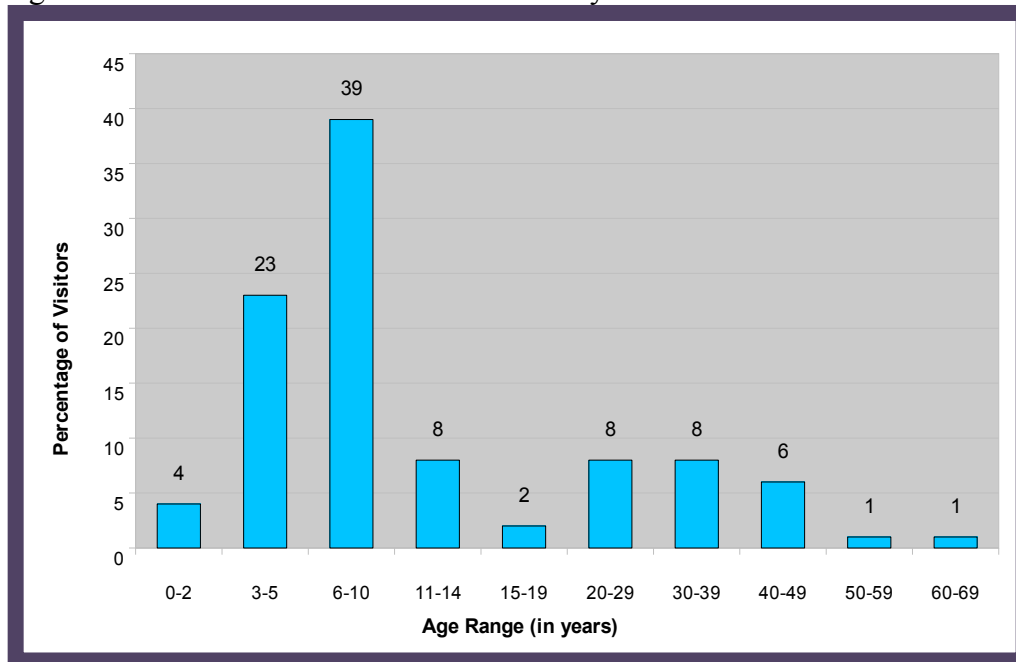


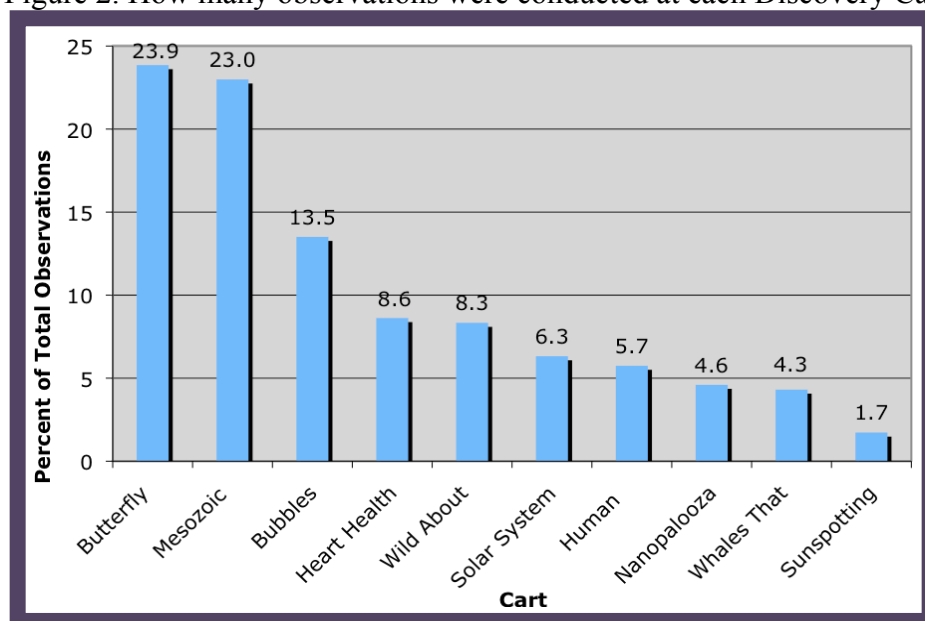
Figure 1 shows a pattern of heavy attendance by elementary- and middle-school-aged children (ages 3 to 14) and a gap in high-school-aged visitors. Adults ages 20 to 49 make up 22 percent of the sample; the age range of these adults indicates that they might be the parents of the child visitors.

There was no gender imbalance in the sample: 51 percent of the subjects were female and 49 percent male.

#### *II. Carts and Locations*

We observed visitors at ten different Discovery Carts. Figure 2 shows the percentage of total observations conducted at each cart.

Figure 2. How many observations were conducted at each Discovery Cart?



The majority of the observations we conducted (82%) were at carts that are related to specific exhibits on the floor. The remaining 18 percent of observations were at carts unrelated to any exhibits. Knowing that interpretive staff are allowed to locate the carts wherever they wish, we expected that the location of carts relative to their related exhibits might affect variables such as time spent at cart or behaviors demonstrated. However, for 96 percent of the observations at carts that were related to exhibits, the carts were located near those exhibits, so we were not able to resolve this question. For further discussion, see Limitations.

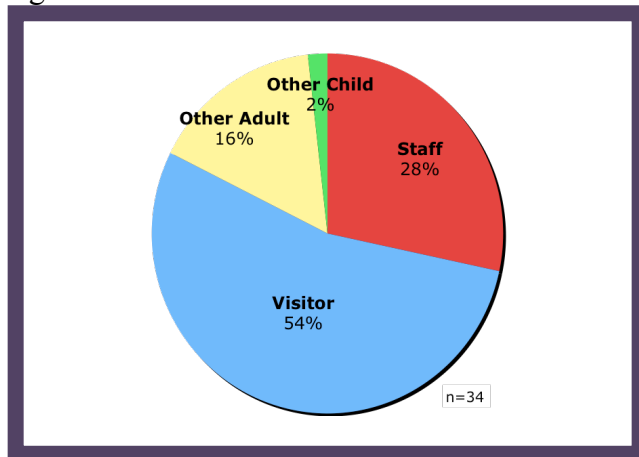
### III. Staff

Pacific Science Center staff and volunteers who work with the Discovery Carts can be classified by their training level; we observed staff at six different levels (see Appendix C). Although we noted each staff member's training level and performed every possible cross-category analysis, we did not find any significant correlations. There appears to be no effect of training level on initiation of interaction, time spent at the cart, number of activities, or learning behaviors.

### IV. Initiation of Interactions

The majority of visitor interactions with the cart are initiated by the visitor (54%), with staff-initiated interactions making up the next largest category (28%). Figure 3 shows the breakdown of interaction initiations.

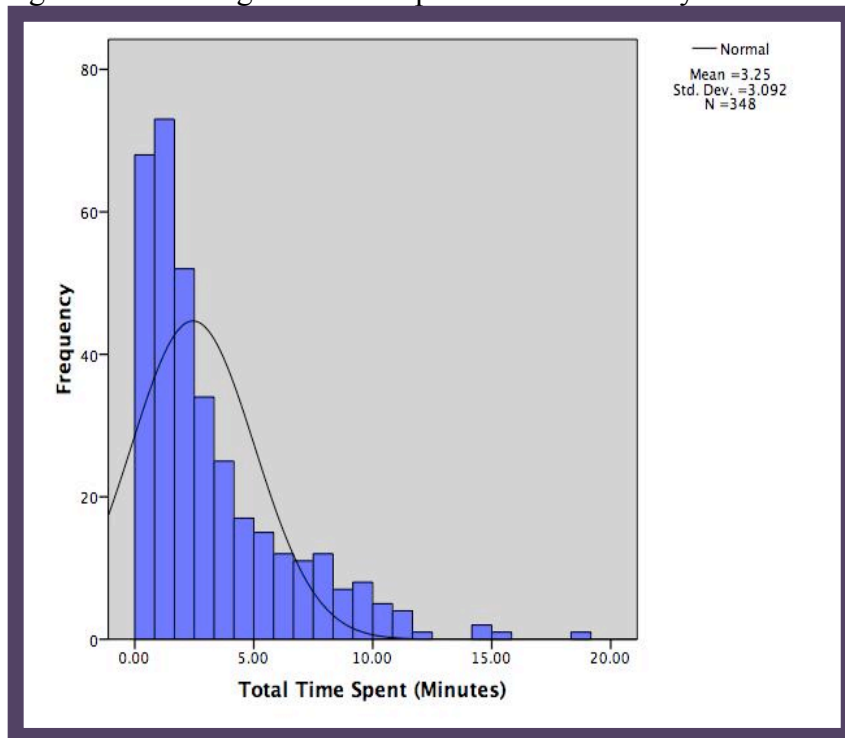
Figure 3. Who initiates interactions at the Discovery Carts?



### V. Time Spent

Visitors spent an average of 3 minutes and 15 seconds at the carts, with a median time of 2 minutes and 9 seconds. The distribution of time spent can be seen in Figure 4.

Figure 4. How long do visitors spend at the Discovery Carts?



The data show a roughly quartile breakdown across the 1<sup>st</sup> and 5<sup>th</sup> minute markers. 24 percent of visitors spent less than one minute at the carts, 54 percent spent one to five minutes, and 22 percent spent more than five minutes. Only 6 percent of visitors were observed making multiple visits: leaving the cart and then returning later.

## VI. Cart Activities

Carts have varying numbers of associated activities. Thus, although we can report an average number of activities engaged in per visit (1.39), it is more useful to examine the proportion of possible activities engaged in per visit. Visitors engaged in a mean of 34 percent and a median of 25 percent of available activities per visit. Our sample size for these analyses was 228, because some of the activities-related data were unreliable and could not be used. For further discussion, see Limitations.

## VII. Visitor Behaviors

We observed six different visitor behaviors that indicate deep learning experiences. Figure 5 shows that the majority of visitors demonstrate either zero learning behaviors (37%) or only one (33%), while Figure 6 shows that the most common visitor behavior was answering questions (45%), followed by asking questions (31%).

Figure 5. How many learning behaviors did visitors demonstrate?

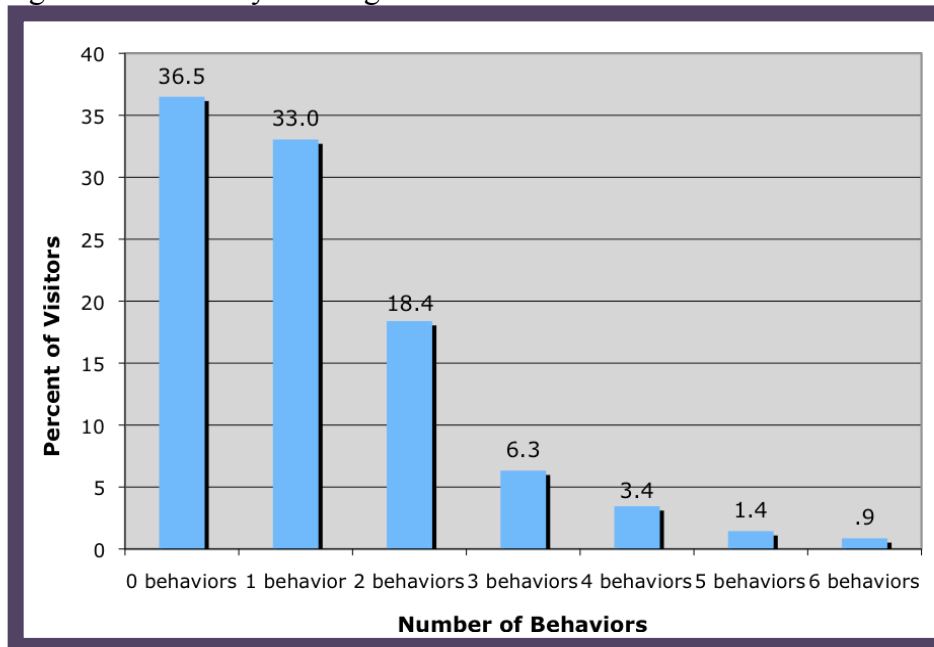
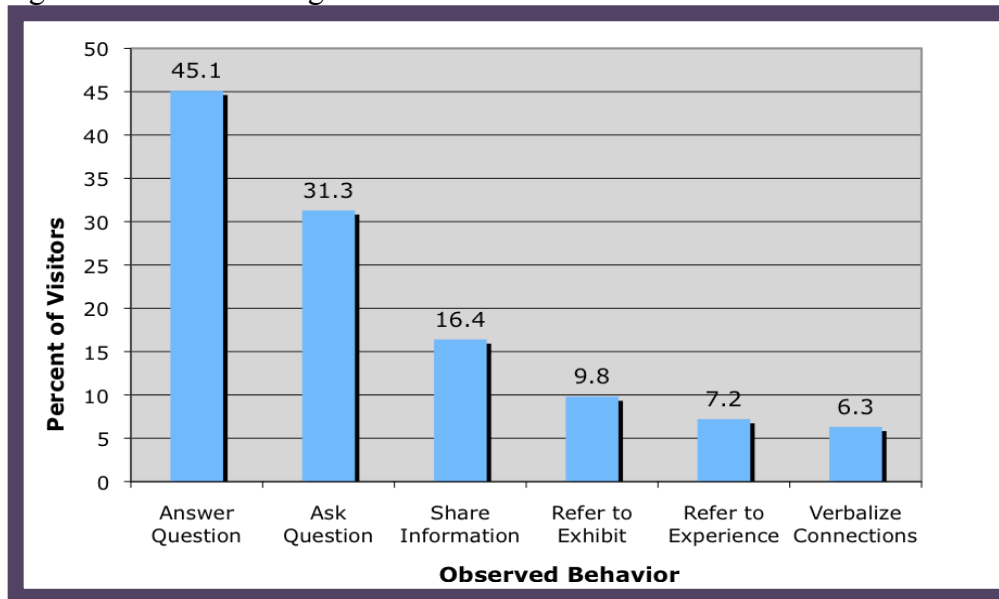




Figure 6. Which learning behaviors did visitors demonstrate?



## CORRELATIONS

### I. Correlations with Age

#### 1. Age and Cart

Most of the carts do not differ from the expected age distribution: the greatest number of visitors fall in the 3 to 14 age range, while the next largest group is 20 to 49. The Butterfly House cart has a higher number of visitors ages 20 to 29 than would be predicted using the overall distribution, while the Whales that Walked cart saw an unusually high number of visitors ages 0 to 2. However, Whales that Walked has a small sample size of 15, which may explain the age variance we noted.

#### 2. Age and Initiation

Figure 3 showed that the majority of cart interactions are initiated by the visitor. This is true for all age groups except ages 0 to 2, for which staff initiate the majority (50%) of the interactions. We also noted a trend that as age increased, so did the frequency with which visitors initiated the interaction.

#### 3. Age and Time Spent

The average time spent per visit across all age groups is 3 minutes and 15 seconds. Some age groups varied in their mean time spent at the carts. Visitors ages 0 to 2 and older than 50 spent the least time at the cart. Visitors ages 15 to 19 and 40 to 49 spent the most time at the cart. Table 1 lists the average time spent by each age group.

Table 1. How does visitor age affect time spent at a cart?

<b>Age Range</b>	<b>Avg. time spent (min.)</b>
0-2	2.45
3 to 5	3.43
6 to 10	3.53
11 to 14	3.14
15 to 19	3.65
20 to 29	2.28
30 to 39	2.73
40 to 49	4.34
50 to 59	1.35
60 to 69	0.64
<i>Total</i>	3.25

#### 4. *No Correlation with Age*

We had expected that age might be correlated with multiple visits, as we noticed during pilot testing that children tended to wander away from the carts and then return later. However, no statistically significant correlation was found between age and incidence of multiple visits.

## II. *Correlations with Initiation*

### 1. *Initiation and Cart*

On average, visitors initiated most interactions, followed by staff, followed by other adults. Five carts varied from this pattern, however. At the Nanopalooza, Whales that Walked, and Wild About Whales carts, staff initiated the most interactions (63%, 54%, and 52%, respectively). At the Butterfly House and Mesozoic Mysteries cart, visitors still initiated the most interactions, but the second-highest category was other adults rather than staff.

### 2. *Initiation and Time Spent*

Interactions initiated by staff were, on average, longer than those initiated by all categories of visitor. Table 2 shows the correlation of initiation and time spent.

Table 2. Is time spent at the cart affected by who initiated the interaction?

<b>Who Initiated?</b>	<b>Mean Time (min.)</b>
Staff	3.91*
Visitor	2.95
Other Adult	3.67
Other Child	2.08

\*Significance:  $p < .05$ .

### 3. *Initiation and Answering Questions*

Analysis of the deep learning behaviors broken down by who initiated the interaction revealed a statistically significant trend: when visitors were called to the cart by a staff member, they were more likely to answer questions. None of the other learning behaviors appeared to be affected by initiation.

### 4. *No Correlation with Initiation*

We found no correlation between gender and initiation; it seems that the visitor's gender does not change the likelihood of the visitor or staff member initiating the interaction. In addition, although staff initiation was correlated with increased time at the cart, as noted in Table 2, neither the proportion of activities engaged in nor the number of deep learning behaviors demonstrated were influenced by who initiated the interaction.

## III. *Correlations with Time Spent*

### 1. *Time Spent and Cart*

The mean time for a visit was 3 minutes and 15 seconds. Visitors spent a shorter than average time at the Butterfly House (2.03 minutes) and Whales That Walked (2.05 minutes) carts. Visitors at the Sunspotting and Solar System carts tended to spend longer than average (5.3 and 4.6 minutes, respectively), but these carts had a small sample size and high variability.

### 2. *Time Spent and Behaviors*

We found a slight positive correlation between time spent at the cart and number of deep learning behaviors demonstrated.

#### IV. Correlations with Behaviors

##### 1. Behaviors and Cart

Visitors demonstrated a mean of 1.15 deep learning behaviors. Figure 5 shows that almost 70 percent of visitors show one or no behaviors, while almost 88 percent show two or fewer. We compared the number of behaviors observed at different carts to determine if cart topic had an effect on visitors' learning behaviors. The Wild About Whales cart inspired the most behaviors (2.1), while visitors at the Bubbles cart showed the least (.6). At only two carts did we observe all six deep learning behaviors: Wild About Whales and Mesozoic Mysteries. In contrast, visitors at the Bubbles cart and the Butterfly House cart often demonstrated no deep learning behaviors.

##### 2. Behaviors and Cart Location

Visitors at carts located near related exhibits demonstrated significantly more deep learning behaviors, 1.24 behaviors on average, than visitors at carts that were unrelated to exhibits or were not close to their related exhibits. Table 3 shows the average number of behaviors demonstrated for each category of cart location.

Table 3. Does cart location relative to related exhibit affect number of behaviors?

<b>Related to exhibit?</b>	<b>Mean # of Behaviors</b>	<b>Sample Size</b>
Close to related exhibit	1.24*	270
Not close to related exhibit	0.83	12
Not related	0.78	63

\*Significance:  $p < .01$ .

##### 3. No Correlation with Behaviors

We found no correlation between age of visitor and observed deep learning behaviors.

#### LIMITATIONS

Two primary limitations were recognized during the planning and implementation of the evaluation project. One of the limitations was the result of using fellow New Directions graduate students as data collectors, who were receiving their first exposure to the field of audience research. The second was caused by previously unrealized similarities in the physical placement of the cart among the interpreters.

Graduate students enrolled in an introductory audience research course completed a total of four hours of data collection each to assist us with this project. The assistance of these students enabled us to expand the breadth of our data collection to include weekdays and weekends almost equally. A misunderstanding within the large group of data collectors resulted in a reliability issue with the specific variable of observed activities presented by interpreters. This variable was not a major focus of this study and by not using data deemed questionable by the team, this issue did not significantly affect the reliability of the analysis or results.

The final limitation provided interesting contextual information, but offered little opportunity for any analytical conclusions. While the SIP staff and volunteers have the ability to set up the Discovery Carts anywhere within the science center, very little variability in positioning was observed. Originally, we hoped to ascertain whether physically positioning the carts that were related to an exhibit in the science center away from the associated exhibit had an impact on the visitors' behavior or length of stay.

Of the 348 total observations, 78.3% of the carts were located close to a related exhibit, 18.2% had no relationship to any exhibit within the Pacific Science Center, and only 3.5% of the carts were ever positioned near an unassociated exhibit. However, each individual cart was very rarely moved from the same general position from observation to observation. Consequently, the lack of variance in where the cart was stationed made comparisons of length of stay and cart activity impossible.

## CONCLUSIONS

### **DISCUSSION**

Discovery Carts at Pacific Science Center provide engaging learning experiences on various science topics for visitors. The average cart visitor is between ages 3 to 10, initiates the interaction with the cart, and stays at the cart about three minutes. Average visitors use one or two activities at the cart and answer questions posed to them.

Discovery Carts are primarily used by children ages 3 to 10. This poses an opportunity to develop carts geared toward the interests and developmental level of these age groups. Additional cart materials or new carts may take into consideration the specific age groups that use the carts most frequently when developing curriculum or activities.

Visitor interactions initiated by a staff member are correlated with longer visit times at the cart. We identify two possible reasons for this correlation. It was often the case that other visitors were already at the cart when the observed subject approached, and this could decrease the likelihood that the staff would initiate an interaction with the subject. If the staff member was occupied with another visitor, the subject might be more likely to leave the cart sooner. Alternatively, it could be the case that staff who feel comfortable initiating interaction are more likely to continue to engage with the visitor, resulting in longer visitor interactions. In either case, encouraging staff to initiate interactions more frequently may contribute to longer interactions with the carts.

This evaluation observed deep learning behaviors referenced from Barriault's framework. These behaviors reflect visitors' experiences at the carts and how they take advantage of learning opportunities. Other learning behaviors from Barriault's framework may have been occurring but were not recorded in this study. The most common deep learning behaviors displayed by visitors were answering and asking questions, while the least common were referring to a previous experience and verbalizing connections. Cart staff may wish to focus on promoting the less common deep learning behaviors. For example, by relating cart content to nearby exhibits, staff can model the behavior of referring to exhibits or even other experiences outside the museum.

## SUMMARY

With the knowledge that interpersonal interaction contributes to learning, Pacific Science Center developed the Science Interpretation Program to facilitate these interactive experiences within the context of informal science learning. This study specifically focused on one of the SIP elements, Discovery Carts, in an effort to understand the parameters of the visitor experience. We used observational methods to examine how visitors used cart activities, how they interacted with the staff interpreters, and how those interactions might affect their deep learning behaviors. Our findings will be instrumental in future cart development and staff training to better suit the needs of the Discovery Cart audiences.

## RECOMMENDATIONS FOR FUTURE STUDY

The list of learning behaviors used in this study was adapted from Barriault's framework (Appendix A). The most commonly observed behavior from our list was *answering questions*, which was not included in the original framework and is also the most reliant on the performance of the interpreter. Analysis of the data related to observed behaviors could be redone without including *answering questions* to focus more solely on visitor driven behaviors.

- This study focused on the deepest level of learning behaviors included in Barriault's framework. Another study could be conducted to observe for all of the learning behaviors included in the framework to create a profile of the range of learning behaviors at the cart.
- This study's observations took place solely at the Discovery Carts. Another study could compare the visitor experience at exhibits or other SIP activities with the experience at the carts.
- It was observed that most of the carts are almost always placed in the same location every time they are presented. An experiment could be conducted to place carts in different locations to investigate the influence of a cart's location on the visitor experience.
- This study utilized quantitative observational data to try to understand how visitors are using the carts. Gathering qualitative data through surveys or interviews with participating visitors and/or staff would add further insight into the cart experience.

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## APPENDIX A: DATA COLLECTION INSTRUMENTS

### COVER SHEET

Researcher: \_\_\_\_\_

Cart: \_\_\_\_\_

SIP Staff: \_\_\_\_\_

Date: \_\_\_\_\_

Day: \_\_\_\_\_

Scheduled  
Start Time: \_\_\_\_\_

Related to exhibit: 1 2 3

- 1: close to related exhibit  
2: NOT close to related exhibit  
3: NOT related to exhibit

### Actual Location:

Draw an X on map to indicate precise location of cart.

1 Butterfly House

2 Insect Village

3 Empty space

4 Genetics

5 Naked Mole Rats

6 Whales

7 Solar System

8 Video Games

9 Water Play

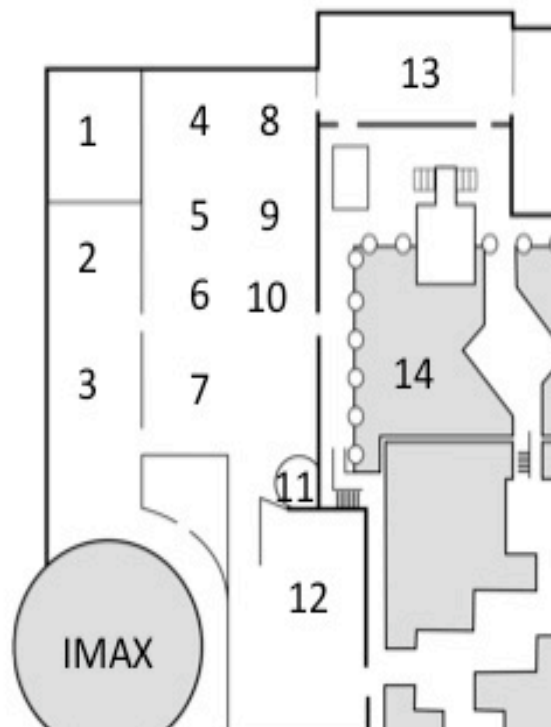
10 Tide Pool

11 Planetarium

12 Dinosaurs

13 Body Works

14 Ponds



# OBSERVATION SHEET

Sheet #: \_\_\_\_\_  
Entered: \_\_\_\_\_

**Cart Name**  
Start time : : Stop time: : : Multiple Visits Occurred: \_\_\_\_\_  
Use seconds!

Gender: M F

Age: 0-2 3-5 6-10 11-14 15-19 20-29 30-39 40-49 50-59 60-69 70+

Initiated by: Staff Visitor Other Adult Other Child \_\_\_\_\_

Activities: Description:	Occurred	Notes:

Visitor Behaviors:	Occurred	Notes:
asks questions:		
answers questions:		
refers to exhibits:		
refers to experiences:		
shares information:		
verbalizes connections		

## **APPENDIX B: CART DESCRIPTIONS & ACTIVITIES**

The following descriptions were compiled using the Pacific Science Center’s staff training guides.

### ***Bubbles***

Designed to increase awareness and excitement of science in everyday places, while introducing the complicated subject of bubbles through the use of bubble “goop”, straws, and wands.

### ***Butterfly House***

Introduces visitors to butterflies and the Tropical Butterfly House through an exploration of butterflies’ unique adaptations and habitats using props such as butterfly specimens and magnifiers.

### ***Heart Health***

Provides visitors with new knowledge about the function of the circulatory system and the biology of heart disease through heart models, heartbeat sounds, and circulatory system floor rug.

### ***Human Evolution***

Engages visitors in an investigation of the evolutionary history of human beings and involves props such as skulls and pictures.

### ***Mesozoic Mysteries***

Helps visitors see earth as an ever-changing environment and explores dinosaurs, fossilization, and Earth history through models, fossils, and diagrams.

### ***Nanopalooza***

Explores the scale and science of nanotechnology and application possibilities for the fields of medicine, science, and industry through props such as product samples and a measuring stick.

### ***Solar System***

Investigates the physical dynamics of the solar system through models and pictures.

### ***Sunspotting***

Lets visitors explore daytime astronomy by observing the sun through a telescope.

### ***Whales that Walked***

Engages visitors to investigate some of the major concepts of whale evolution using models and bones.

### ***Wild about Whales***

Introduces the interesting physical and behavioral traits of whales of all types through props such as models, teeth, and blubber.

## **APPENDIX C: SIP STAFF TRAINING LEVELS**

### ***Discovery Corps***

#### *Discovery Corps Members*

Discovery Corps members range from volunteer (Discovery Corps Assistants) to paid positions (Discovery Corps Interpreters and Senior Interpreters). They begin working with a few floor positions and through training and promotions, learn all floor positions and a Discovery Cart.

### ***Volunteer Science Interpreters***

#### *Volunteer Science Interpreter 1*

Volunteer Science Interpreter 1's work alongside Science Interpreters on the exhibit floor staffing positions, delivering interpretive programs and assisting in operations. No Volunteer Science Interpreter 1's were observed in this study, since they do not present Discovery Carts.

#### *Volunteer Science Interpreter 2*

Volunteer Science Interpreter 2's fill all functions as Volunteer Science Interpreter 1's. They also present Discovery Carts.

#### *Volunteer Science Interpreter 3*

Volunteer Science Interpreter 3's fill all functions as Volunteer Science Interpreter 2's. They also train new hires and new volunteers on exhibit positions through the shadowing system.

### ***Science Interpreters***

#### *Science Interpreter 1*

Science Interpreter 1's staff exhibit positions, deliver interpretive programming and assist in other operational functions.

#### *Science Interpreter 2*

Science Interpreter 2's fill all functions as Science Interpreter 1's. They also train new hires and new volunteers on exhibit positions through the shadowing system.

#### *Science Interpreter 3*

Science Interpreter 3's fill all functions as Science Interpreter 2's. They also deliver live science demonstrations or planetarium shows.

## APPENDIX D: BARRIAULT LEARNING BEHAVIORS FRAMEWORK

### The Science Center Learning Experience: A Visitor-Based Framework

In Barriault's (1999) study, data analysis revealed that there are eight discrete learning behaviors that occur as part of a visitor's interaction with an exhibit and that these behaviors can be grouped further into three categories that reflect increased involvement and depth of the learning experience.

Learning Behavior	Depth of Learning
Doing the activity	Initiation behaviors
Spending time watching others engaging in the activity	
Information or assistance offered by staff or other visitors	
Repeating the activity	Transition behaviors
Expressing positive emotional response in reaction to engaging in activity	
Referring to past experiences while engaging in activity	Breakthrough behaviors
Seeking and sharing information	
Engaged and Involved: testing variables, making comparisons, using information gained from activity	