

Plastics Unwrapped: A Summative Evaluation

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Chapter 1

Introduction

Project Background

In keeping with their vision statement, “to inspire people to value their connection with all life---and act accordingly,” the Burke Museum of Natural History and Culture (Burke) designed and installed *Plastics Unwrapped*. On display in Seattle from December 20, 2012 through May 27, 2013, the exhibit tells the story of plastic and the rapid and transformative impact it has had on society since its invention. The exhibit includes sections on life before plastic, the science of how plastic is created, the medical benefits and concerns related to the use of plastic products, the environmental concerns related to plastic waste, and a section on rethinking the plastic products people purchase. The main idea the exhibit explores is the complicated legacy of plastic, in that it has improved life in many ways, but not without serious impact on people and the environment. *Plastics Unwrapped* also highlights how these impacts can be limited by acting responsibly. The exhibit occupies a space of 2,000 square feet.

The Burke Museum developed *Plastics Unwrapped* as part of a larger strategic plan that supports not only the museum’s vision, but also its mission to “create a better understanding of the world and our place in it.” One of the key factors in the strategic plan includes a focus on the type of exhibits being presented as a means of raising the museum’s visibility. The museum is prioritizing exhibits that address contemporary issues, allowing for visitors to learn about critical topics that connect people to the world around them while also increasing their recognition of the Burke brand. When designing the exhibit, Burke staff and advisors articulated that the objectives and goals were to carry out and support the museum’s mission and vision, and to support the strategic goals of strengthening the museum’s brand and essential partnerships.

A front-end evaluation was carried out in advance of the exhibit's development in the spring of 2011. The two-part evaluation was conducted with Burke visitors to assess interest in and previous knowledge of the topic of plastic. The study consisted of 45 onsite interviews with Burke visitors, as well as an online questionnaire completed by 104 Burke members (Visscher & LaPlant, 2011). The study found that most visitors were interested in learning about the topic of plastic, but not necessarily as it related to recycling or their own behavior.

This paper describes a summative evaluation study of the installed exhibit, assessing visitor responses to *Plastics Unwrapped*. Data were collected from a total of 60 visitors in March and April 2013. Specifically, 30 individuals were tracked during their time in the exhibit and 30 were interviewed following their exhibit experience. Evaluation results will inform how the staff evaluates other exhibits, demonstrate impacts in grant seeking activity, inform the museum's larger strategic plan, and allow the staff to learn more about the visitor experience with contemporary environmental exhibit topics.

Purpose of the Evaluation Study

The purpose of this study was to explore visitor responses to *Plastics Unwrapped* three main evaluation questions, developed in conjunction with the Burke exhibit development team:

1. Where do visitors go and how much time do they spent in the *Plastics Unwrapped* exhibit?
2. What knowledge and information are visitors taking away from *Plastics Unwrapped* and from what section of the exhibit are they getting this information?
3. What are the expressed attitudes of visitors toward plastics use after visiting the exhibit?
4. In what ways did the exhibit influence the visitors' perceptions of the Burke?

Chapter 2

Literature Review

Significant research has been conducted to examine the best practices and methodology for summative evaluations. In addition, there are a number of summative evaluation studies that have looked at exhibits with similar goals to *Plastics Unwrapped* in determining effectiveness of messaging and visitors' engagement with the topic. There are three main bodies of literature that are relevant to consider in relation to this report; evaluation done on exhibits that relate to environmental issues, evaluation done at natural history museums, and studies previously conducted at the Burke Museum.

A good deal of research has been conducted that examines the best practices and methodology for summative evaluations, which were useful when designing the methods for this project. One primary evaluation question addressed in this study is determining how much of the exhibit's intended messaging is reaching the visitor and how much informational knowledge visitors obtained from the exhibit about plastic. However, measuring impact is one of the most difficult aspects of evaluation. As outlined in *Practical Evaluation Guide*, "the complexity and diversity of learning...requires evaluators to think carefully about the design and use of appropriate measures of learning" (Diamond, Luke, & Uttal, 2009, p. 19). Framing is critically important when trying to determine what a visitor takes away from an exhibit. When directly communicating with a visitor in an interview or a survey, it is possible to determine what they *report* learning or understanding, but that should not be taken as necessarily providing a complete picture for the questions explored in any study.

One way to overcome the limitations of measuring self-reported responses from participants is to utilize a multiple methods approach. Multiple methods result in different kinds of data that can be triangulated in order to create a more robust response to evaluation questions.

Combining multiple methods allows for different kind of data to be collected and then measured and compared, offering a more holistic picture in answering research questions. This can allow for a richer analysis because “there is more insight to be gained from the combination of both qualitative and quantitative research than from either form by itself” (Creswell, 2009, p. 203). The kinds of questions addressed in this evaluation of *Plastics Unwrapped* are particularly suited to a multiple methods approach due to the desire to not only find out what messages and impacts are sticking with visitors, but also where in the exhibit these things are happening and what elements are responsible.

Observation of the visitor in the space is a key tool to gain “insight into what exhibits or objects” visitors engage with and *how* they do so (Diamond, Luke, & Uttal, 2009). Although observation of visitor behavior in a gallery does not result in impact data in the same way that direct qualitative communication can, evidence “strongly supports the feasibility of using observable behavior and time at exhibit as predictors of learning” (Falk, 1983). Systematically and deliberately observing for predefined or unusual behaviors and recording where visitors go in an exhibit, what they do, and how long they stay in a particular area provides useful data surrounding the accessibility and effectiveness of exhibit elements.

A number of evaluation studies have examined the topic of environmental awareness, as *Plastics Unwrapped* does. Some of the work done on the impact of environmentally themed exhibits has occurred in zoos, aquaria, and science centers rather than in a natural history museum. These studies were useful for developing a framework in which to think about concepts explored in *Plastics Unwrapped* in measurable terms that also capture, as much as possible, the impact an exhibit has on a visitor. This area of evaluation has focused on some of the most relatable questions on environmental messaging. Those detailed below in this report were

examined with closer scrutiny because they are fairly typical in that they focus on messaging in a way that relates to this study. Though one project was conducted nearly 20 years ago, and the other more recently, they both address similar questions.

A study conducted at the Science Museum of the University of Mexico looked at the ways environmental topics were addressed in the then recently opened Biodiversity Hall (Bravo, Lopez de Lara & Zamora, 1994). The researchers focused on evaluating how the exhibit designers' intended messages were impacting visitors. One of the chief aims of the Hall is to "encourage visitors to value national biodiversity and to eventually take concrete steps to protect it" (Bravo, Lopez De Lara , & Zamora, 1994, p. 199). Trying to measure impact in terms of some action visitors may take in the future as a result of the exhibit is nearly impossible, so the evaluators in this exhibit chose to focus on what conceptual information visitors reported knowing about biodiversity, and where they reported obtaining that information.

Without using the word biodiversity, researchers interviewed visitors about their knowledge of environmental issues related to biodiversity within their country. The report revealed that visitors did have some conceptual awareness of the topic in a more general sense, and that the messaging of the exhibit contributed to that knowledge. It also recommended that environmental exhibits should frame their messages clearly and in relation to specific biodiversity problems targeted to communities they impact. When analyzing the results, the report concluded that the exhibit did create conversation and served as an educational resource for visitors, but that exhibits of this type might better achieve stated goals if they have more focus on problems and communities (Bravo, Lopez De Lara , & Zamora, 1994).

Another more recent example of evaluation on an environmental topic is a summative study conducted in 2011 by Randi Korn and Associates at the Los Angeles Zoo and Botanical

Gardens California Condor Zone exhibit. Again, this study evaluated whether or not specific exhibit goals were accomplished, but with a very explicit focus on the environmental issues that impact the endangered California condor. The exhibit focused more on a specific problem relating to a community with the goal of “increasing knowledge of California condors, demonstrat[ing] why people should care about condors, and increase[ing] understanding of [the] LA Zoo’s participation in condor conservation” (Korn & Associates, 2011). The targeted approach to environmental issues seemed to yield understanding of the exhibit’s intended messages among visitors surveyed.

From the interviews and observations conducted, the study also found that the Condor Zone effectively communicates most of their goals to visitors. “Nearly all visitors, adults and children, reported leaving the space knowing something [more] about condors, including the environmental threats and actions taken to protect the species” along with a reinforcement of the idea that the condor is an important issue for the environment of California (Korn & Associates, 2011, p. 3). The one goal which was less effective in the exhibit was the communication of the LA Zoo’s contribution to condor conservation. Visitors reported leaving Condor Zone with more conceptual knowledge about condor conservation in general, but not explicit awareness of the zoo’s activity in this area (Korn & Associates, 2011) .

Summative evaluation studies conducted in natural history museums tend to focus not so much on environmental or current issues per se, but more on whether or not the goals and messages articulated or presented in an exhibit are reaching visitors as intended. For a typical example, this summative study conducted at the Yale Peabody Museum of Natural History in 2008 examined the temporary exhibit “Travels in the Great Tree of Life”, with a focus on the effectiveness of the exhibit’s goals, including expanding visitor awareness of evolutionary

research (Giusti, 2008). The study utilized a multiple methods approach, but also paid particular attention to what aspects of the exhibit achieved these goals, and whether or not visitors recognized the topic of evolutionary research as current and relevant to the world beyond learning for the sake of knowing more. The study found that though visitors did leave the exhibit with an increased understanding of evolution and the fact the related research was ongoing, the practical applications of that research within the context of natural history “were not communicated to visitors as effectively as they might have been” (Giusti, 2008, p. iv). Visitors who participated in the study had a hard time connecting how learning more about the ‘tree of life’ had importance to society and how that applied in a natural history context. Current issues, such as those addressed in an exhibit such as *Plastics Unwrapped*, may be more challenging for natural history museums to present to visitors as a relevant part of their role.

Within the field of there is a lot of current conversation surrounding the future relevance of natural history museums and their role in informal education. In February 2012, the Smithsonian held the 21st Century Learning in Natural History Settings to address this discussion. The conference sought to “initiate, and disseminate a collaborative and sustained learning research agenda to inform how natural history museums can best use their resources to support our audiences in the 21st Century” (Public Value Working Group, 2012). Specifically, parts the discussion focused on what kinds of topics natural history museums have a responsibility cover in current times.

Conference participants affirmed that “humanity is embedded within nature and we are at a critical moment in the continuity of time, [that] the human species is actively altering the Earth’s natural processes [and that] as the sentient cause of these impacts, we have the urgent responsibility to give voice to the Earth’s immense story and to secure a sustainable future”

(Public Value Working Group, 2012). Though natural history museums thus far have not been as engaged in current environmental topics as other informal learning institutions, it is clearly a topic that will guide the field going forward. Exhibits such as *Plastics Unwrapped* represent a shift in emphasis for natural history museums.

As discussed earlier, a front-end evaluation of *Plastics Unwrapped* was conducted in two parts in May 2011 and July 2011 with the Burke Audience to “assess levels of interest and previous knowledge around the topic of plastic” (Visscher & LaPlant, 2011). The first part of the study consisted of 45 onsite interviews conducted with visitors, and the second part of the study was an online questionnaire dispersed among Burke Museum members, which received 104 responses. This front-end study was used largely to determine what areas of interest Burke visitors had about plastic and whether they were interested in seeing an exhibit about plastic. The questions they responded to informed some of what ended up going in the actual exhibit, as well as some of the evaluation questions in this study.

The findings of the front-end study supported the idea that there was interest in an exhibit about plastic among Burke audiences (Visscher & LaPlant, 2011). Both visitors in person and Burke members online were asked what they found to be most and least interesting topic areas about plastic from a choice of seven topics. Both the online and in person participants experienced approximately the same amount (20%) of interest in learning about “Life Before Plastics” and “Plastics Science and Engineering”. (Visscher & LaPlant, 2011). The topics that visitors said they found most interesting ended up as sections of the actual exhibit which will be measured in this study. Both elements of what this study determined to be most and least interesting to visitors influenced the final execution of the exhibit, and this summative evaluation reports on data regarding the engagement outcomes in those areas.

Another summative evaluation was conducted at the Burke for the *Coffee: The World in Your Cup* exhibit. The exhibit was at the Burke from January 24th 2009- September 7th of that year. Data for the study were collected between April and May 2009, and consisted of two parts: timing and tracking instrument as well as an exit interview conducted with a pre-visit, immediate visit, and post visit audience group. The goals of the study were to “describe the nature of the exhibit experiences for adult and family visitors” and to “assess responses of visitors to the museum’s intended messages *and* motivations for behavior change related to the coffee trade” (Visscher, 2009). These goals and the evaluation questions that this study speak to are similar in many ways to the questions explored in this evaluation of *Plastics Unwrapped*, in particular the interest in visitors’ responses to the museum’s intended messages about the exhibit and whether or not they reported their motivations being impacted by attending. The exhibit was also of a topic that is not usually covered in a natural history context.

For the *Coffee* study, visitors reported feeling “more informed” about coffee growing, production, and distribution, while only “a small set of visitors surveyed indicated that their coffee buying behavior changed as a result of their exhibit experience” (Visscher, 2009). The main reasoning indicated in this response was that visitors felt that they already had knowledge about the topic and “already incorporate socially and environmentally responsible coffee buying behavior into their everyday lives” (Visscher, 2009). Since there are many similarities between the *Plastics Unwrapped* and *Coffee* evaluation questions, the results of the two studies may prove interesting and useful for the Burke to compare.

Overall, considering the examples discussed above, it appears that exhibits that deal with the topic of the environment and more specifically human impact on the environment are largely successful in science centers and zoos. The effectiveness of these kinds of exhibits in natural

history museums is less certain, but there does seem to be an interest in these sorts of topics, at least among Burke audiences (Visscher & LaPlant, Summer 2011). This study is a unique opportunity to understand the impact of an exhibit focused on current environmental issues and in a context that does not typically offer exhibits with this focus. The study provides insight into the visitor's experience of *Plastics Unwrapped*.

Chapter 3

Methods

A multiple methods approach was used to collect data for this study. Structured exit interviews recorded visitors' responses to the exhibition experience and the topics explored. Structured observations of visitor behavior in the gallery space, though timing and tracking, captured data about how a random sample of the visitor population behaved in *Plastics Unwrapped*, what parts of the exhibit they used, and for how long. Together, these approaches provided a more complete understanding of the exhibit's impact on its audience in order to answer the study's evaluation questions.

To identify the evaluation questions, a meeting was held with stakeholders at the Burke, including representatives from Communications, Education, and Exhibits staff. The discussion in that meeting identified the main avenues of interest for the Burke staff, as well as the articulation of expected exhibit impacts and indicators (see Table 1).

Table 1: Evaluation Questions and Indicators

Evaluation Question	Indicators*
Where do visitors go and how much time do they spend in the <i>Plastics Unwrapped</i> exhibit?	i Stay time in each exhibit area. ii Visitor paths through the exhibit area.
What knowledge and information are visitors taking away from <i>Plastics Unwrapped</i> and	iii Awareness of the speed at which plastic has become an integral part of modern life.

from what part of the exhibit are they getting this information?	<ul style="list-style-type: none"> iv Knowledge about the ways that plastic is made. v Knowledge about the differences between life today and life before plastic vi Awareness of the benefits and the consequences of plastic. vii Awareness of alternative options to plastic products.
What are the expressed attitudes of visitors toward plastics use after visiting the exhibit?	<ul style="list-style-type: none"> i Appreciation for the impact that plastic has on the environment ii Appreciation for option rethinking plastics use.
In what ways did the exhibit influence the visitors' perceptions of the Burke?	<ul style="list-style-type: none"> i Appreciation for why an exhibit about plastic would be at the Burke. ii Perceptions of the Burke.

*Indicators informed by the National Science Foundation Framework

Visitor Tracking

From February through April 2013 visitor tracking was conducted in *Plastics Unwrapped* to record the behavior of visitors in the exhibit space. On a mix of weekend and weekdays, 30 adult visitors were unobtrusively tracked through the exhibit. The participants were unaware that they were being observed in order to avoid cueing their behavior. The participants were selected at random, using no other criteria than observing the next visitor to cross an imaginary line. When the line was crossed, the participant's movements within the exhibit were timed and recorded on the timing and tracking instrument (see Appendix 3).

The tracking instrument contained a floor plan of the exhibit, sectioned off into 7 different zones. This structure was chosen because Burke staff was interested in how visitors

engaged with various sections of *Plastics Unwrapped*. For each zone, the visitor's stay time was tracked (in addition to their overall time spent in the space), and it was noted where he or she stopped for more than 3 seconds, read a label or interacted with an exhibit component. Using a modified engagement scale developed by the Institute for Learning Innovation (Foutz & Hershonin, August 2012), the data collector recorded an average engagement level for the visitor in each area of the exhibit (see Appendix 4). Brief explanatory and visually determined demographic notes of each study participant were recorded on the instrument as well, describing significant or unusual behavior at the discretion of the data collector.

Visitor Interviews

From February through April 2012 visitor exit interviews were conducted in *Plastics Unwrapped* to assess visitors' reactions to the exhibit. On a variety of weekend and weekdays, 30 adult visitors were questioned following the completion of their visit to the exhibit. Participants were selected using random continuous sampling, intercepting adult visitors exiting the exhibit after they crossed an imaginary line. When the line was crossed, the visitor was approached and asked if he/she had completed his/her visit to the exhibit, and whether he/she had time to answer 8 questions relating to their experience. Participants' refusals were recorded, and participation was refused at a rate of 27% (30 participants of 41 approached). The responses of visitors who chose to participate were recorded by the data collector onto the interview instrument (see Appendix 1 for the interview guide).

Data Analysis

The data collected for this study was analyzed in a number of ways. The timing and tracking information (time spent, engagement score, and group size) was entered into Excel. Using the program the study ran descriptive analysis on the data to identify frequencies. Content

analysis was performed on the open ended interview responses to identify patterns in visitor's answers, to develop categories based on the identified patterns, and to code responses according to those categories.

Chapter 4

Results

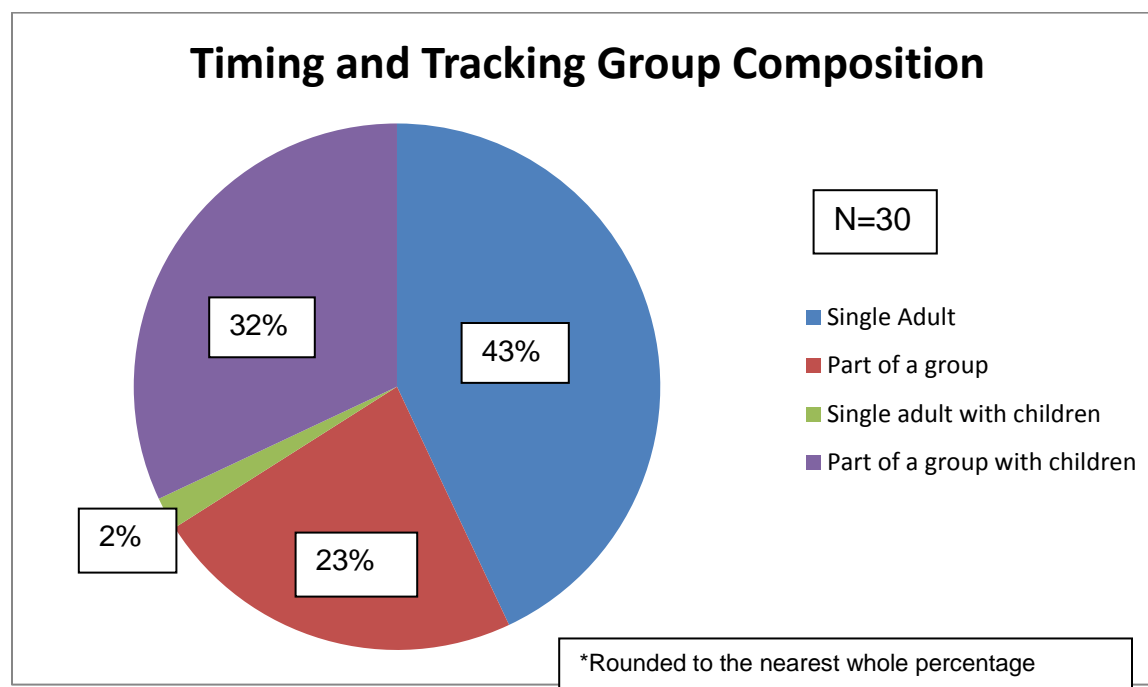
Description of the Samples

From February 2013 through April 2013, two separate samples of visitors participated in providing data for this study. 30 adult visitors were tracked through the exhibit. For this set of 30 individuals, information about their group size was recorded. Over the same data collection period, 41 individuals were approached to participate in the interview this study. Of those, 10 declined, and 1 was ineligible to participate due to age. All subjects recorded were adults over the age of 18.

Timing and Tracking Group Composition

Only adult visitors were tracked and recorded in this study, but simple notes were taken on whether or not they were observed in the area exhibit alone, and what was the group made up of those who did move through the exhibit as a part of a group. The composition of groups that were observed in *Plastics Unwrapped* for this study reveal for categories of visitor: those observed in the exhibit area alone, those observed in a group with other adults, those single individual adults observed with children and those who appeared to be a part of a group made up of both adults and children (see Figure 1). Of the 30 subjects observed, 13 walked through the exhibit alone, 8 as part of a group with other adults and children, 7 as part of a group of adults, and only 2 were the only adult in a group with children.

Figure 1: Timing and Tracking Group Demographics



Where do visitors go and how much time do they spend in the *Plastics Unwrapped* exhibit?

Of the 30 visitors observed, 18 (or 60%) visited every section of the exhibit. Of the subjects observed, the Introduction and Consequences section were always visited. Of the 30 subjects observed, 28 visited Life before Plastic section, 27 visited the Science/Promise of Plastic section, 27 visited the Medical/Health section, 24 visited the Rethink section, and 22 visited the Studio Lab section.

Time Spent in Plastics Unwrapped

The stay times of 30 visitors were recorded in *Plastics Unwrapped* during both weekend and weekday visits. The shortest stay time was 5 minutes, while the longest stay time in the exhibit was 36 minutes. Median stay time is recommended for skewed distributions, and the median stay time for the exhibit was 12 minutes (Serrel, 1998, p. 19). The amount of time visitors spent within exhibit section varied widely, as seen in Table 2. On average, visitors spent

the least amount of time in the Introduction and the most amount of time in the Consequences section of the exhibit.

*Table 2: Stay time by section**

Section	Median Time	Max Time	Min Time
Introduction	46 seconds	4 minutes 19 seconds	6 seconds
Life Before Plastic	1 minute 36 seconds	4 minutes 17 seconds	23 seconds
Science /Promise of Plastic	1 minute 32 seconds	3 minutes 38 seconds	11 seconds
Medical/Health	1 minute 59 seconds	4 minutes 40 seconds	20 seconds
Consequences	2 minutes 32 seconds	12 minutes 37 seconds	59 seconds
Rethink Plastic	1 minute 18 seconds	10 minutes 36 seconds	19 seconds
Studio Lab	31 seconds	9 minutes 36 seconds	9 seconds

*Minimum time excludes those visitors who stayed less than 3 seconds in a section

Visitors' Engagement with Plastics Unwrapped

Independent of the amount of time spent in the exhibit, visitors were observed for displays of engaged behavior with each section of the exhibit. Their actions were recorded on an engagement rating from 1-4. Visitors were placed on within those categories according to the following criteria:

1= Disengaged to Low: Visitor spends little time in the exhibit area and does not stop or pause often. They only glance at panels and labels, and do not appear to read them. They do not utilize any interactives.

2=Cursory to Brief: Visitor stops at least one time in the zone. They point, or approach labels and panels, and appear to read some of them. They examine interactives but do not linger.

3=Medium: Visitor stops at multiple points during the zone. They point and approach multiple labels and panels with interest, and appear to read them. If they are in a group or with others in the exhibit, the visitor might briefly engage with them, briefly discussing the exhibit. They engage with interactives.

4=High to Thorough: Visitor stops at most if not all points in the zone, spending significant amounts of time. They point and approach many labels and panels with interest and appear to thoroughly read them. If they are in a group or with others in the exhibit, the visitor engages with them, discussing the exhibit in an extended way. They engage with all present interactives completely (e.g. touches all parts, watching the complete video).

Table 3 illustrates the most frequently observed engagement scores for each section of the exhibit. Engagement was lowest in the Introduction and highest in Science/Promise of Plastic, Consequences, and the Studio Lab.

*Table 3: Engagement by section**

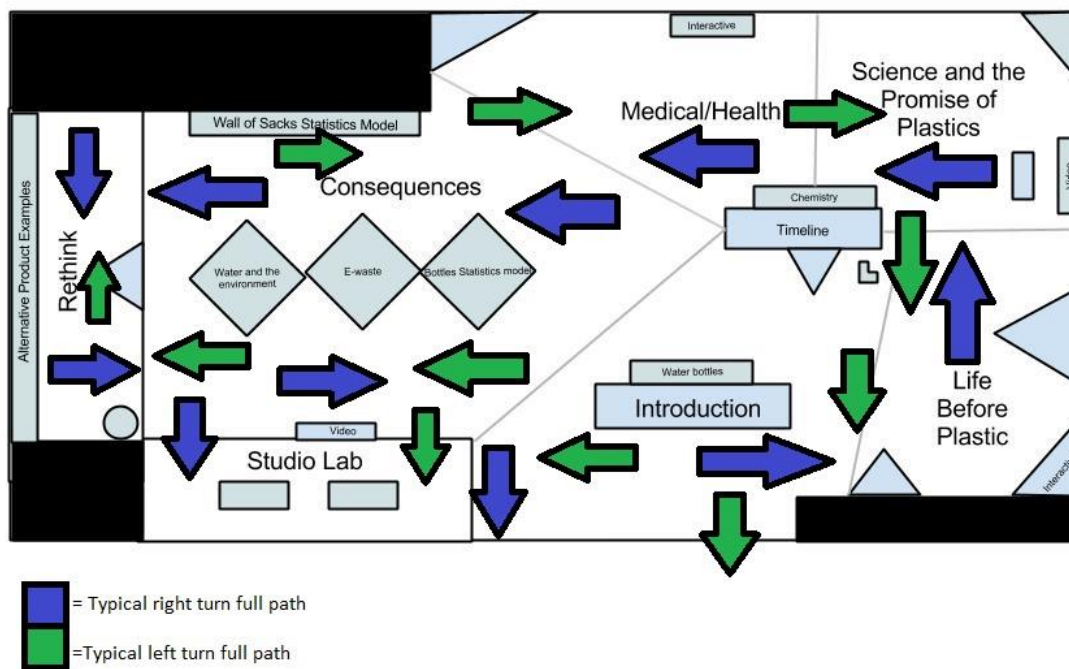
Section	Mode	Maximum	Minimum
Introduction	1	4	1
Life Before Plastic	3	4	1
Science/Promise of Plastic	4	4	1
Medical/Health	3	4	2
Consequences	4	4	2
Rethink Plastic	3	4	1
Studio Lab	4	4	1

Paths

In general there were two distinct paths taken by the subjects of the study (See Figure 2). The most typical path taken by the observed visitors in this study upon entering the exhibit was a turn to the right after the introduction panel, moving directly into the Life Before Plastic section. Only 6 of the 30 subjects turned left, moving from the Introduction either to the Consequences section or the Studio Lab. Of those visitors that turned left, 4 did not visit every part of the

exhibit, and skipped more than two areas. Visitors that took both paths did not typically spend very much time in the Introduction section, and often (16 of the 30 subjects) failed to visit the upper portion of the area, which contains the bottle statistics model, and the plastics timeline.

Figure 2: Typical Visitor Paths



What knowledge and information are visitors taking away from *Plastics Unwrapped* and from what section of the exhibit are they getting this information?

Perceptions of the Main Message of the Exhibit

When visitors were asked to describe what they thought was the main idea of *Plastics Unwrapped*, about two thirds (20 of the 30) articulated that they thought it was describing the dual nature of plastic, how quickly it has permeated our everyday lives, as well as the

consequences plastic waste has on the planet. Several visitors also used terms that reflected the exhibit language, such as “rethink” and “reevaluate.” Representative quotations included the following:

“Plastic was invented quickly, it makes life easier but too much waste makes problems.”

“Plastic is done some cool and incredible things but it can also hurt us the most. Easier and cheaper isn't always better if society is not careful.”

“This is a great exhibit and a good explanation of plastic: what it is, how it has changed, consequences and alternatives.”

“Plastics haven't been around for very many years. It is useful but destroying the world. We need to reevaluate.”

“To explain the situation with plastic and inspire small change.”

“Re-examine plastic uses every day; it hasn't been around that long and it's already messing the environment up.”

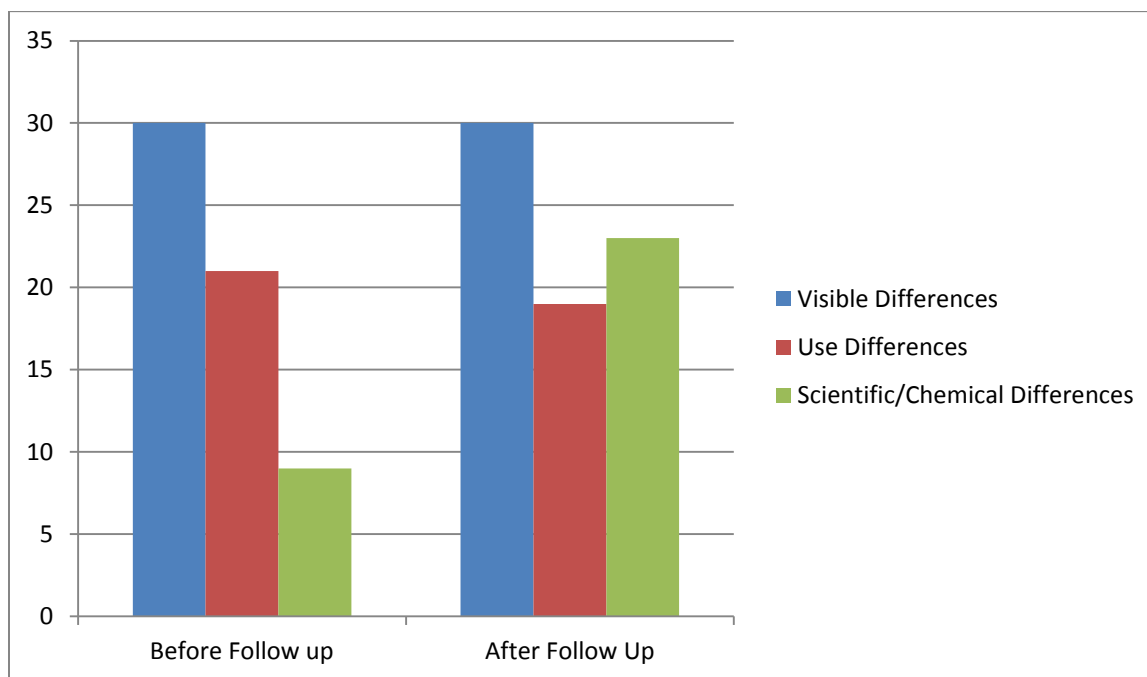
“Exploring the relationship of humanity and plastic; for evil or for not.”

Knowledge of Different Types of Plastic

During their interview, visitors were asked to look at photo cards of three different plastic objects from the exhibit (a plastic sack, a spork, and a soda bottle). They were asked to describe what made these objects different from each other (though all were composed of plastic) in order to gauge the level of knowledge the subjects had about the different kinds of plastic and the different manufacturing that creates these plastics, a primary theme within the exhibition. Visitor responses fell into one of three categories: 1) visible differences (color, shape, flexibility); 2) use differences (for eating, carrying, or drinking); and/or 3) scientific/chemical differences (how it is made, how it can be recycled.) The participants could reference more than one category. Most visitors spoke easily about the first two categories spoke very easily about both of the first 2 categories. All 30 participants initially described use differences when they looked at the images,

while 21 of 30 or 70% of visitors referenced use differences. Only 9 participants mentioned scientific or chemical difference. When asked a follow up question; namely “Why do the plastics look different?” or “How were they used differently?”, 23 of 30 visitors (an increase of 16) expanded their description and spoke about chemical, scientific and recycling differences in addition to the reference to use and visible differences (See Figure 3).

*Figure 3: Visitor responses to the interview question “[Show photo cards] All of these items are made of plastic. How are they different?”**

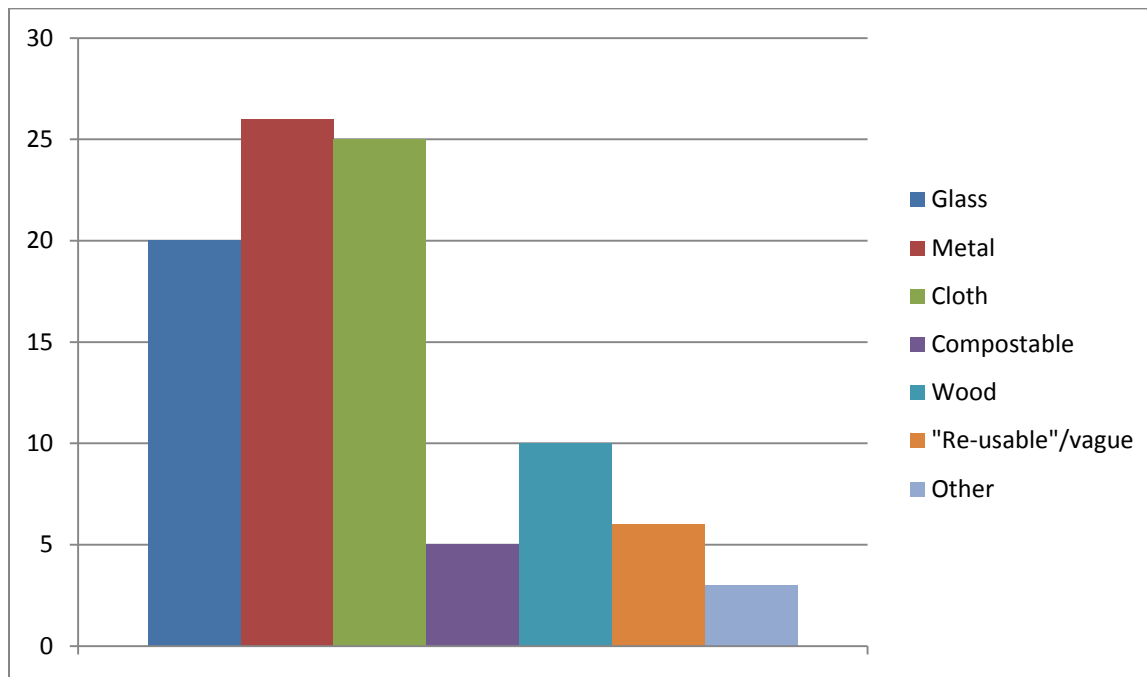


*accounts for frequency of mention; visitors responded with multiple answers

When asked to describe a non-plastic alternative to each of the items on the card, the majority of visitors offered glass, metal, and cloth as the best alternatives for bottles, utensils, and bags, indicating awareness of alternatives to plastic products (see Figure 4). They could speak about actual products that existed in this form, such as Klean Kanteen water bottles, as

well as experiences with the Seattle bag ban. Significant unusual alternative options listed by subjects for the plastic items included, clay, bone and water fountains.

*Figure 4: Visitor responses to the interview question “What is a non-plastic alternative to each of these things” [Photo cards]**



*Visitors listed one alternative for each of the three cards

Plastic Impact on Personal Life

When asked to identify one single impact that plastic has had on their own life, most visitors found this very difficult to do. All 30 commented on how integrated plastic is in all parts of every day modern life. The general consensus expressed was “plastic is everywhere.” When pressed, 60% of visitors (18 of the 30) cited technology as the biggest impact plastic has had on their lives. Other typical mentions were items of personal hygiene, such as make up, toothbrushes, or combs and food storage. One visitor spoke about seeing trash and litter as an impact on his life. Typical comments included the following:

“I have to say all my technology stuff. Phone, video games, television. All that stuff.”

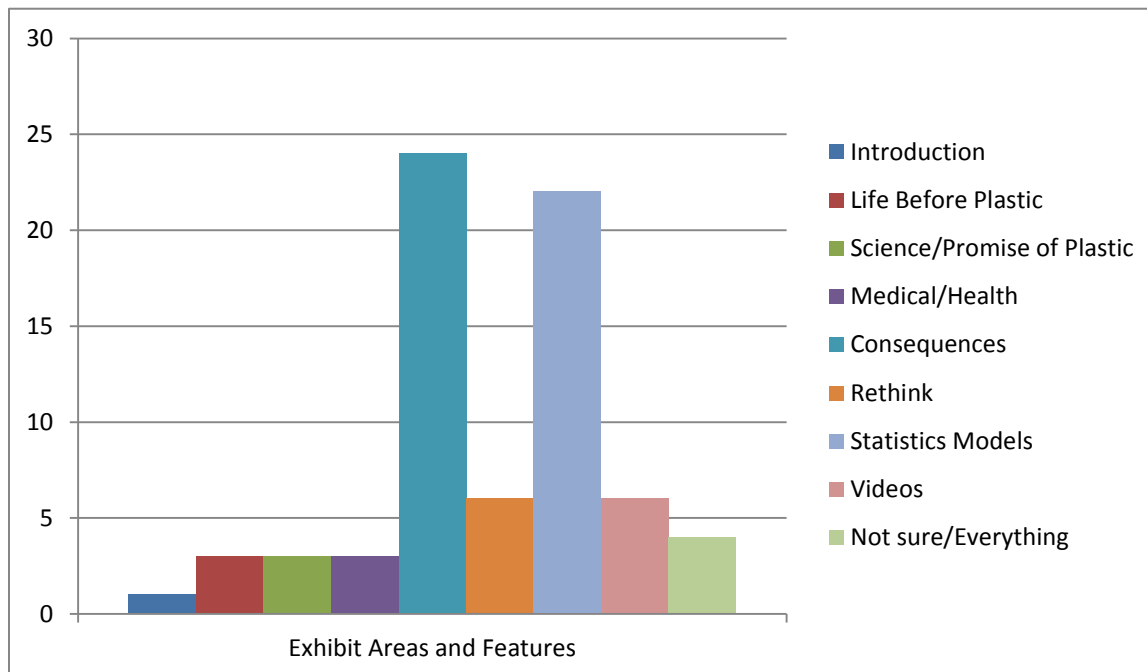
“It is kind of invisible in my life. Used to it being around. Isolating one thing, I have to say my iphone. I use that all the time.”

“Technology is a big one. I am glued to my cell phone.”

“I’m so unaware of what is in my own life! Make up is a biggie, and toiletries. Packaging. Just everything.”

When asked what part of the exhibit made them most connect with the role of plastic in their own life, most of the visitors spoke about the Consequences section of the exhibit (See Figure 5). Additionally 63% (19 of 30) of the study participants specifically cited the statistics models (such as the wall of sacks, wall of bottles, and barrel of bottles, e-waste, and medical waste) as the most impactful.

*Figure 5: Visitor Responses to the question “What part of the exhibit made you think about that?”**



*Visitors listed as many areas as they felt impacted

What are the expressed attitudes of visitors toward plastics use after visiting the exhibit?*Positive and Negative Impacts of Plastic*

Visitors were asked to describe both ways that plastic had made life better and ways that it made life worse. They did not have a particularly difficult time articulating both the positive and the negative impacts they believed plastic had on life. In speaking about the ways plastic products made life better, all 30 visitors described how it made objects more convenient, and cheaper to purchase, thus making life a lot less complicated than they viewed the past to be. In Figure 5, a wordle of the responses visitors gave in response to the question “How does plastic make life better?” have been laid out with the words sizes determined by the frequency of their use by participants. In a broad stroke way, this provides insight into the kind of language used by visitors in relation to this question. It visually describes the most common words they used, highlighting these words and phrases by ascribing differences in size to differences in the words frequency of appearance within responses. Generally speaking, people said they felt plastic made life easier (see Figure 6). A frequent response was “makes things easier”. Other notable phrases often used included describing life as “much better” and “like convenient” as a result of the existence of plastic. Some also focused in particular on medical, hygiene and food storage improvements plastic has allowed in the past 50 years.

reported feeling aware that even though they think the exhibit could impact their thoughts on plastic, they could not be sure the impression would last. Representative comments included:

“I knew a lot already, but I think that seeing what alternatives there are will make me a more conscious consumer. I want to start looking for bamboo utensils.”

“I want to stop and think "Do I really need it?"; that question they ask in the products part. A lot of time you just buy things without really thinking.”

“The bag model made me want to be much more conscious about my decisions. Because being near Seattle after the bag ban, you realize that it really isn't that hard to keep cloth ones in the car. I can do that everywhere.”

“I knew a lot about how bad plastic is for the environment. The visuals showed me the levels of excess and how much we really pollute. Then again, the bottles in the display looked brand new so what does that really say? We all have a long way to go.”

In what ways did the exhibit influence the visitors' perceptions of the Burke?

In order to better understand visitors' perceptions of the Burke, and in particular the ways *Plastics Unwrapped* might have impacted those perceptions, visitors were asked two questions about the exhibit in relation to the Burke Museum. First, visitors were asked “Why do you think an exhibit about plastic is at the Burke?” Almost half of the visitors (12 of 30) initially stated that they were uncertain. However, once they had expressed an initial uncertainty, these visitors went on to guess about why the exhibit was at the Burke. More broadly, 24 of the 30 visitors interviewed cited the importance of the issue or a museum's role in public education as the reason to present *Plastics Unwrapped*. Representative comments included the following:

“Not sure. It was surprising. Probably because it is an important current issue.”

“To spotlight a big issue and educate the public.”

“It is an important and urgent issue to society. Why not have a museum illustrate that?”

“Plastic is pervasive and it is important to raise the issue. This is a great platform to do that.”

“Science is responsible for spreading the world and sharing expertise; museums educate in the same way.”

Another portion of the visitors (8 of the 30) cited the Burke’s location as part of the UW campus community, as part of Seattle, or as part of the Pacific Northwest as the reason why the museum would display an exhibit on plastic. A few visitors (5 of 30) referenced the Burke’s role as a natural history museum and how they perceived an exhibit of this type fitting into that position.

Representative quotations were as follows:

“It is kind of different. Very bold. I think it is here to make a point about an issue of importance. It shows a lot about what UW/Burke and Seattle values.”

“Because plastic is everywhere in the environment. UW and the Northwest have a reputation for sustainability, so it makes sense for the Burke to show this.”

“To raise awareness? I was surprised to see it. I didn't really expect something like this to be here. But I do think it sort of makes sense. Natural history is about the earth. Plastic is impacting the earth. It's new history.”

Second, visitors were asked “Is it the kind of exhibit you would expect the Burke to have? Why or why not?” Eighty percent of the visitors (24 of 30) said it was not something they would expect the Burke to show. When asked why or why not, most described seeing the Burke primarily as a natural history museum, with exhibits on “old” topics such as fossils and dinosaurs. For example, these visitors made comments such as:

“No. This is more current than I expected. I thought the Burke was only natural history and fossils and stuff.”

“Not really what I thought. I thought the Burke would have more about animals and fossils.”

“Plastic doesn't seem to be natural or historic which was more what I was expecting.”

“It seems like too modern a topic.”

“Because I think of this having more exhibits on "natural" things; not man made.”

After seeing the exhibit, though visitors expressed surprised at the topic of plastic being in a natural history setting, 19 of the 30 participants were able to articulate reasons why they thought it made sense for *Plastics Unwrapped* to be at the Burke. Representative comments included:

“This stuff all impacts our world, which is what natural history is all about.”

“Not traditionally what you think of for natural history, but it is a part of history.”

“It impacts habitats and natural history issues.”

“I was surprised. I thought Burke exhibits would be about the past, but having seen this, it makes sense now.”

“Well, I just wasn't expecting it, but I suppose it makes sense. The exhibit explains problems.”

“It seems apropos since the plastic issue is becoming new natural history.”

Limitations

Sample Size: This study consisted of 60 total participants (30 per method), so it is not statically significant in a broadly generalizable way. The study only relates to a small sample size of Burke subjects. This means that the information is not likely to be useful to museums other than the Burke. However, because the Burke museum designed this exhibit and greatly

influenced the structure of this study, the information gathered from this sample size is still useful within that institution.

Interview Sample Demographics: Demographic data for the interview portion of this study was not collected to parallel the information collected in the timing and tracking method (such as group composition). When the instrument was originally designed, demographic data did not seem to be significant to answering the evaluation of this study. However, from the data collected in the timing and tracking method, there is an impact on visitor experience, depending on demographic information for that portion of the study. Not having that data for the interview method limits information about that data sample.

Engagement Scale Subjectivity: There is a level of subjectivity that occurs when subjects were observed and placed onto the engagement scale based upon the listed criteria (See Appendix 4). However, limiting the data collection to one individual for all observations allowed the observations and scoring to be internally consistent though still subjective under the judgment of one collector.

Coding Subjectivity: Again, there is a level of subjectivity that is possible when coding responses to open ended or qualitative methods. Again, limiting the data collection to one individual for all coding determination allowed measurements to be internally consistent though still subjective under the judgment of one collector.

Chapter 5

Discussion

Where do visitors go and how much time do they spent in the *Plastics Unwrapped* exhibit?

Most visitors moved through the exhibit hugging the outside walls. More than half of the visitors observed took an almost immediate right turn from the Introduction section to the Life Before Plastic section. The right turn visitors were more likely to visit every section, and to better display indicators about this evaluation question. Left turn visitors were less likely to visit to all sections of the exhibit, and displayed a more distracted engagement overall. Subjects who turned either direction did not typically spend a lot of time in the Introduction and most missed the upper area of that section. Additionally 5 of the 6 left turn visitors were part of groups with children.

Overall average stay time in *Plastics Unwrapped* was around 12 minutes, giving the exhibit a sweep rate index (SRI) of 153.8. According to Serrell's work on visitors and museums, the lower the SRI, the more time visitors spent in an actual area (Serrel, 1998, p. 15). The mean SRI for natural history museums of various sizes within that study was 335.8 with a standard deviation of 156.1 (p. 29). For the Burke's size, the sweep rate for *Plastics Unwrapped* was below 200. The amount of time visitors stayed in a section did not always correlate with the level of engagement subjects displayed in any particular area according to the scale used in this study.

Time spent in an exhibit is not alone very revealing. It is one indicator of larger engagement within a section or an exhibit as a whole. People spend the most time in the Consequences section of *Plastics Unwrapped* and the least amount of time in the Introduction. Looking at the stay times and the observed engagement behaviors in those two sections, the stay time indicates engagement. The consequences section had the highest engagement score, and the introduction had the lowest. There are a number of reasons which could impact this. The

Consequences section is very dense with multiple visuals, statistics models and a video. The area of the Introduction that visitors encounter most often does not include as many exhibit elements. The one statistics model contained in the Introduction is in an area that was often skipped. Since the introduction is at the very beginning of the exhibit, visitors also might have been more invested in progressing into the exhibit to see more elements.

For other sections of *Plastics Unwrapped*, the observed engagement level did not always predict a longer stay time. For example, the Science/Promise of Plastic area and the Medical/Health section had similar median stay times, but the most frequently observed engagement level in the Science/Area was one level higher than the most frequently observed engagement level in the Health section. In this case, the presence of a video generated more engagement behaviors, like pointing and discussion, in the science section even though it might not have made visitors actually stay longer. Overall there was also a high rate of photography as an indicator of engagement throughout all sections of this exhibit, and this could also explain the differences between stay time and engagement level. Anecdotally, this study observed that the most second popular exhibit element to photograph (after all of the statistics models) was the recycling code in the science section.

What knowledge and information are visitors taking away from *Plastics Unwrapped* and from what part of the exhibit are they getting this information?

The data indicates that the exhibit is specifically effective in delivering a number of messages about plastic to visitors. Most of the visitors could articulate the exhibit's main message very well, and displayed 4 of the 5 indicators of this evaluation question. They demonstrated an awareness of the speed at which plastic has become an integral part of modern life, knowledge about the differences between life today and life before plastic, awareness of

both the benefits and the consequences of plastic, and an awareness of alternative options to plastic products. Slightly fewer visitors demonstrated knowledge about the ways that plastic is made without follow up questioning, but those that did could clearly talk about what they learned.

During the interviews, when asked about what parts of the exhibit left lasting impacts, the majority of study participants cited the Consequences section and the statistics models in particular as being particularly important to their visit. When asked to discuss the impact plastic had on their lives, and whether *Plastics Unwrapped* would impact their thinking about plastic, most visitors also discussed elements that related to these sections. However, visitors were generally able to express some level knowledge gained from most parts of the exhibit, with the weakest area being on scientific information. Visitors might have been able to demonstrate knowledge gained in many areas of the exhibit, but they expressed feeling like the Consequences section influenced them the most.

What are the expressed attitudes of visitors toward plastics use after visiting the exhibit?

Visitors' responses related to this evaluation question are not entirely conclusive. It is clear that the exhibit does leave visitors with an increased or heightened appreciation for the impact that plastic has on the environment. When describing both the main idea of the exhibit, and how plastic made life worse, visitors referenced damage to the environment. About 50% of visitors stated that they did not think that the exhibit influenced their attitude toward plastic because they felt like they were already aware of the current issues surrounding plastic.

Based on their comments it seems that most of the visitors in this study already were aware of the option for rethinking plastic use, but almost all visitors reported that the exhibit affirmed knowledge that they already had. The 50% of visitors who reported that they did feel

that *Plastics Unwrapped* would impact their relationship with plastic did seem to appreciate the option for rethinking plastic use, and cited alternatives they planned on trying instead, as well as reporting that they will think more carefully about consumer decisions.

Location might also be factor. Though demographic data was not specifically collected during the interview portion of this study, it should be noted that the exhibit was on display in Seattle, an area that is generally perceived to be more ‘green’ and environmentally conscious than average. Many visitors talked about living in the northwest as a factor to their awareness of the issues, and further evaluation of this exhibit in a different geographic location might record different results.

In what ways did the exhibit influence the visitors’ perceptions of the Burke?

From the interviews conducted for this study, it is clear that visitors to the Burke have a very strong perception that the museum is a place of natural history, and possess very clear expectations for what they believe are the kind of exhibits a natural history museum would have. Subjects were largely surprised to see an exhibit about plastic at the Burke because it was not something they considered “natural.” They expected topics relating to older issues, dinosaurs, and geology. However, most of the visitors hedged their statements by saying that after they had seen *Plastics Unwrapped*, they could see why it made sense to have the exhibit here. The exhibit seems to have effectively demonstrated the connection between plastic and natural history.

In addition, the interviews also show that a majority of visitors were impressed by the fact that the Burke was addressing a current issue of this nature, feeling that the exhibit demonstrated to them the museums values. This exhibit seems to have altered visitors’ perceptions of what it is possible to explore at a natural history museum as well as show the

Burke as an institution that makes unusual or bold exhibit decisions with a generally positive discussion.

Conclusion

Though the sample size for this study is small, it does provide insight into visitor experiences of *Plastic Unwrapped*. The exhibit seems to be effective in delivering specific messages about plastic. Subjects were able to describe how quickly plastic developed in society, the benefits and consequences it created, as well as different choices that could be made in the future. The exhibit also appears to be impacting visitor perception of the Burke. Covering the topic of plastic seems to have made subjects expand their understanding of what exactly a natural history museum covers, with positive reception. It is unclear how much *Plastic Unwrapped* influences visitor's attitudes toward plastic, as many subject report already being aware of issues relating to plastic. This may be a result of the location of the exhibition in Seattle and the level of awareness area audiences already have about environmental issues.

For the Burke, this study provides data about visitor experiences with the exhibit. Though all 4 of the evaluation questions are useful to the museum, in light of their continued rebranding and long term strategic plan, some questions have more pressing interest. When the results of this study were presented to Burke stakeholders at a debrief following the end of the exhibition, staff seemed most excited about the qualitative data surrounding visitors perception of the Burke in relation to *Plastics Unwrapped*. Staff indicated that the data and discussion in this report provides them with a basic understanding of how an environmental and atypical 'natural history' exhibit impacts their audience's perceptions of the Burke and will be useful when designing, marketing and evaluating future exhibits.

Considering both this study and the front end evaluation conducted prior to *Plastics Unwrapped*, the staff seemed interested in continuing to use evaluative techniques. Also of future use to the Burke staff was the exhibit sections and elements that visitors reported being of most interest to them. Data in this study demonstrates that the large statistics models in the exhibit were particularly meaningful part of the experience of the exhibit, and that is consistent with the kind of social media engagement (such as tagged photos of the exhibit) that staff measured. This may impact designs in future exhibition planning.

A recommendation for further study of this exhibit would be to conduct the same study when the exhibit travels to determine if any of the data for these same evaluation questions yields different answers based on data collected from audiences in contexts outside of Seattle. Due to the culture of the Northwest, it is possible that visitor's experiences of *Plastics Unwrapped* in other locations could differ significantly from information analyzed in this evaluation. Additionally, the Burke might wish to continue including questions about future exhibit's impact on visitor perception in future evaluations as they continue with their rebranding and strategic plan.

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Appendix 1

Interview Instrument:

Plastic Interview Instrument

Instrument #: _____

Date: _____

Time of Day: _____

1. Why do you think an exhibit about plastic is at the Burke?

2. Is it the kind of exhibit you would expect the Burke to have? Why or why not?

3. How would you describe the main idea of the exhibit?

4. [Show picture cards] All these things are made of plastic. How are they different?

-What is a non-plastic alternative for each of these things?

5. Plastic has only been around for 50 years, but it has made a big impact. Can you give me an example of how plastic has impacted your daily life?

-What made you think about that?

6. How has plastic made life better?

7. How has it made life worse?

8. Has this exhibit influenced your thinking about how you use plastic?

Yes No

-If yes: How?

-If no: Why not?

Appendix 2

Interview Instrument relation to Evaluation Questions

<i>EQ</i>	<i>Item</i>	<i>Purpose/Intent</i>
EQ3,i	Why do you think an exhibit about plastic is at the Burke?	Provide evidence of visitor perception of the Burke
EQ3, ii	Is it the kind of exhibit you would expect the Burke to have?	Provide evidence of possible change in visitor perception of the Burke
EQ1, i,iii	What is the main idea of the exhibit?	To determine whether or how much the exhibits themes are being understood
EQ1,ii	All these things are made of plastic. How are they different?	To determine whether and to what extent visitors understand the different production of plastic types
EQ1, v/ EQ2, ii	What is a non-plastic alternative for each of these things?	Provide evidence of visitors awareness and/or appreciation of alternative products to plastic (self-reported)
EQ 1, i,iii, iv	Plastic has only been around for 50 years, but it has made a big impact. Can you give me an example of how plastic has impacted your daily life?	Demonstrate whether and to what extent visitors can relate plastics impact to their own lives informed by the exhibit
EQ1	What made you think about that?	Describes what area of the exhibit influences the previous response
EQ1, iv	How has plastic made life better?	To determine whether the visitor can describe the

		positive aspects of plastic
EQ1, iv/EQ 2, i	How has it made life worse?	To determine whether the visitor can describe the environmental consequences of plastic
EQ 2, i,ii	Has this exhibit influenced your thinking about how you use plastic?	Provide evidence of the exhibits impact on the visitor's intended plastics use (self-reported)
EQ 2, i,ii/EQ1	If yes: How?	To determine whether the exhibit influenced the previous response and what areas of the exhibit this came from
EQ 2, i,ii/EQ1	If no: Why not?	To determine what visitors express as reasons for not being influenced

Appendix 4

Engagement Level Key:

1= Disengaged to Low: Visitor spends little time in the exhibit area and does not stop or pause often. They only glance at panels and labels, and do not appear to read them. They do not utilize any interactives.

2=Cursory to Brief: Visitor stops at least one time in the zone. They point, or approach labels and panels, and appear to read some of them. They examine interactives but do not linger.

3=Medium: Visitor stops at multiple points during the zone. They point and approach multiple labels and panels with interest, and appear to read them. If they are in a group or with others in the exhibit, the visitor might briefly engage with them, briefly discussing the exhibit. They engage with interactives.

4=High to Thorough: Visitor stops at most if not all points in the zone, spending significant amounts of time. They point and approach many labels and panels with interest and appear to thoroughly read them. If they are in a group or with others in the exhibit, the visitor engages with them, discussing the exhibit in an extended way. They engage with all present interactives completely (e.g. touches all parts, watching the complete video).

Appendix 5**Timing and Tracking Instrument relation to Evaluation Questions:**

EQ	Item	Purpose/Intent
EQ1	Stay time	To describe how long visitors stay in each section of the exhibit, providing some evidence of interest
EQ1	Engagement Level	To measure observable levels of engagement