

California Academy of Sciences

Habitat Earth

Planetarium Show

Evaluation

May 22, 2017

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VisitorStudies.com
 Spring 2017

- *The first section is information that is obviously sort of new, but it's good to hear again. The second one is information you don't want to hear, but it is your reality. It is what we are creating...it is something we are doing to ourselves. They both work as one good piece, but it gives the information that needs to be given. The word "perfect" comes to mind.*
- *It hit home thinking about how the food that I choose to eat - like if I choose to eat things or even buy things that come from a shipping container, say China, has an impact on the land that is right around me.*
- *Every organism on earth is connected in the massive overall ecosystem. So in that massive overall ecosystem are smaller ecosystems, it's like a puzzle, so we kind of fit together somehow. And we all affect each other. And since we are at the top of the species food chain, we really can dictate, where we're headed.*
- *My main take away is how every action has a reaction, and everything is interconnected and we may not understand the influences that are happening, so we should be mindful and pay attention. Whether it's in our daily life about how we eat or the food choices we make or just understanding that there's going to be elements and things out there that may not be in our immediate understanding but which have effects, such as the ships and ship channels passing animals between different far reaching nations and how that affects the ecosystem.*
- *Made me think more about waste. How to cut back. In school I am in a fraternity and we throw a lot of food away. I hate that, how to think about changing our habits.*
- *I think a feeling about the human impact. That we shouldn't waste food. We pledged [to each other during the movie] to at least monitor that.*
- *I was surprised by the fact that a small box of beef consumed so much water. I'll definitely try to switch to a more energy-efficient diet.*

Sample quotes from Habitat Earth Audience Members

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Introduction

California Academy of Sciences (CAS) contracted with Wendy Meluch of VisitorStudies.com to design and conduct an evaluation of the Habitat Earth planetarium show (HE) during winter/spring 2017. HE is a 30-minute show which features a pre-recorded movie-like section, and a live presentation. HE team members' primary interests were to assess cognitive, affective and behavioral impacts of the show on audience members, and understand the roles and relative strengths of the live and pre-recorded segments of the program in manifesting those impacts. Findings of this study will inform development of the next planetarium show, which explores coral reefs.

During March and April, we conducted in-depth interviews, structured interviews and questionnaires with audience members as they exited the planetarium. In total, 147 HE audience members who participated in the evaluation were included in the samples for analysis.

CAS Director of User Insights, Akemi Mease, was the primary contact for the project. Akemi worked with the internal project team and evaluator to develop project goals and parameters. She was also instrumental in supporting logistics, including coordinating with relevant CAS departments as needed for access to the Educational Lab, thank you gifts for participants, etc. Akemi helped arrange for internal staff to assist with recruiting study participants on most data collection days, and conducted a few structured interviews as well.

Key Findings

Overarching Outcome: Awareness, Emotional Response and Motivation

The different segments of HE work in concert, engaging audience members in different ways to effectively communicate key messages (cognitive impacts), generate emotional energy (affective impacts), and inspire action (behavior-related impacts). The pre-recorded section is fun, immersive and engrossing; it engenders feelings of awe and appreciation for nature and its elegant interconnectedness. The live portion presents a frank, but not preachy, story of negative human impacts on the environment which surprises and alarms people. With both a sense of appreciation for the natural world and concern about common human activities which damage it, audience members are receptive to messages about actions they personally can take to protect it. They demonstrate self-reflection, a sense of reverence for the importance of nature, and an obligation to protect it.

A large majority of participants in all three studies in some way described this sequence of thoughts and reactions...

- They had a positive experience of the pre-recorded section. They were moved by the beauty, delighted by discovering new information, and awed by the intricate connections in the natural living world. It was fun and immersive; they felt a part of it.
- They were surprised, angry, disappointed to learn about the amount of water and/or land used in food production, and huge levels of food waste, things that are related to everyday activities for everyone.
- They were surprised and pleased to learn that individual choices and behaviors can actually have a substantive impact. This was motivating and empowering.
- They became concerned about their own food-related behaviors and contemplated them, often with clearly stated intent to be more attentive and/or make changes. These were new considerations for some people; for others HE served to further inform their thinking.

Audience members easily recognized HE's main messages – Cognitive Impacts

- Audience members readily recognized and understood messages about interdependent connections between life forms on earth, and humanity as a part of that network.
- People learned details about symbiosis in the forest. For most people, the relationship of mushrooms and tree roots, and the fact that trees can push water back into the soil was new, often surprising information.

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- Study participants learned about human activities which impact life on a global scale: water and land use in food production, food waste, and invasive species (introduced by ships). Most people had been aware of these things, but had not previously understood their magnitude.
- Audience members learned about individual behaviors people can do to benefit life on earth, and understood that they can truly be impactful. They cited eating less meat, shopping for and using food more efficiently, finding ways to use old produce, and generally not being wasteful.
- People thought critically about their own food-related behaviors, often stating that they intended to pay more attention to them and/or actually make changes. They mentioned specific activities as listed above, and/or made general statements about making better choices or having a lighter carbon footprint.

Audience members had affective reactions to HE – Affective Impacts

- HE audience members expressed a personal sense of connection to or obligation to life on Earth, and feelings of awe, inspiration, and the importance of nature and the connectedness of life on Earth.
- People exhibited concern about their own behaviors and how they might be contributing to waste.
- Audience members found the pre-recorded visuals to be beautiful, fascinating, exciting and immersive. They felt like they were flying, like they were in the scenes, and like they could reach out at touch things.
- People were surprised and delighted to learn details about mushrooms and the fact that trees can push water back into the soil at night. They were appreciative of a special view into otherwise unseen phenomena.
- People were surprised and disgusted by the volume of water used in food production and the amount of food waste.
- Study participants enjoyed HE very much. They expressed excitement, pleasure and enthusiasm about the show.

Audience members contemplated and intended to affect their behavior – Behavioral Impacts

- Audience members were moved to think deeply about their own food-related behaviors.
- They expressed intent to pay more attention to and/or make changes in their food-related behaviors such as shopping more carefully, wasting less and using old produce.
- Some people had already discussed changing food-related behaviors amongst themselves during/after the show and before the interview.
- People recognized the importance of sharing this information with others, e.g., telling them to attend HE, or collaborating with family/friends to eat and manage food differently. A few were highly energized in this regard.

Pre-recorded and live segments complement each other to impact audience members

- Generally speaking, the pre-recorded section was thought to provide background information about life on Earth and how it is interconnected, and the live portion was perceived as a personalized call to action. The live portion also made the show up-to-date and relevant locally.
- Most people felt the combination was fine; virtually no one disliked having two types of delivery or more than one segment in the show.
- Respondents were very clear that had they seen *only* the pre-recorded section, their takeaways would have been very different. They speculated that they would have left with awareness and information about life on Earth and how intricately connected it is, but they would not have taken those messages personally, nor would they leave with any sense of mission, duty or ideas about how people impact that network of life.
- The pre-recorded segment engaged audience members with the beauty and intricacy of life on Earth and its interconnectedness. Circle-line graphics e.g., birds and fish were enjoyable, memorable and make the message clear.

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- The live segment clearly demonstrated human impact on the network of life on Earth with the bathtub and silo graphics, and the compost dump footage. The enormous volumes of water and waste evoked feelings of surprise, anger or frustration.
- Images of global water sources and land use in the pre-recorded section gave context for resource use in food production.
- The live portion presented concrete examples of personal actions which can be impactful and which people easily related to. For example, Josh jokingly pointed out his mushy bell peppers in the compost video, and also talked about eating less meat.
- The live presenter made difficult content approachable. People appreciated Josh’s friendly manner and silly jokes, and his comment about being able to see the mushy green peppers he threw away last week helped people relate to the issue without feeling preached at about it. Unlike the unseen movie narrator, a live presenter is actually in the room with the audience, and his “confession” helps people recognize him as a fellow traveler in this problem. They felt spoken to, not lectured at.

Discussion: A Framework for Understanding These Findings

In addition to astounding visuals and compelling, but relatable information, a significant part of HE’s success appears to be rooted in its structure. HE guides audience members down a path of engagement, understanding, self-reflection and motivation, effectively bringing them to the primary desired outcome: appreciating the need for personal action and feeling empowered to take it. A walk through the HE planetarium show experience from the perspective of the visitor evokes Maslow’s Hierarchy of needs. Though not an exact map of the HE audience member experience, it can help us understand HE’s success with visitors and provide a useful touchstone for future program development.

Being greeted and welcomed personally by a friendly, confident person puts people at ease. So do the presenter’s jokes and comment about audience members sometimes not knowing what show to expect. This satisfies people’s need for physical comfort and safety (at the base of the Pyramid). The good mood generated by this lighthearted patter also serves the need for belonging. Feeling safe, comfortable* and happy, people are ready to receive information.

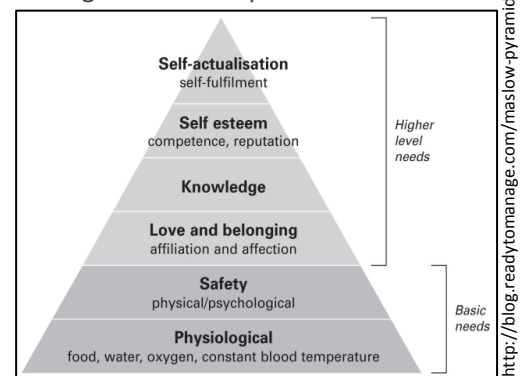
The immersive movie accentuates feelings of connectedness as audience members feel like they are a part of what they are watching. Physical sensations of movement or flying, and striking visuals, such as dropping below water level or zooming up the tree, give people a thrill, a visceral involvement.*

The striking visuals also delight people with new and surprising information, such as the tree roots putting water back into the soil. Engaging examples, of life’s diversity and interconnectedness mount up and impress people emotionally (*it’s so beautiful*) and intellectually (*I never knew...*). They feel and understand that the natural world is important, and deserves care and protection because life depends on it.

Direct messaging in the live section shines a brighter light on humans as a part of that beautiful and important network of life. Knowledge and belonging intertwine here as people are learning about their belongingness. In this case, the visuals are not immersive, but starkly illustrative, e.g., bathtubs and silos.

When it comes to human impacts on the environment, food is easy to relate to at a personal level and a societal level. Josh’s little joke about his old produce in the compost video is powerful because it brings the huge compost pile down to a personal scale. That delivery is also part of what keeps the message from sounding preachy: receiving difficult information, or a call to action from a familiar friendly person (someone who even admits to wasting food), is easier than hearing it from a faceless narrator. Josh’s “confession,” draws people’s attention to their own personal behaviors in a non-threatening or bossy manner.

In this analysis, self-reflection about personal food-related behavior loosely maps to self-esteem on the Pyramid illustration. People check in with themselves about their choices, asking themselves and their partners what more they could do.



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HE audience members reach a point of motivation/ability to take action (the top of the Pyramid) because they have been supported and engaged physically, emotionally and intellectually, and because difficult content (the call to action) is shared by a pleasant person who is not only in the same room, but sharing the same predicament

*Some people felt motion sick during the show. Are there any tips to share, for instance is the effect less pronounced if you are seated at the top or bottom? On the other hand, a few people were so comfortable that during part of the movie section they got drowsy and appreciated the change to a live presenter, which helped them wake up and re-focus. This suggests that a shorter initial section, or perhaps using multiple segments, could be beneficial.

Evaluation Purpose

The HE team’s original vision of the evaluation addressed typical summative questions about program impacts, and included comparison studies of different live segments presented at different times during the program. They had also hoped to investigate behavioral impacts of the show based on participation in a choice activity immediately after the it. Ultimately, and with input from the evaluators, team members refined their focus to assess program impacts overall, and look closely at how the live and pre-recorded segments compare and complement each other in terms of impacts and preferences.

Findings of this study will inform CAS staff in their current work designing a planetarium show about coral reefs. In particular, they want to understand the roles and relative strengths of the live and pre-recorded segments of the program. The following research questions guided development of our research protocols and data analysis. They have been adapted from the original CAS request for proposals and contract to reflect updated goals for the studies.

- Cognitive/Messaging: How well do audience members understand the show’s intended main messages and what role does each part of the show play in communicating them?
- Affective/Emotional: What are the audience’s emotional reactions to the show and what is the impact of the live segments on the final takeaway? To what extent does the audience enjoy the live segment?
- Behaviors: How and to what extent do audiences expect they will follow through after the complete Show with conservation-related actions and how do the Live Segments impact this decision?

Evaluation Design & Rationale

Our three-pronged research design employed in-depth interviews, structured interviews and a self-completed questionnaire form, which enabled us to get both a deep understanding of how HE impacts audience members, and a clear sense of the frequency of different key takeaways and experiences. Findings from each study informed development of the subsequent one. We conducted in-depth interviews in early March, structured interviews in mid/late March, and the questionnaire in early April. All data collection took place Tuesday-Thursday. During all the interview dates and most of the questionnaire performances, the same person was presenting the live portion of the HE program, Josh. On most days we had assistance from staff to recruit participants. All respondents were offered a choice of thank-you gifts after completing the interview or questionnaire.

Study Description	Rational
Study 1: In-depth Interview (n=15), Random Sample	
<ul style="list-style-type: none"> • Semi-structured, conversational style interview to follow the interest of the respondent, while guiding them to all areas of inquiry. • Participants were seated with interviewers in the teaching lab. • Most interviews were about 12-15 minutes long. • All were audio recorded and transcribed. 	<ul style="list-style-type: none"> • This nimble approach allowed us to collect initial reactions and then explore deeply all areas of inquiry. • Strictly a qualitative effort, these conversations gave us insight into the range of impacts and ideas that people were experiencing. • Findings informed development of subsequent studies and protocols.

Study Description	Rational
<ul style="list-style-type: none"> Participants completed a paper demographic survey form. 	<ul style="list-style-type: none"> Data provide rich detail about audience reactions and impacts; they are not quantitatively analyzed.
Study 2: Structured Interview (n=28), Random Sample	
<ul style="list-style-type: none"> Structured interviews conducted with respondents as they stood in the walkway out of the way of the foot traffic. See Appendix B. Most interviews were about 4-6 minutes long. Participants completed a paper demographics survey form Interviewers took hand-written notes and immediately transcribed them into the data base. 	<ul style="list-style-type: none"> With knowledge from Study 1 about the types of impacts people experienced, and how they described them, we could create a streamlined interview protocol for structured interviews. Shorter structured interviews allowed us to hear from a larger group of people, but still gave us the ability to explore and clarify their answers. Data are not as dense as in Study 1, but they are often still rich and nuanced. Data were coded and quantified.
Study 3: Questionnaire (n=104) Random Sample	
<ul style="list-style-type: none"> A one-page, double-sided self-completed questionnaire form made use of open-ended questions, ratings and Likert scale-type items. See Appendix C. To shorten the instrument slightly, staff reduced the demographics section somewhat. 	<ul style="list-style-type: none"> Though questionnaire forms do not allow us to probe responses, nor can they always capture emotional reactions, they do enable us to hear from a larger sample. Data can quantifiably confirm key findings, but offer less depth.

Findings

Understanding These Data Sets

In most situations, interviews generate more, and more detailed data than self-completed questionnaires do. People have an easier time stating responses than taking time to write them down. This predictable pattern is apparent in our data. All messages and themes appear in the in-depth interview data because that protocol was designed to explore respondent experience and awareness of all intended messages. Structured interviews probed responses which were offered, but did not bring up additional HE content for discussion with participants. Responses on self-completed questionnaire forms tended to be quick; most are not detailed, however they can confirm key findings. Bar graphs in this section present coded and quantified data from the structured interviews and questionnaires. Representative quotes include examples from all three studies.

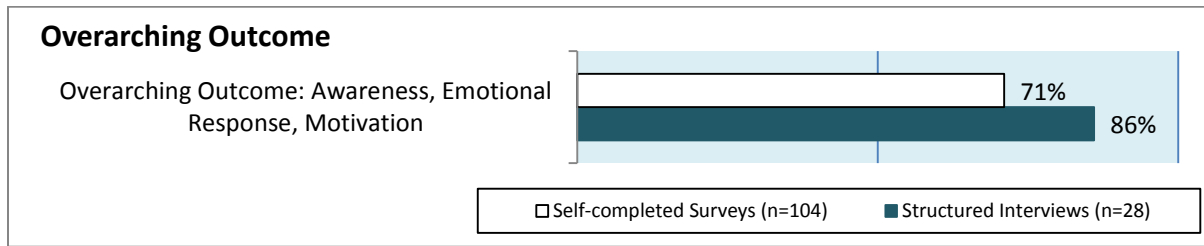
Overarching Outcome: Awareness, Emotional Response and Motivation

A primary goal of the HE team was to make people aware of the power of food-related choices and behaviors to impact the environment. In all three studies, a large majority of participants expressed new awareness or better appreciation of the ability of individual actions to impact life on the globe, often with a sense surprise, awe or determination (71%, 86%). Most of them were reacting to the connectedness of everything on Earth in light of food waste and/or water use in food production. These respondents contemplated their own and others' behaviors around food choices, shopping and waste, recognizing the importance of being thoughtful about how those things affect the world. Quite a few people specifically stated that they intended to attend to and/or change their food-related behaviors.

For many people, issues of food production, food waste, and associated human behaviors were not new, but they valued the reminder; others found new information. Responses were typically charged with emotion as people reacted to images of food waste and water-use graphics with surprise or frustration. The compost site, silo and bathtubs were frequently mentioned. Several people also referenced invasive species arriving on ships. Numerous respondents stated that those scenes and the messages in the live section "really hit home," "made it real," and the like.

Visitors experienced an emotional reaction to images and messages about the connectedness of life on Earth and/or the magnitude of waste or water use. That emotional reaction appears to have moved them to engage in self-reflection, criti-

cally considering their own behaviors. Because this unfolding process within audience members weaves together cognitive, affective and behavioral impacts so neatly, and because it is a main focus of the project, this outcome is segregated and highlighted here. Other impacts are discussed below, grouped by type, i.e., cognitive, affective and behavioral.



In-depth Interviews – Representative Quotes

- I like learning about the impact of our food choices on the environment and seeing how ecosystems connect with each other. That's my thing. ... Lately I've been thinking of ways that I can reduce my carbon footprint, and the current administration and all the stuff that's going on....I've been looking for things that I can personally do to make a change, to affect change. Actually the live part today really got right to me.*
- The reminder that everything is connected even if it's far away, even if we're in our own little bubble. Our plants and animals and waterways seem far away but they are connected even though it's far away--like the salmon. It reminds me to be more proactive about food choices. And waste multiplication. By everyone wasting, waste does impact us.*
- I think it was wastage. The fact that we are wasting most of our - everything that we have in this planet; we are just not giving it the real value. We are not using it as it should be used. We are just taking it for granted and wasting it away. For me, that was the biggest message. An eye opener. ... For me it's just something that changed....coming out of that room...I walked into that room with one mind set expecting something completely different, and a different person came out. That's for sure. That changed something in me regarding wastage, food. I wish I could do something, I really wish I could do something more than just not wasting my food. I wish I could spread the word...well, I'll try to. ... I'll try to send some more people here. ... We are being idiots. Not to see it, once we see it, we feel even worse about ourselves, because this is us....destroying everything we have in abundance...everything that is here created for us...beautiful life, we are just exchanging everything good for what? For nothing...for money...for moments of happiness that is sometimes not even real happiness. We are just misguided regarding the whole subject. ... It's so clear that it's all down to you. As long as you listen...it's for every age, anybody that walks into that room and pays attention to what's being said will come out a different person. It happened to me. It gives me shivers down my spine. Anyone who walks into that room will get the full message, because it's very clear. Everything that needs to be said to the world is there.*
- [Responding to question about emotional reactions] Probably towards the end, the waste, the food waste, just in general. The things we discard. Even when we try to recycle, it still ends up in nature somehow. ... it makes you wonder, what are you doing? Me individually, what am I doing? ... Just everyday life, you know, what you are processing, what you're eating at home and stuff. My wife and I - when you're cooking, it's really difficult, but when you shop, you can't just buy a little, you end up buying way too much. So even though you're planning meals, by the end of the week, something you thought you would use, is now starting to go bad -so you end up -I see myself doing it, wasting without even realizing at the time that I'm gathering it at the local market, that by the end of the week I've maybe thrown away a quarter of what I've bought. ... I think just at the very end, the guy that was narrating at the end talking about you can see my bell peppers from last week. That really jumped up at me. ... It was showing - it was talking about how much we waste and food waste and how that's connected in regards to the growth and the energy needed to produce all that, and the time and resources, and it was showing some kind of a dump or recycle area, and he had mentioned at that point that if you look closely, you'll see my green peppers from last week that were starting to go mushy. And that's where I rubbed my head, and I can relate to that. I've done that.*

Structured Interviews – Representative Quotes

- Bugs and the tree, I never thought about that before. I never see that kind of thing and didn't understand how it works. [Is it new?] Yes, new to me. Enlightening, I don't think about this kind of thing every day. So I have to appreciate how interconnected we all are. I'm part of it; we're all part of it. What I do has an impact. We're at the top of the food chain but we have to take care of things.*
- How you have to be careful with the planet, how what you do has an effect. How much water it takes to make things, whole bathtubs full of water. [Son interjects: I thought, "seriously!?" it's that much water. I did not know.] So now when I ask them to eat everything, they know there is a reason. Will you eat all those chicken nuggets now? [Son smiles: I guess so.]*

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- *Try to be more efficient and not wasteful. I'm thinking of the buffalo wings we ordered last night and didn't like them. [to children] so what happened to those, someone threw them away. ... Maybe we should be more selective, like not getting a whole order of something just to try it. [Long explanation of buying too much fast food, storing in fridge, eventually tossing it etc.]. ... Not new [information], but when you look at it globally, it's more important worldwide. It moves up the priority list. ... Water and food conservation are urgent.*

Questionnaire – Representative Quotes

- *I was surprised by the fact that a small box of beef consumed so much water. I'll definitely try to switch to a more energy-efficient diet.*
- *Eating less animals (meat) because it uses too much water. I want to adopt a more plant-based lifestyle.*
- *Eating chicken is not good for the environment. It was a bit shocking but equally surprising to know that vegetarian food is good for our planet.*

Cognitive Impacts & Perceived Messages**Most Frequently Cited HE Content****Human Impacts**

Among the HE themes most frequently cited by participants over the course of their interviews or questionnaires was the power of individual actions to have an impact in the world, as discussed above (Overarching Outcome, 71%, 86%). Also at the top of the list was awareness that human activities, such as food production and shipping, impact other life on Earth (without overt contemplation of the respondent's own actions), (81%, 82%). Acknowledgement that one's own actions (primarily food-related) have an impact, but without verbiage about intent to affect them was also fairly common (56%, 64%). Messages about individual actions one can take seem primarily to come from the live section, messages about shipping from the movie, and messages about food production from both.

Connectedness of Life

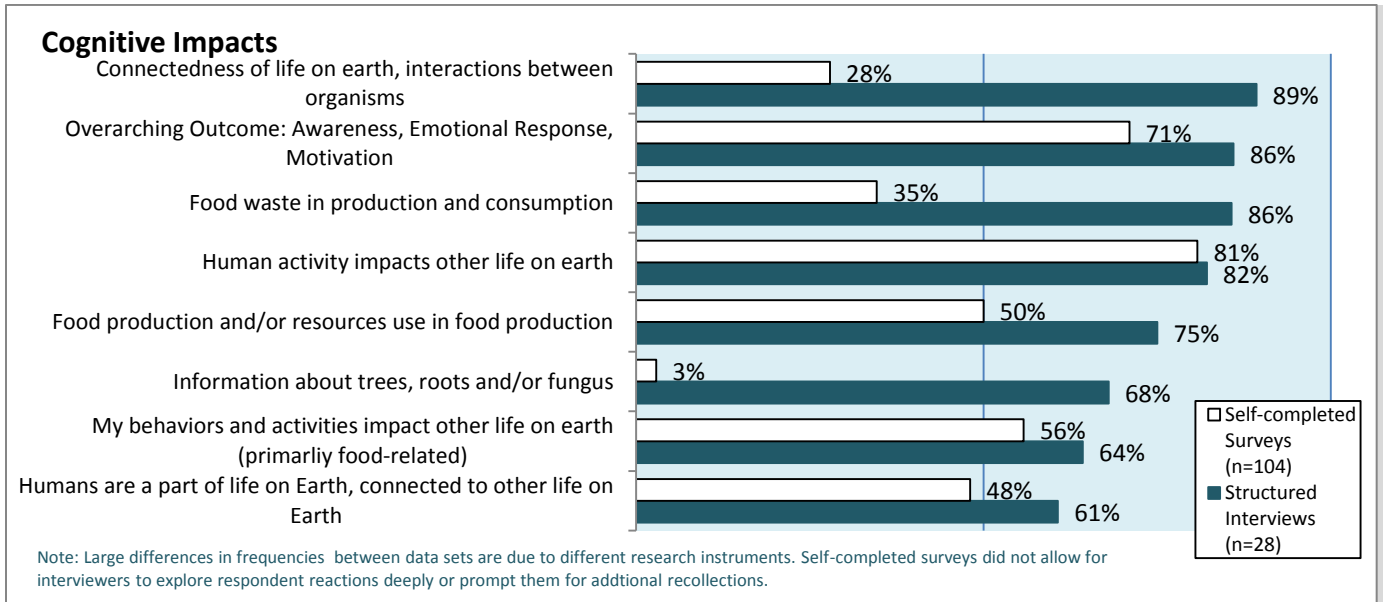
Over the course of their interviews or questionnaires, respondents identified several messages about the connectedness of life on Earth. Many individual respondents touched on more than one of these ideas. Connections among all types of life on earth, including complex interactions between organisms, dominated responses in both interview studies (89% structured Interviews); this was less often specified on questionnaires (28%). Those who commented on this in detail typically referenced the interactions of fungus, tree roots and/or water in the trees/soil. In smaller numbers people referenced birds and fish or otters. Musings about humans as a part of life on earth, or as being connected to life on earth were also fairly common (48%, 61%). Responses almost always referenced the movie portion of HE; a few people specifically mentioned the graphics: circles and lines which connect animals, e.g., the bird and the fish.

Food Waste, Food Production

Information about food waste in production and by consumers stood out for most interview participants (86%); about one third of questionnaire respondents mentioned this (35%). Note that in addition to this, many questionnaire respondents touched on food waste when discussing individual human impacts as noted above. Three quarters of interview respondents referred to food production, sometimes specifying water use; this was on the minds of half of the questionnaire participants.

Trees, Roots, Fungus

Details about trees, roots and fungus stood out for a large number of interview participants (68%), many of whom stated that this was new information, which clearly excited or delighted them. Even if this was not new information, people enjoyed being able to get a special view of how those things look and function. Interview participants typically commented on this content when discussing highlights of the show overall, or strengths of the pre-recorded part of the show. The self-completed questionnaire did not invite this type of reflection or specifically ask about new learning. Had it done so, tree roots and fungus would probably have appeared more frequently in that data set.



Human Impacts – Representative Quotes

- *Humans are changing the Bay entirely because we were bringing in different species. We might have had something so cool there that we just completely destroyed, because we brought in a new species that killed off that certain species. So humans kind of messed it up.*
- *The integration of the Earth. I think we all should be producing only one child each. It's weird in our society that we forgot about not reproducing so heavily. No one talks about that anymore.*
- *Yeah, I definitely learned about the Bay. ... The information at the end about the different invasive species in the Bay, that was really fascinating. I had no idea that there were so many....I guess I didn't even really fully realize the extent of the activity that happened in the Bay. So that was really fascinating to hear about the species that affect the Bay.*

Connectedness of Life – Representative Quotes

- *[Child] Yeah, they had two times when they showed how everything is connected, especially the birds and the fish. It seemed to focus on that a lot, more than anything else. And it also showed how the otters, for example, ate the sea urchins so they wouldn't become overpopulated and eat everything else, and then that whole habitat would be ruined. ... Yes, I actually had known, but I hadn't known the full extent of it. Like I didn't know it could ruin the entire population. I thought it would just mess it up a tiny bit.*
- *I enjoyed it. It showed the connections between everything, then brought it back to us as consumers. It's about how I'm a part, that I have an effect. ... It was new in a way. In class they taught us about the food pyramid, but this is more clear. A better way of explaining it, a different way to show how humans waste. I've never seen that before, the visuals made it new.*
- *I liked when they did the globe with all the different lines, and I thought that was interesting how they showed the animals, the whale patterns, the bird migration, and then they did the humans. I thought that was really a good way to show interactively like the chaos and connectedness of it. ... I liked [that] all of the human ones were very straight and direct whereas all of the animals, and migratory connections, that was just a cool transition.*

Food Waste – Representative Quotes

- *We should be concerned to see how we people spend tons of money about buying tons of food and we just consume a third of the food that we buy. We throw away too much food that probably people can use. ... He was talking about the same thing that we should be careful about what we eat and what we spend money buying all the groceries and food that we don't use. In my mind, I was thinking, he's right, because we spend tons of money buying food and we don't use. And people around the world, like Africa, Mexico, whatever country, they don't have anything to use to feed their kids, or to feed the animals. And here we spend money on nothing.*
- *I guess I never realized how much wasted food had an impact, and how much food is actually being wasted every day. And the whole silo thing, the analogy was very good at showing to what degree things were being wasted. The whole bathtub, too -*

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what a carton of rice versus beef, and how much we take for granted. We walk to the grocery store, it seems so casual, [but] now every time a buy a steak - laughter

- *It's amazing how much food is wasted in the household. I thought food is more likely to be wasted in a grocery. That's one of the things. So many things. Very impressive!*

Food Production/Water Use– Representative Quotes

- *[Parent] That over half the earth's population is in India and China and that's why they use the most water. [Child] And we use one third of our land for crops. [Parent] And that half of the food that's produced is wasted. Sad. Half of that are things that we can prevent, such as when we're buying food being more mindful...like if we know we are going to travel, not to buy as much because it most likely will spoil and waste.*
- *I mean learning about that there are different things that are happening because we are using so much water, we are using so much for our food, to grow our food, to create our food, to feed our animals that we are soon going to be into our food. I found that really interesting, because I've always known the land we use a lot of, the different produce and grain and plants and all that I know about, but the water, I didn't know we used so much for each one. I knew they take water, but it didn't know it was as much as that.*

Trees, Roots, Fungus – Representative Quotes

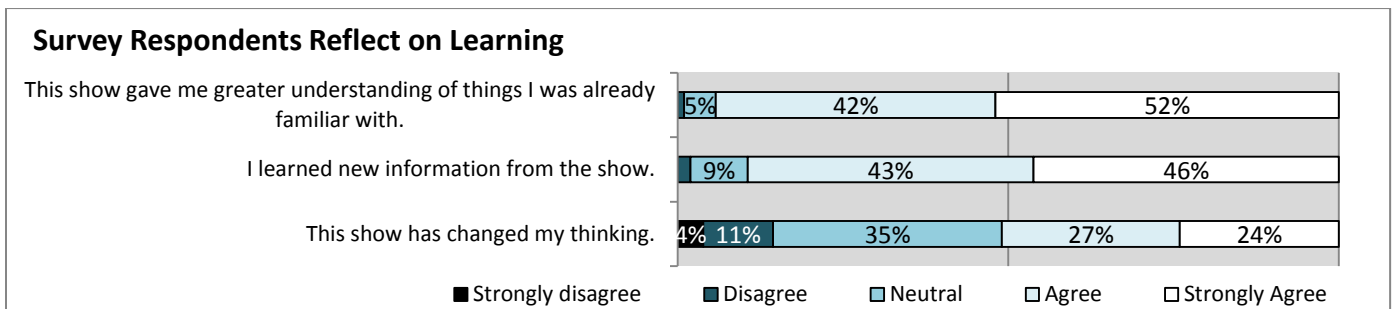
- *They talk about how even like the tiniest little thing you can't see is connected somehow across the web to bigger things. One thing that I got new from this was the way the fungi and the little threads are actually cellular connected with the ends of the trees. That was really interesting to me. I think I went to a good school, so I kind of new about the different habitats and the web chain and stuff like that - oh and how trees influence weather. That was pretty cool. I did learn something.*
- *[Child] I like when they showed how the mushrooms sort of connected and worked with the roots. I thought that was cool. ... It was just different than everything else, 'cause no one really knows how mushrooms really work. So, kind of cool. ... After learning about primary consumers and all that in school actually, so I knew most of that so sort of made me feel like, Wow, I never knew this about Earth. I never knew Earth could do that.*
- *I have less of a science background than she does, but I thought the fungi part at the forest floor was neat, and how...I had no clue what fungi did to be honest with you. So that was pretty cool. And then I honestly didn't know how photosynthesis worked, so I didn't know that trees actually excreted water at the top. That was pretty neat. This will help our kids because I don't know much, and she does...she knows a whole lot more. Laughter*

Reflecting on New Learning & Being Reminded

When interview participants told us about ideas or information that they saw in the HE program, we asked them if that was new to them. For many people the facts of food waste or the amount of water used for food production were not new, but their enormity was new, even shocking. They had a similar response to information about forests; tree roots in general were familiar, but most people were not aware of the role fungus plays, and almost everyone was surprised to learn that trees can expel water back into the soil through their roots.

Questionnaire respondents used a Likert Scale-type question to reflect on the information they heard in the HE show, was it new or a reminder, did it change their thinking? As the bar graph below shows, large majorities of respondents agreed or agreed strongly that HE gave them a greater understanding of familiar material (94%) and/or taught them something new (89%). About half indicated that the show had changed their thinking (51%). A few questionnaire respondents offered comments as well.

Comments which express surprise and/or new learning are found among representative quotes throughout this report, grouped by content. Presented here are a few participant quotes which exemplify surprise, delight or other reflections about discovering new information.



Reflecting on Learning – Representative Quotes

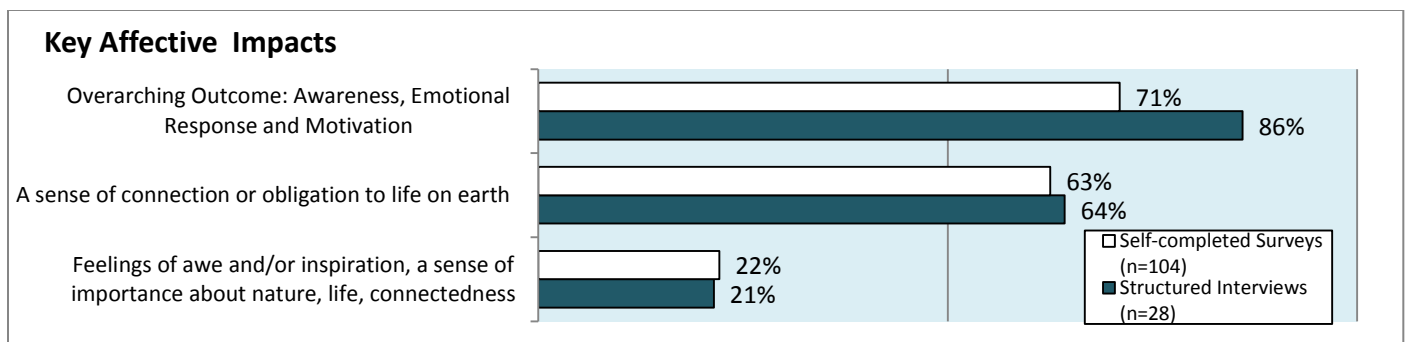
- *It opened my eyes how the parts of the ecosystem were intertwined with all this nature - depends on survival and everything like that. ... Interaction - we should be more open to nature, more interaction with them. The survival of the planet depends on it. We are all connected and we all depend on each other.*
- *[Child] I was looking at the graphs and stuff from a while ago, and it looked like before Christopher Columbus came to America, Atlanta, at least (that's where we're from) didn't have any of those green squares - like where the agriculture was and the cities - with the yellow dots and the squares that were green in the movie.*
- *The trees were something - I never knew that pine trees actually did that, pushed water back out. I just thought they just absorbed everything. They're almost like a holding cell for conserving water for a period of time and then help their neighbors afterward. I never really grasped that concept before.*
- *Ecosystems are connected from top to bottom. That's not new for me. I didn't realize the mushrooms were so important for the roots of the big trees, and I'm a biologist!*
- *Eating chicken is not good for the environment. It was a bit shocking but equally surprising to know that vegetarian food is good for our planet.*
- *About eating meat. I never thought I would not eat meat for a "planet" thing.*
- *More efficient use of food could greatly benefit the environment.*
- *The fungi & soil networks were informative, especially as I'm interested in soil remediation.*

Affective Impacts and Emotional Reactions

Interview participants had more opportunity to express emotional reactions and insights than did questionnaire participants; in addition, interviewers used follow up questions to probe for this information. Questionnaire respondents could easily include comments about or descriptions of affective experiences, however the instrument did not ask for that specifically. The difference in the nature of the data from these two studies is clear on the bar graphs below; interview participants expressed a wider range of reactions and did so more often.

Key Affective Impacts

Both sets of study participants shared three important affective impacts: the Overarching Outcome as described above (71%, 86%), a personal sense of connection or obligation to life on Earth (63%, 64%), and feelings of awe, inspiration and/or the importance of nature and the connectedness of life on Earth (22%, 21%).



Personal sense of connection or obligation to life on Earth– Representative Quotes

- *Yeah, we have to take care of them. We have to be a steward...we have to take care of them...we depend on them for survival. Without them, we wouldn't be here. Like the rain, the trees, the rainforest, all that.*
- *For me, it was just being cognizant to our environment and that we can make a huge impact. ... Makes me feel like humans are bad. I feel guilty almost. In this grand scheme, in this grand network, what do we contribute? Where does our waste go? What do we produce that's benefiting the rest of the ecosystem besides ourselves? It seems we do a lot to benefit human kind, but what are we doing to benefit the Earth?*

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- *I think appreciation. Our entire habitat and ecosystem, how delicate it is, how much we really impact it. Also you feel kind of small, in a sense. I know there are things we can do to improve the situation and appreciate the network, and keep it going and preserve it. But in the end, everyone has a small bit that they all contribute to....*
- *We're all part of a big network, we're impacting that network. We are where we are and have to understand, to protect it all. Now that we, we humans, have changed it all, we have to protect it. Wow, it's the whole earth. We occupy it, we control it, even for larger animals like down there [gestures to African Hall] the more of us there are the more we have to feed ourselves, that's all taking away from their habitat*

Feelings of awe, inspiration, the importance of nature and the connectedness of life– Representative Quotes

- *I thought it was very awe inspiring! You could see on such a microscopic level or such a macroscopic level, and understand how the Earth's ecosystem was so connected and how that could be imbalanced by human activity.*
- *The dramatic beginning part. It brings me into this thing. It's bigger than myself. The Oakland logistics center--the birds and trees got me more excited--the trees and ants and how they work--that's awesome. I feel very touched or emotional. The fish make the world more connected.*
- *For me, it was how everything is connected, how energy is connected in some way, shape, or form. How the ecosystem works a certain way, and it's kind of amazing how everything was designed to work together. ... Some of it brought me to an epiphany...like I can't believe how much we rely on plant life other than just growing our own food, right? But just the delicate network of photosynthesis, the energy from the sun, and because of them, we have animals that can feed on the plants, and then we feed on the animals and the plants...so it's like when we're chopping down the rain forest, deforestation and all that stuff, it's like we're going to kill ourselves. When we wipe all that out, we're not going to be here anymore. There's nothing for us to sustain our own life system.*
- *That we're all interconnected. How we survive without trees on this planet -- trees are the only that can make sugar with water and the sun and carbon dioxide. We [humans] can't. Only plants can get energy from inorganic matter. We learn this in school but it's more clear here.*
- *Everything. Everything on earth. We depend on each other. We depend on earth, trees depend on us. We depend on birds. Everything depends on each other. We cannot live without each other. Something will be missing. Some sacrifices will be made if we disconnect, and that disconnection is actually happening. Sadly, the disconnection is happening gradually...it's happening every day. Some people don't believe it, but it's happening.*
- *To show...People the complexity & pillars of ecosystems, together with their fragility & sensibility to human actions.*
- *To make people... Aware of the impact & importance of preserving ecosystem.*
- *To make people... Feel important & powerful*
- *Message to politicians. Science is fact.*
- *We should love our planet as much as we love ourselves.*

Additional Affective Impacts

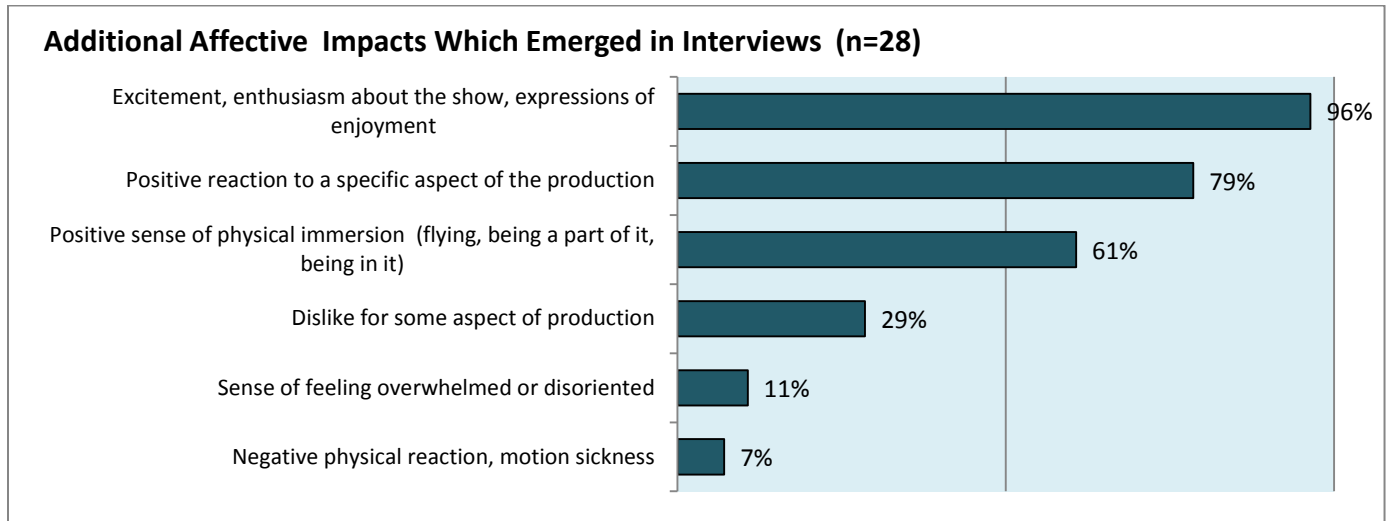
In conversation, interview participants touched on a range of affective experiences and reactions to the HE program. Almost everyone expressed excitement, pleasure or enthusiasm about the show (96%). The fact that questionnaire responses do not tend to include overt statements of enjoyment is a function of the research protocol, and should not be interpreted as evidence that they disliked HE.

Interview respondents had positive reactions to specific parts of the show, such as the otters, the fungus and tree roots, the excellent visuals and colors, clear message, etc. (79%). Many people felt immersed in the show, like they were flying or traveling through those spaces. They talked about being *in* it or *part of* it (61%).

A few people had negative reactions or critiques of the HE program. Several commented on delivery, e.g., the live portion was too quiet; two people would like to have seen a more emotional or forceful presentation of the conservation message (4%, 29%). A few people felt overwhelmed, or thought that the program could be overwhelming or “too much” for others, e.g., seniors or children (1%, 11%). A small number described feeling motion sick (7%). Note: data collectors also heard this from would-be interview participants who declined to participate because of it.

Many respondents commented on how much they enjoyed the presenter and what a lovely voice he had. We did not code those responses, but they would far outnumber the few comments about his presentation which are counted

among negative responses in the graph below (4%, 21%). Please see Live & Pre-recorded below for more information about reactions to the live portion of HE.



Sense of Immersion– Representative Quotes

- *I liked going underground. The ants. I thought that was really great visualization when it went underground and I think it was more interactive - you were going through it. I liked that part a lot. I thought it was really good how they broke down - like how they went through the sizes. It was really informative and easy to follow.*
- *[Child] It was just so interesting because we could see all the fish moving and the otters and the trees and the mushrooms, and I just thought that was really cool. ... I felt like I was moving and I'd have to look down and Oh, I'm not moving.*
- *No matter where your eyes gazed off to, you were totally encompassed in it.*
- *I felt like I was flying. You felt like you were on a bit of a roller coaster...you were moving with it. It was a different experience completely.*
- *It was interesting, to see something so close up, felt like I was touching the trees, swimming with the otter.*

Other Positive Reactions – Representative Quotes

- *...you never to get to see that under the ocean...you only get to see it in a place like this. Don't expect me to scuba dive. It held my attention. I learned a lot. You absorb a lot from it....it has movement and description and everything.*
- *It was mind blowing to start with. I didn't know if the seats were moving or, but the information.... laughter ...the information given is something that everyone should have access to it. It opens our minds to things that we don't actually value much on our day by day. Food. The way we are producing food. The way we wasting it, which is a sin. The show overall was mind boggling. Unbelievable. Well done.*
- *[I would tell a friend] Come watch it, if you like bright colors and things, and something that's not hands on interactive, but very mentally interactive, where it kind of makes you think about ideas you may have never thought of that you do on a daily basis. Definitely come and watch it...you're going to learn something you never learned before. It's definitely ing. Bring the kids. Even if they don't like to sit down, if they like the colors and the movements, they'll definitely be able to follow it especially with all the lines, there's always something going on....it's not staying in one spot for too long. The different angles. I think it's something that everyone in the family will be able to enjoy.*
- *Excellent, I think everything from the visuals to the content was solid. [Say more about what you thought was solid about the content?] I think... obviously it was steeped in science but also bite-sized and you could follow the flow about how things were connected.*

Negative Reactions & Critiques about Presentation – Representative Quotes

- *The production was good. I would have liked more real footage. The graphics were good, though.*
- *I thought it flowed nicely, though the visuals did not flow as nice in the live portion.*
- *I couldn't understand the lady well during the live part, I'm hard of hearing.*

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- *To be honest, it can get monotonous, the talking part at the end feels like the movie is closer to you b/c it's like a call to action b/c someone is speaking to you, it feels more personalized like talking to someone, not built for a large audience.*
- *[The live part] could have been recorded, and wasn't clear that it was really different; it had ums and ahs, so I guess I knew. But it could have been a recording of a different person.*
- *Maybe it was a little too much for a small child - too much looking at the earth. You zoomed in and you zoomed out but you really didn't know where you were. It was a little disorienting and boring, [especially] towards the middle end with all the lights.*
- *[I would tell a friend] that it causes motion sickness. I'm sorry, maybe I'm just too tired or something.*

Critiques about Content– Quotes

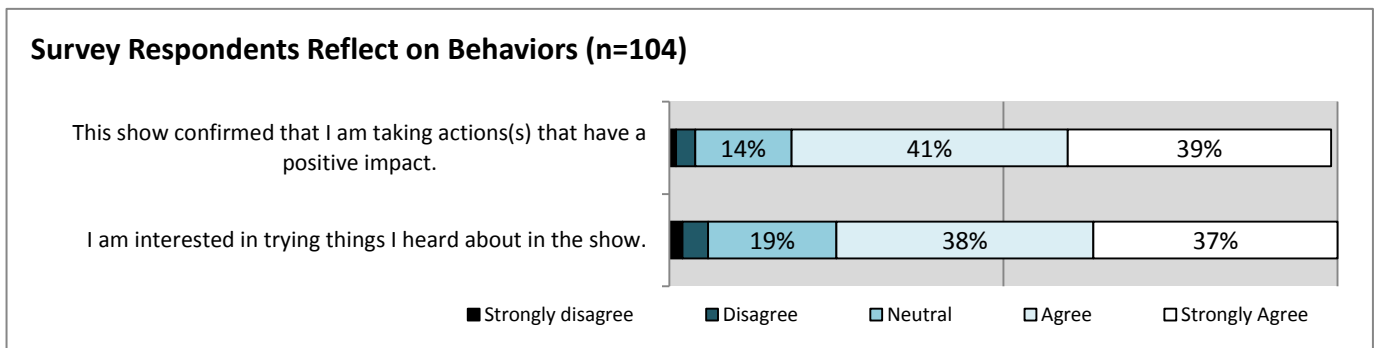
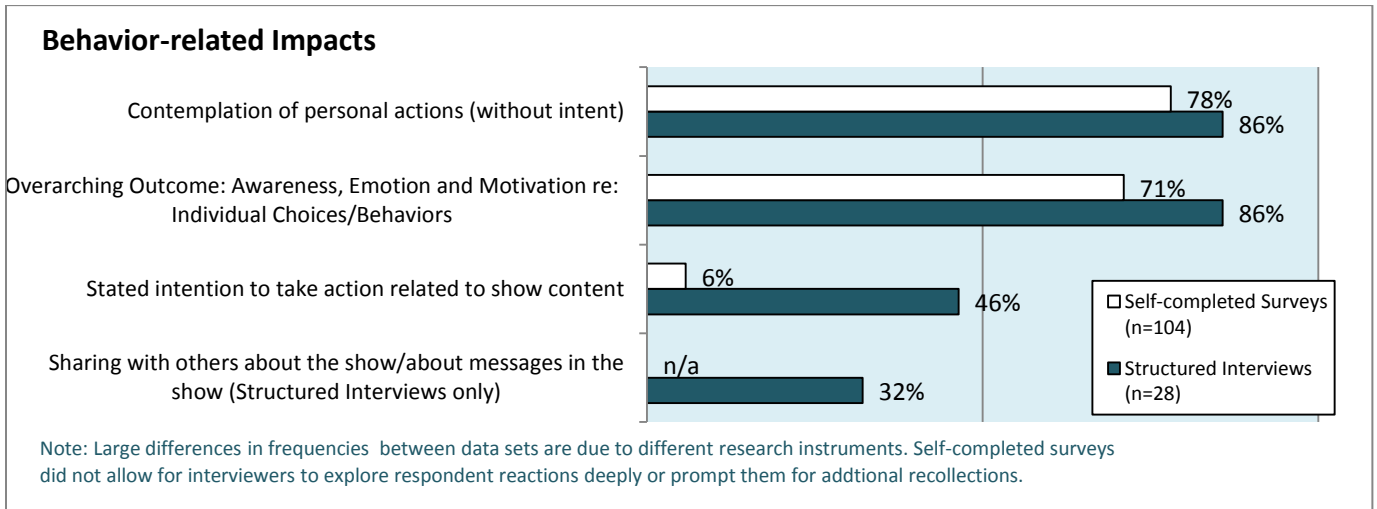
- *I think it could have been more emotional to show landfills. When they started to show a little composting area, I was starting to get excited because I've always wondered about the San Francisco compost, but I've never seen the process. So I was kind of bummed that it only showed that one image. It didn't really get into the process and returning back to the earth and what happens to the compost. I was hoping for a little bit more information on that. I think a lot of people don't understand that and how it works, and so just as far as being compelled to make different food choices, I think it would be really interesting to see the landfill versus a composting area.*
- *I feel like we are in a very dire state right now as far as the environment goes, and climate change and everything. I guess climate change wasn't really explicitly discussed. I mean I thought it was compelling, but I feel like for the average person - like I studied environmental education and I try to be very aware, and I feel like I'm more aware than the average person. ... I thought it did a good job showing how things are interconnected, but it didn't necessarily - there wasn't really an urgency behind it as far as making changes. There were suggestions about taking out some meat and the graphics about how much water is used for consumption of beef versus rice or plants, I thought that was a really good graphic. I feel like people are very emotionally driven and when there's no images of polluted waters or actual - I feel like, I guess there's this balance you want to leave people feeling kind of happy, feeling like they can do something, but I feel like somehow some other graphics depicting what's really going on, 'cause there is really more of a dire situation than they let on. That was one of the thoughts I was having. I was expecting a little bit more of an emotional response to really want to make changes.*
- *I realized how negative the animal agricultural industries are viewed by your organization. I think you are missing a great opportunity to educate about alternative production systems!*
- *Perhaps there should be more emphasis on how humans benefit from a healthy/productive ecosystem.*

Behavior-related Impacts

In-depth interview participants who did not bring up the idea of behaviors and behavior changes were asked about those messages in the HE program. Structured interview participants were not directly asked about behaviors, but when they mentioned them, interviewers explored those ideas with them. Questionnaire writers often referenced personal behaviors in response to open-ended questions.

As discussed earlier in Overarching Outcome, a majority of people were moved to consider the fact that individual actions truly can have an impact in the world (71%, 86%). Over the course of their interviews or questionnaires many people also mused about individual actions more generally (78%, 86%). In smaller numbers they stated intent to pay more attention to and/or change their behaviors, primarily around food choices, shopping, consuming and conserving. (6%, 46%) A few Structured Interview participants were energized about sharing information with others, e.g., telling them to attend HE, or collaborating with family/friends to eat and manage food differently (32%).

Self-completed questionnaire participants responded to a Likert Scale-type question to reflect on their current behaviors as well as their level of interest in trying any of the things suggested in the show. Large majorities agreed or strongly agreed that HE confirmed for them that they are taking actions which have a positive impact (80%). In slightly fewer numbers, respondents indicated that they were interested in trying things that they heard about in the show (75%).



Contemplating One’s Own Behaviors and Their Impacts – Representative Quotes

- *When we would go to like the lakes and they always say look for invasive species. They always check your boats and all that stuff. I didn't really understand how big of an effect that has. That movie showed that, it showed that they were circling the species that weren't supposed to be there in the Bay. So I thought ... you know life is a ripple effect. Like throwing a rock in a pond, every action we do is a ripple to the economy and everything else we're doing. So me, throwing something I find disagreeable away just because I don't want it anymore ripples the economic system and everything else. We have to be aware of what we're doing.*
- *Well, I am a vegetarian, but I didn't know this was positively impacting the water on Earth.*
- *That I don't just waste food; I waste more than that.*
- *The main takeaway for me was at home we try to utilize all our food. We're moving in the right direction. We recycle everything. It was not necessarily new information but brought it home, more real. [We plan to] try more to recycle, to use less water.*

Considering and/or Making Changes in My Behaviors

- *[My main takeaway was] definitely to not shop when I'm hungry. ... [Did they specifically say something about shopping when you're hungry?] No, no, no. That's what my conclusion was about it - just to kind of think about what you're buying. Buy what you need to eat and then only cook what you need to eat...maybe put stuff away in the freezer. That's what I took away from what he said about being conscious about what you're purchasing.*
- *[Child] I was a little disappointed in myself, because I waste a lot of food, now that I think about it. [Parent] Yes, you do. So how could we - instead of throwing away the brown bananas - how we could possibly freeze them and put them into a smoothie. So how can we, instead of throwing away the food, how can we think longer term about how we could still use it. Yeah, I was thinking about that, because somebody sitting beside me wastes a lot of fruit if she doesn't eat it. And we do drink a lot of smoothies....but we buy frozen fruit, so like recycling that....is what it made me think about. How we waste a LOT of food.*

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- *That it is doable. That we should buy less. Waste less. It's something we can start doing as soon as we get home (back to the UK).*
- *I could do more to lessen the negative impact of my actions, especially wasting food.*
- *I think it was honestly about making better local and resources decisions. The [live] presenter made a point about having a few more meatless meals a week. [Do you think that was a doable action for people?] Absolutely.*
- *Eating less animals (meat) because it uses too much water. I want to adopt a more plant-based lifestyle.*
- *The chart with the silos. It was nice. I asked the kids, "What can we do better?" I'm a vegetarian but they aren't.*

Spreading the word

- *I am a parenting advocate and breastfeeding consultant...I talk about health and eating with my clients... I will be able to talk about the macro effects. Yes I will include this, I can explain to them what happens when food is wasted and how it affects every species in the universe.*
- *What people do to affect those connections... The wastage of food...recycling, the fact that people don't recycle. The fact that people misuse plastic. The fact that people misuse everything that could be put to a better use. And it's all down to ignorance. People that don't read about subjects that actually affect our lives directly. ... I believe people don't think they can do anything about it. ... On their own they think they are hopeless...they are too weak to do something. ... It's all down to getting someone to spread the message and letting people believe they can do something together.*
- *I can actually talk to people. That's one thing. I don't know if people will listen to me but I can read more about the subject and answer questions and try to make people get to know that we can get together to do something. I know that in the UK, I can get something done. People there are concerned. ... The British people are doing something about it. They are concerned about the environment...they are doing something.*
- *Spreading the word of conservation, saving the planet, about being less wasteful. The message was not new for me [said this unprompted] but useful for spreading the message anyway. I think everybody needs to do more. As I was walking out I mentioned the name of some friends who waste too much food. [to person she was visiting with]*
- *Understanding that the choices you make impact the world we live in. People are pretty ignorant of that. I teach high school and the kids say that they are just one person, they can't make a difference. No, the things you do do impact the environment. I think with the internet and smart phones people have gotten pretty narcissistic, they don't feel connected to the environment.*

Live & Pre-recorded

Each of the three study protocols specifically addressed the two parts of HE: the prerecorded or movie section with a narrator, and the live section with a presenter. In-depth interviews included a deep exploration of the two parts, how they were perceived, what strengths each had, and how they worked together. Structured interview participants answered a similar line of questions. Questionnaire respondents answered a fixed response question about how noticeable it was that the show had two parts, and rated how well they thought the two parts worked together. An open-ended follow-up question asked why they felt that the parts did or did not work well together.

As the presenter welcomes people into the planetarium s/he explains that the show has two parts and that they will be hearing from him/her partway through the show. For clarity with respondents, and to minimize variables, we used the same male presenter at every show during data collection, with the exception of one day (two performances) during the self-completed questionnaire study. Having a male presenter enabled us talk with interview participants about the two different parts of the show, because the movie narrator is female. While this helped to ensure that respondents would be able to provide useful feedback, having a male presenter could have functioned to elevate the level of awareness of the two parts of the show.

Aware of Two Parts

When asked if they had been aware of the two distinct parts, most interview participants said yes (96%). As noted above, using male presenter could have heightened audience awareness of the two parts since the pre-recorded narration is done by a female. Later in their conversations, 25% were at some point unclear or unsure about which part contained which images or messages. This is understandable given the length of the show and the great amount of information and images it presents. Any responses which could not be clarified during the interview or during data entry were coded as either/both.

The fact that nearly every single participant in both interview studies had been aware of the two parts is in contrast to the finding that only 59% of questionnaire respondents did so. People who found it “somewhat noticeable, now that you mention it” could be exhibiting a “courtesy bias.” If they *did* notice it, but had interpreted the Museum’s intent to make the distinction *not* noticeable, this response allows them to soften the blow. If they had not noticed the presence of two parts and were embarrassed to admit that, the “somewhat noticeable” response gives them a way to avoid revealing the oversight.

The show you just saw has two parts: the prerecorded movie with the woman narrating and a live part with the male presenter. Were you aware of the two different segments?	
Structured Questionnaires	(n=28)
Yes, I was aware	96%
No, I was not aware	0
Not Sure	4%

Most of the Habitat Earth show is a movie with a recorded video and recorded narration. Towards the end, a live person talks to you about food. How noticeable was it that there were two parts to the show, a recorded part and live part?	
Questionnaires	(n=104)
Very noticeable	59%
Somewhat noticeable, now that you mention it	32%
Not noticeable	9%

The Parts and the Whole of HE – Themes and Messaging

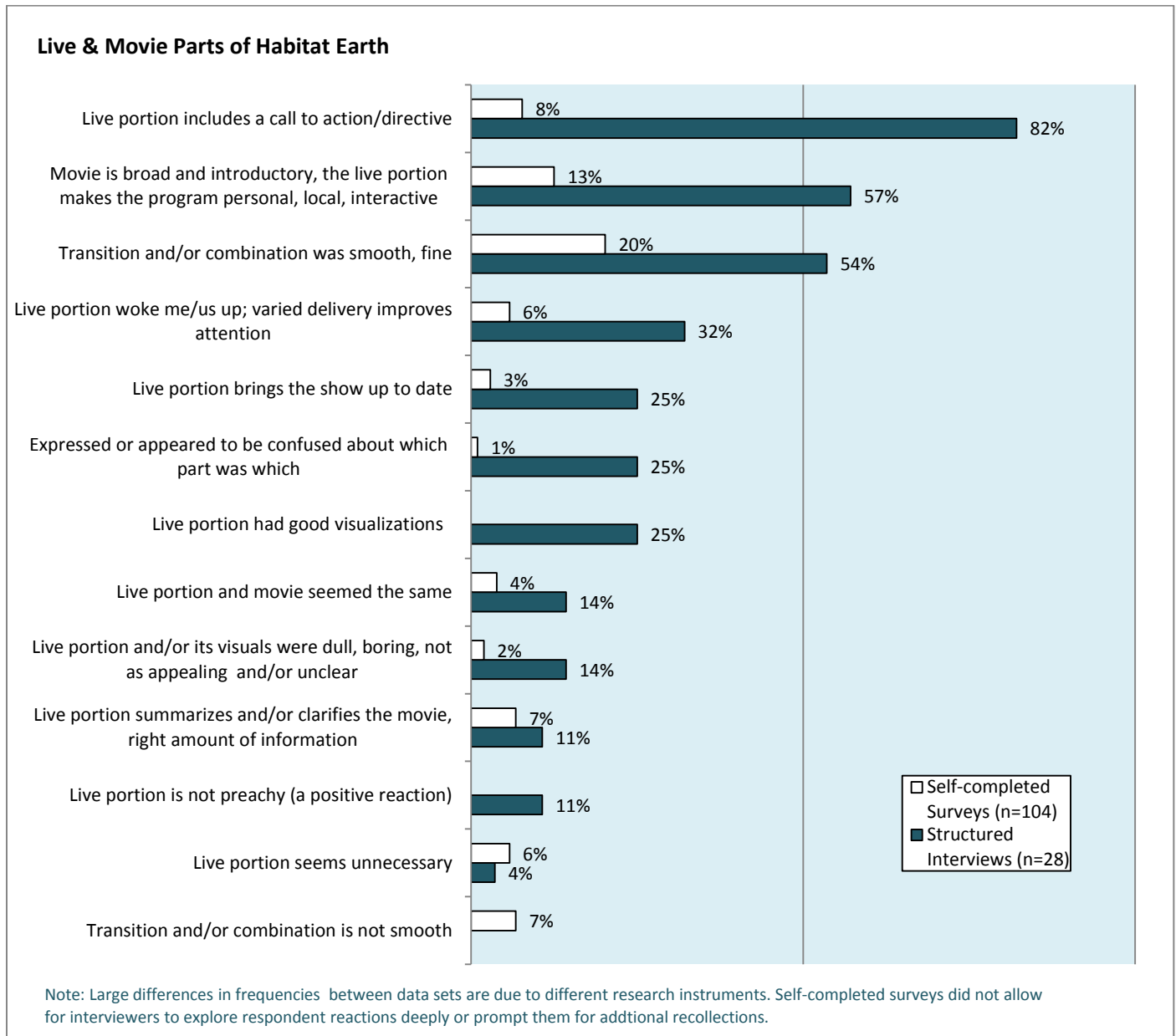
Every theme presented in the bar graph below is reflected in the in-depth interview data as well. As with other data sets, interviews naturally generated more responses of every type than self-completed instrument tend to. In this case the relative frequency of responses in the self-completed data vaguely echoes that in the interview data. Both data sets share the top three response categories: the live portion includes a call to action (8%, 82%), the movie introduces concepts and the live portion makes it personal, local or interactive (13%, 57%), the transition and/or the combination was fine (20%, 54%). Closely related to the notion that the live portion makes the show more personal or local is the idea that it brings the show up-to-date (3%, 25%).

Staff had anecdotal evidence of people getting sleepy during planetarium shows, something which is supported by these data. Almost one third of interview participants commented that the live part woke them up or otherwise improved their ability to attend to the show (6%, 32%).

One quarter of interview respondents noted the value of the graphics in the live portion, primarily the bathtub and silo graphics and the compost dump (25%). As noted above, a few people also commented on the circle-line graphics used in the movie segment to demonstrate connections.

After exploring highlights and/or strengths of each part of the show, our wrap-up question for structured interview participants asked them to reflect on how their takeaways might have been different had they only seen the movie. “This might be a hard question to answer because you just saw the whole show... do you think your takeaways would be different had you only seen the movie portion?” A large majority were very clear that the show’s message(s) would have been different had they only seen the movie portion (75%). There is strong agreement in their responses that without the live portion, they felt that they would have taken away messages about interconnected life on Earth, but they would not have carried with them information about food production, food waste, or related actions that they can take.

When considering the use of pre-recorded and live segments, and how they worked together, very few people had a negative reaction. In very small numbers respondents noted that the transition did not seem smooth, that the live section was not necessary or that the live section could have been pre-recorded also.



The live part is a call to action; makes it local, personal, interactive, up-to-date– Representative Quotes

- *Yeah, the recorded part almost felt more informational, but when he started talking, it was like I am talking directly to you, and it felt more about accountability on the speaking part.*
- *I thought it flowed so great, but it's hard for me to remember which part was recorded and which part was live....I just remember that when he was talking, he was more intentional, that's when I felt like a little bit of guilt... let's start thinking about what we can do versus just a pre-recording. It flowed...it's hard for me to remember which part was which but I do remember when he was talking, here's some plans that we need to do to change.*
- *It would be different. With the Live I am more conscientious. When I think about ordering a burger, I'm still probably going to get the burger [laughs] but I am going to think more about it and what it means, maybe not get the burger every time. Or when apples get squishy like he said, I'll think about the waste, where it goes, it goes somewhere not just away. I'll think I should have eaten it sooner or maybe bought less.*
- *I think having somebody actually talking and someone you were familiarized with before the show - it was the same guy - and I think it made it more personal, this is why YOU need to do this rather than just a movie talking over you. Less kind of com-*

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mercialized. I thought that was good and it was a good transition. I didn't notice, like the nice lady's voice went away. He still had a nice soothing voice.

- I wouldn't call it insights...it's more just re-energizing or re-thinking things that I've either studied myself or read or whatever in regards to how we're all living in this world, how we're all connected in some way, and watching how deeply it goes down to the microorganisms all the way back up to the larger mammals and all that, [but] how do you react to that? ... In my mind, the information is great, but can I use that information in everyday life? ... How do I use that? I mean, at a cocktail party it's kind of hard to talk about microorganisms unless I'm meeting some botanist friend of mine. I think the part about the waste and stuff resonated...to think about conserving in some way.
- There was a whole section where he's kind of filling in information in regards to current [information]. I guess the show was produced previously and there was other information during that time, and he bridged the two. That brings more context into what you're seeing.
- The fact that there's a voice...it seems the images that we see on the live portion impacts you a bit more than the first bits. It actually hits you harder with reality. ... So the first one, good information, the second one, really good information, but it actually hurts - someone who is concerned about our planet. But it's a good way to give information. You need to give it as it is, because you just can't masquerade things - it's perfect, the way it's being put out is just perfect. And there's impact on the first bit, impact on the second bit, but in the different style of impact.
- I think it would be different because you wouldn't be trying to link the two. You wouldn't be trying to link the movie together for their different points. Instead you would only be seeing the movie portion which strongly talked about the different connections between the creatures and living organisms and us. So that's what my mind would be on, how we all connect in the world. Versus how we connect and how our consumption is connecting with them and kind of involving each other in each other's ecosystems.
- I just thought it did a really good job of piecing it together and making it viscerally, tying it together in a way that's more likely to reach the average person. Even someone who's not specifically like me. ... I think the reason why the guy was there and it makes it so much better is because it takes it back to reality that you are not just completely always listening on this one person and it just captivates your attention.
- Yeah, just making different food choices, different choices in your home when you're buying things, about what you're eating. They didn't talk very much about other ways that humans have impacted the environment, such as deforestation and littering and that sort of stuff. But I think they gave a good inspiring basis for when you want and go do more research and find out what you can do. They didn't tell you that you have to do these exact things, which is nice, so you don't feel like I'm not going to do that because it doesn't fit into my lifestyle. I think they gave a general view.

Live portion graphics are memorable and impactful – Representative Quotes

- Yes. I honed in more on his visual presentation about food waste. ... His presentation sparked my interest more than the movie part.
- [The live section] helps support the show. The information and visuals help you focus because they're flat, they're not all around and moving so you can focus on the point he's making. The images (in the live section) are very effective.
- I think that was a big strength, to see, to kind of travel with the nutrients, the bugs, to travel with the movie. That was really cool. I like seeing data, I like statistics, it drives it home for me and it makes it personal, so that for me was the strength of the live section.
- Comparing the amount of water--the stack of bathtubs--makes you think. I absolutely loved it!
- It was presented well so it worked. The visuals were the best. Per container of food, the visuals of the bathtubs, of what actually goes into food. (was this new?) I guess I knew it already but numbers aren't visual. Logically I knew, but didn't know how much more. This was really eye opening.
- The graphics are important to explain his point of food waste--the silo chart. You can visually see what he's talking about.
- Waste, food waste. Yes it was new information (but she could not state what was new, I asked what messaged it) The Silo, seeing the layers in the silo.
- In response to the question If you had only seen the movie without the live part would it have been different, the children responded, "Yes, you wouldn't notice the waste--the bathtubs."

Comments about the Presenter

Many people offered comments about Josh's pleasant manner, funny jokes and nice voice. They appreciated his introduction and being told what to expect. One person had assumed that he took the microphone at one point because part of the audio system wasn't working.

- *[Child] When he introduced it, he was funny. laughter*
- *From an enjoyment standpoint, just having someone add a few jokes in the beginning, it was light entertainment to keep you occupied while you got your seats...that's always good. I think my daughter was the only one who knew what the show was about, she went and got the tickets. So having the live part in the beginning giving you the intro, the context, was really good.*
- *He did give us like a - I wouldn't say warning, because it wasn't negative - so we knew it was coming. I think it would have been a little bit jarring if we didn't know it was coming. I think in general it was pleasant, because it kind of made it more personal instead of just having a recorded voice. I think it was really strong, because in the beginning he introduces himself, he stands in the front; he talks to the audience versus just being back there.*
- *I thought he was great by the way. ... He explained, he said that our narrator is great and we love her but at some point you're going to hear my voice coming on, but he didn't explain why, so I just assumed like the audio was broken. ... Maybe a slightly different introduction to make me think that this was more the way it was supposed to be as opposed to a correction...else maybe the movie integrates the message the gentleman was giving into it better.*

Appendix A - Sample Descriptions

		Self-Completed (n=104)	Structured Inter- views (n=28)	In-depth Interviews (n=15)
CAS Visit & Member- ship	First-time visitor	48%	82%	48%
	Repeat Visitor	50%	11%	52%
	Member of CAS	20%	7%	19%
	Not Member	79%	89%	81%
Residence	California	64%	21%	52%
	Other state	20%	50%	43%
	Other country	15%	18%	5%
Age of Respondent	17 - under	11%	0%	5%
	18-24	13%	11%	14%
	25-29	11%	4%	14%
	30-34	11%	4%	29%
	35-39	9%	18%	5%
	40-44	10%	14%	14%
	45-49	12%	4%	10%
	50-54	7%	14%	0%
	55-59	0%	0%	0%
60 and up	11%	29%	10%	
Highest level of re- spondent's education so far	Middle school	6%	0%	5%
	Some high school	5%	0%	0%
	High school graduate	4%	0%	5%
	Some college	10%	18%	0%
	College graduate	37%	39%	67%
	Post graduate degree	38%	43%	24%
	Prefer not to say	1%	0%	0%
Household Income	Less than \$20,000	n/a	4%	14%
	\$20,000 to \$39,999	n/a	4%	10%
	\$40,000 to \$59,999	n/a	7%	24%
	\$60,000 to \$74,999	n/a	11%	5%
	\$75,000 to \$99,999	n/a	14%	10%
	\$100,000 to \$199,999	n/a	11%	14%
	\$200,000 or more	n/a	21%	10%
	Prefer not to say	n/a	21%	5%

Evaluation Spring 2017

		Self-Completed (n=104)	Structured Inter- views (n=28)	In-depth Interviews (n=15)
Ethnic Identity (check all that apply)	White/Euro-American	n/a	64%	67%
	Black/African-American	n/a	4%	5%
	Asian, Asian-American, or Pacific Islander	n/a	25%	24%
	Latino/Hispanic or Latino- American	n/a	7%	10%
	Native American	n/a	4%	0%
	Other	n/a	4%	0%
	Prefer not to say	n/a	4%	0%
Do you have any special interest, education or ex- perience which relates to the Habitat Earth show content?	Yes	35%	21%	n/a
	No	60%	50%	n/a
	Missing Data	5%	29%	n/a

Appendix B – Structured Interview Protocol.*March 15, 2017*CAS, Habitat Earth Structured Interview **1. So, what did you think of the show?****2. What was the highlight for you?***Why did that jump out... tell me more... was that new info...**Follow up re: Actions... do you think they seem do-able... did the show change your awareness or ideas about doing that ...***3. What was your main takeaway?***Why/where did you hear about that... tell me more... was that new info...**Follow up re: Actions... do you think they seem do-able... did the show change your awareness or ideas about doing that ...***4. The show you just saw has two parts: the prerecorded movie with the woman narrating and a live part with the male presenter. Were you aware of the two different segments?**

Yes	No
Not sure	

5. The people who created this show are especially interested in how the movie and the live portion work together. Do you have any thoughts for me about the combination?*Follow up re: Actions... do you think they seem do-able... did the show change your awareness or ideas about doing that ...**How did that make you feel...***6. What do you think is the strongest aspect of the movie portion?***What did it communicate well... what was most memorable...*

7. What do you think is the strongest aspect of the part with the live presenter?

What did it communicate well... what was most memorable...

Follow up re: Actions... do you think they seem do-able... did the show change your awareness or ideas about doing that ...

How did that make you feel...

8. This might be hard to answer, because you just saw the whole show. If you had only seen the movie part without the live part, do you think your takeaway would have been different?

Follow up re: Actions... do you think they seem do-able... did the show change your awareness or ideas about doing that ...

How did that make you feel...

Date:

Case:

Appendix C – Self-completed Questionnaire*April 3, 2017 Ver.d*CAS, Habitat Earth Self-completed Survey 

Thank you for answering every question.
Your feedback will help us improve the California Academy of Sciences planetarium shows!

1. What would you say is the main purpose of the Habitat Earth planetarium show?

To show...

To make people...

2. What part of the show, or what about the show made those ideas or messages clear for you?


3a. Most of the Habitat Earth show is a movie with a recorded video and recorded narration. Towards the end, a live person talks to you about food. How noticeable was it that there were two parts to the show, a recorded part and live part?

Not noticeable Somewhat noticeable, now that you mention it Very noticeable

3b. How well did you think those parts worked together? (circle one number on the scale below)

Not Well	1	2	3	4	5	Extremely Well
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3c. Why do you think the movie part and live speaker part **did** or **didn't** work well together?

Just a few more quick items on the reverse. 

4a. How strongly do you disagree or agree with the following statements? (circle one number per row)

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I learned new information from the show.	1	2	3	4	5
This show gave me greater understanding of things I was already familiar with.	1	2	3	4	5
This show has changed my thinking.	1	2	3	4	5
I am interested in trying things I heard about in the show.	1	2	3	4	5
This show confirmed that I am taking action(s) that have a positive impact.	1	2	3	4	5

4b. Please share any new insights or changes in your thinking that you gained from the show.

Please tell us about yourself.

5. Do you have any special interest, education or experience which relates to the Habitat Earth show content?

Yes No If yes, please describe:

6. Is this your first visit to the Academy? Yes No Not Sure

7. Are you a member of the Academy? Yes No Not Sure

8. If you live in the US, what is your state of residence? _____ And zip code? _____

9. If you are visiting from outside of the US, what is your country of residence? _____

10. Who is in your group today? (circle all that apply) Child(ren) Teen(s) Adult(s) Senior(s)

11. How old are you? (check one)

17 and under

30-34

45-49

60 or over

18-24

35-39

50-54

Prefer not to say

25-29

40-44

55-59

12. Which category best describes your highest level of education so far? (check one)

Middle school

Some high school

High school graduate

Some college

College graduate

Post graduate degree

Prefer not to say

Thank you!