Formative Evaluation

MAY 2022

GAIA EXHIBIT

Museum of Science, Boston

PRESENTED TO

Elizabeth Kunz Kollmann
Director of Research & Evaluation, MoS

PREPARED & PRESENTED BY

Lauren Hom
Kris Hsu
Julia Rose

T523

Formative Evaluation for
Educational Product Development

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Through the T523: Formative Evaluation for Educational Product Development course, our team conducted a semester-long formative evaluation for the Museum of Science, Boston (MoS) Gaia Exhibit. The Gaia Exhibit (Gaia) is a new, temporary art installation located in the MoS's Blue Wing exhibition hall. Gaia that strives to inspire appreciation for the earth and climate change awareness. The exhibit displays imagery of the Earth's surface on a twenty feet diameter, three-dimensional globe. Additional exhibit elements includes projected questions on the floor to prompt reflection and exhibit-specific floor signage with a QR code that connects visitors to information about the MoS's larger climate change Initiative. The exhibit is recommended for children as young as eight and adults.

EVALUATION PURPOSE & QUESTIONS

Gaia is an atypical exhibit for the MoS, as the primary component is a large art installation within the open exhibit hall space compared to the other Blue Wing exhibits, which are more interactive in nature. Therefore, the MoS was interested to know how visitors—particularly adults and children 8 years old and older—engage with the exhibit and whether the exhibit inspires visitors to learn more about climate change. To address the museum's goals, our team generated an evaluation plan in partnership with our stakeholders to addressed the following questions relevant to the exhibit's four objective areas:

Awareness	In what ways, if any, are visitors connecting to the exhibit?
Engagement	In what ways, if any, are visitors engaging with the exhibit?
Interest	In what ways, if any, does Gaia prompt further interest in climate change?
Exhibition Space	How do visitors describe their experience?

Ultimately, this evaluation will be used to inform future art installations at the museum.

KEY FINDINGS

- **Visitor Activity**—Visitors were most active on the first floor near the entry and balcony areas.
- **High Pleasantness, Short Dwell Time**—Visitors reported feelings associated with a high degree of pleasantness and 50% of observed visitors' engagement was less than 11 seconds.
- **Cursory Behaviors**— Visitor engagement mainly consisted of brief glances and gestures toward the globe upon entering the exhibit hall.
- **Content Connections**—The majority of visitors did not independently connect the Gaia exhibit to climate change.
- **Visitor Orientation**—75% of sampled visitors reported not seeing and/or reading the signs and no visitors was observed to scan the QR code.

RECOMMENDATIONS

- Increase explicit informational exhibit elements to increase visitors' awareness and intentionality.
- Explore additional tangible multi-model exhibit-specific components to increase visitor interest and curiosity in/about climate change.
- Create a space that invites visitors to engage in prosocial behaviors.

INTRODUCTION

EXHIBIT DESCRIPTION

The Gaia Exhibit (Gaia) is a new, temporary art installation located in the Museum of Science's (MoS) Blue Wing exhibition hall. Gaia strives to inspire appreciation for the earth and increase awareness around climate change. Suspended from the museum's Blue Wing exhibition hall ceiling, this exhibit fits within the mission of the MoS, to "inspire a lifelong love of science in everyone." The art piece was originally created by UK artist, Luke Jerram. Gaia displays imagery of the Earth's surface on a twenty feet diameter, three-dimensional globe. Inspired by the phenomenon astronauts experience, the Overview Effect,[1] the Gaia globe art installation hopes to evoke similar feelings of awe for people living on Earth. The MoS describes Gaia as providing viewers with "a profound understanding of the interconnection of all life, and a renewed sense of responsibility for taking care of the environment" (Gaia-MoS, n.d). Admission to the Gaia exhibit is included with the general ticket and the exhibit is recommended for children in third grade and older and adults. The Gaia exhibit offers a space for photographs, learning, and viewing the earth from a new perspective (see Appendix A for a detailed logic model of the exhibit).

In addition to the large suspended globe, the exhibit includes elements to support visitors' reflective thinking and climate change exploration. There are two questions projected onto the ground level floor, in both English and Spanish. Exhibit-specific signs are located on the ground level (LL) and first level (L1) to raise awareness about the exhibit, as well as, contain a scannable QR code that is linked to the MoS's Change Climate Change Initiative.

EVALUATION OBJECTIVES

The MoS leverages the art installation as one component of the museum's larger climate change initiative; the other climate change exhibits are housed in other exhibit halls. Therefore, within this specific context, the primary purpose of the Gaia exhibit is to showcase the beauty of Earth, alongside scientific concepts, to elicit an emotional, and contemplative experience for visitors (Liz Kunz Kollmann, personal communication (p.c.), February 16th, 2022). Key MoS stakeholders are specifically interested in knowing: 1) if Gaia evokes emotions from feelings of awe to wonder, 2) if Gaia increases visitors' curiosity of climate change, and 3) if Gaia inspires independent exploration of climate change concepts (e.g. visiting the other MoS climate change exhibits).

EVALUATION QUESTIONS

In efforts to support the MoS in investigating the initial and immediate impact of the Gaia exhibit, our evaluation focused on the impact areas of awareness, engagement, and interest while considering the surrounding museum context (Freidman, 2008). This evaluation seeks to answer the questions:

Awareness. In what ways, if any, are visitors connecting to the exhibit?

- What connections are visitors making between Gaia and climate change, if at all?
- What emotions does the Gaia exhibit evoke?

Engagement. In what ways, if any, are visitors engaging with the exhibit?

- How are visitors engaging with the reflective prompts of the Gaia exhibit, if at all?
- To what extent are visitors demonstrating contemplative behaviors?

Interest. In what ways, if any, does Gaia prompt further interest in climate change?

- In what ways, if any, did Gaia influence visitors' prosocial behaviors towards climate change?
- In what ways, if any, did Gaia influence which additional exhibits visitors visited?

Exhibition Space. How do visitors describe their experience?

- How do visitors feel about the presence of an art installation at a science museum?
- What would improve visitor's experience with the Gaia exhibit?

[1] The Overview Effect refers to a profound reaction to viewing the earth from outside its atmosphere. Subjective qualities associated with the overview effect, specifically awe, self-transcendent experience, and alterations to the individual's self-schema. (Yaden & Iwry, 2016)

INTRODUCTION

Overall, this formative evaluation of the Gaia Exhibit allowed us to understand visitors' impressions and perceptions of the art-science exhibit, which will aid in the design and curation of future Gaia interactions to better support visitors' interest and curiosity.

METHODS

Our evaluation procedure for the Gaia exhibit was a mixed methods approach, data was collected through onsite behavioral observations and structured interviews and analyzed using descriptive statistics and thematic analysis. We identified trends across quantitative and qualitative data regarding visitors' activity and experience. In total, 3 sweeps, 52 observations, and 22 interviews were completed.

SAMPLE

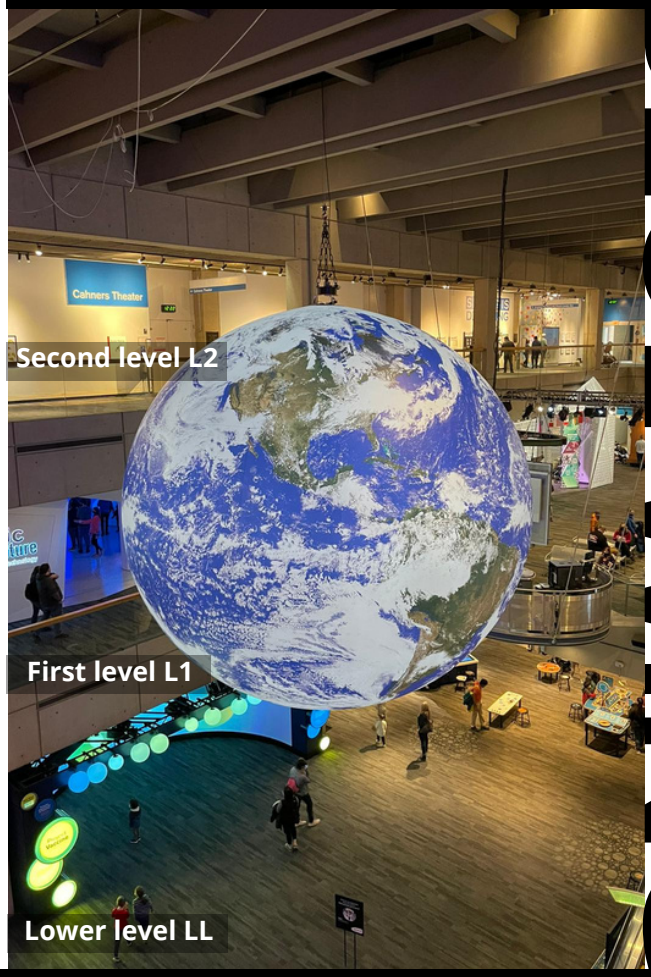
Gaia's target audiences are adults and children in 3rd grade and older. However, our stakeholder emphasized the interest in understanding the adult visitor experience. Therefore, we collected data from visitors within this age range, with our primary focus being primarily adult visitors.

The primary focus of the evaluation is to understand visitor experience, their feelings towards the exhibit and how they engage with the exhibit components. Therefore, the evaluation team did not explicitly collect demographic information but made broad projections regarding age and sex during observations and interview trials, to support an understanding of any trends that may occur across these two variables (Yalowitz & Bronnenkant, 2009). No demographic information was collected or speculated for the sweep trials. *Observations:* 52 visitors observations were completed. The majority of sampled visitors were adults (79%) with 37% being male and 63% females. Additionally, 62% of the visitors were in attendance with their families, while others were in a peer group (15%), with one other person (19%), or were observed to be alone (4%). *Interviews:* 22 interviews were completed. The majority of sampled visitors were adults (86%) with 45% being male and 55% females. Additionally, 45% of the visitors were in attendance with their families, while others were in a peer group (18%), with one other person (10%), or were observed to be alone (27%).

BEHAVIORAL OBSERVATION

Onsite unobstructive behavioral observations were conducted to further our understanding of the more nuanced visitor movement and behaviors present while engaging with the Gaia globe. Art-oriented exhibits are not as common within the Museum of Science, making understanding visitor interest and engagement crucial for present and future exhibit success. The Gaia exhibit is an art installation within a science museum and is not attached to specific learning goals or structured programming. Therefore, the data collectors acted as onlookers, by remaining inconspicuous and allowing the selected participant to move freely throughout the space, noting behaviors that are indicative of engagement or lack thereof (Diamond, 2016). The quantitative data collected was analyzed using descriptive analysis statistics (counts and percentages), details of our data collection and data analysis methods are described below.

Image 1. Floor Levels in the Blue Wing Exhibition Hall



[2] Adapted the method of conducting sweeps every 10 minutes (Serrell, 2020)

METHODS

Sweeps

We conducted sweeps to deepen our understanding of where visitors interact with Gaia. Mapping the number of people looking at the exhibit allowed us to quantitatively identify where engaged visitors are concentrated in the exhibit. Furthermore, sweeps allowed us to address our evaluation objectives centered on *Engagement* and *Exhibition Space*, listed in the Introduction section of this report. Sweeps ultimately helped us gain a better understanding of our evaluation objective on increasing visitors' curiosity about climate change.

Completing sweeps was the first step in our evaluation procedure followed by behavior sampling. We conducted 3 sweeps on 2 different days—Saturday and Sunday—at the MoS, where each sweep took 5 minutes. We used physical copies of the exhibit hall floor plan across all three-floor levels to record where visitors are viewing the exhibit, where we delineated boundaries for sections of the plans we observed. Each member was assigned a floor and recorded where visitors were engaging with the exhibit (e.g. viewing and/or gesturing towards the globe, QR code, and/or floor prompts). No individual recruitment was needed for this instrument since we were observing visitors at the exhibit. A detailed sweeps protocol can be found in Appendix C.

We initially thought about analyzing the sweep data by calculating the sweep rate index for each floor. However, this type of analysis has been typically used for exhibits with defined boundaries and involves the average total time spent at an exhibit (Serrell, 2020). Since the exhibit did not have distinct boundaries and tracking of time spent was conducted in our observation section, we decided to conduct our analysis using counts and clusters. We analyzed the total number of visitors observed on each level and across levels along with the total number of visitors between Saturday and Sunday for localized comparisons (Diamond & Uttal., 2016, p. 88-91). We then clustered where visitors observed Gaia on each floor to identify areas with the most engagement (Beyer, 2010), creating clusters of 4 or more visitors who were in close proximity to each other within the same area of a given floor.

Visitor Observations

The primary focus of the behavioral observation was to document the frequency of specific behavioral patterns that are indicative of engagement toward Gaia and the duration of contemplative states in relation to the globe. This instrument was intentionally designed to directly address the evaluation questions pertaining to visitors' *Engagement* and *Interest*.

We completed 52 observations, the average length was 6 minutes long. We employed behavior samplings, recruiting every 3rd visitor entering into the exhibition space across the three levels (Yalowitz & Bronnenkant, 2009). The observation period began as soon as the target visitor entered into the Blue Wing; observations ceased after 10 minutes or until the visitors left the exhibit hall. The observer (evaluator) inconspicuously observed one visitor at a time, recording each occurrence of the predetermined target behaviors listed on the observation instrument checklist (Appendix B & D), noting any important contextual factors or unexpected relevant behaviors (Diamond, 2016). The Gaia Exhibit has minimally invasive prompts and no formal programming to elicit specific behaviors. Therefore, this method was decided to be the most appropriate and manageable when considering the large open space of the exhibit and the high probability that the visitor's movement will be continuous during the observation period.

When developing the methods for documenting visitor behaviors that may indicate feelings of awe or reflective thinking in relation to Gaia, we used open coding to analyze our pilot

METHODS

observations and interviews. We attempted to descriptively document the different facets of engagement within a museum space. The piloting testing revealed two broad engagement styles, cursory and contemplative. The evaluation team then crossed referenced initial findings with existing literature pertaining to verbal and nonverbal behaviors that are indicative of engagement and contemplation and how these behaviors manifest in informal learning settings (Chiozzi & Giorgio, 2001)

Literature pertaining to the feeling of awe and contemplative educational practice discusses the importance of sustained attention. Contemplative behavior is broadly defined as a sustained focus of awareness on particular objects or entities over time (e.g. maintaining a particular physical pose) or the shifting and sustaining focus of awareness on the moment to moment flow (e.g., sitting watching the in-coming and out-going breath, topic maintenance during conversational periods), engagement of this type, provides opportunities for a person to develop new ways of understanding oneself (Roeser & Peck, 2009). This is in contrast to cursory behaviors that tend to be brief or fleeting engagements that are more superficial in nature. There is a study that suggests that fleeting feelings of awe (i.e. one minute of looking at trees in a quiet nature setting) can have a meaningful impact on various types of prosocial judgments and behavior (Piff & Dietze, 2015). However, longer periods of sustained attention are more strongly associated with awe.

Additionally, Diamond (1986) found that 57% of exhibit interactions of families at science centers were less than one minute long, whereas 18% of exhibit interactions were more than three minutes. Therefore, based on prior research and our own pilot observations at MoS, the evaluation team focused on documenting the frequency and duration of behaviors. Additionally, when considering the high-energy environment of the Blue Wing exhibition hall, we decided to define contemplative behaviors as a prolonged or sustained demonstrations (2+ minutes of one or more of the coded behaviors outlined below).

Overall, our team of three evaluators conducted observations and discussed the evidence gathered for each category, revising the definitions and criteria for each indicator as needed to reach a consensus on how each indicator might be expressed. The final set of indicators was then used during two formal data collection periods. Table 1 lists each coded category and provides a description of the behavior(s) associated with each category (Diamond, 2016).

Table 1. Description of behaviors observed and capture on during observation periods.

BEHAVIOR	DESCRIPTIONS
Glanced	Cursory glance while walking, stopping to glance at the globe
Gestured	Cursory gesture (hand/heads movements towards globe) while walking or standing
Photo	Taking or posting a photo(s) of or with the Gaia globe
Conversed	Conversing while body/gestures are oriented towards the globe or other exhibit elements
Signage	Stopped to view or read exhibit signage; scan of QR code
Floor	Stopped to view or read floor prompts; gesturing towards floor prompts

METHODS

Structured Interviews

Given the multiple facets of this evaluation, an onsite, in-person interview creates a unique opportunity to gather feedback about our evaluation goals. The onsite interview consisted of two parts and targets the evaluation questions pertaining to the area of *Awareness*, *Engagement*, *Interest*, and *Exhibition Space*. During the first part, interviewees marked the mood meter matrix, with their position representing their level of pleasantness and excitement in relation to the Gaia exhibit (Sunewan Paneto, p.c., February 23rd, 2022). During the second part, the interviewee answered questions, listed to the left in List 1, that aligned with evaluation objectives, asked by the evaluator. The participants were asked four open-ended questions. The first question pertains to their mark on the mood meter matrix (Appendix B). And following questions center around the visitors' awareness, engagement, interest, and exhibition space.

Adults and families that observed the Gaia exhibit for at least 5 seconds were approached for these on-site interviews. The target visitor population for this evaluation was adults and families with children over the age of 8 years olds (Museum of Science, n.d.). In addition, evaluators randomly approached visitors by approaching every third visitor that engaged with the Gaia exhibit in the Blue Wing. We completed 21 on-site interviews, with each interview taking around 3-5 minutes.

The interview questions specifically addresses the evaluation objectives (bolded in List 1), centered around the visitors' *Awareness*, *Experience, and Interest*. Interview questions asked are listed below these objectives (List 1).

List 1. Interview Questions

AWARENESS

In what ways, if any, are visitors connecting to the exhibit?

1. [In reference to the mood matrix] Why does this Gaia exhibit make you feel this way?

2a. What, if anything, did you learn from this exhibit?

2b. How do you think the Gaia exhibit connects with climate change, if at all?

ENGAGEMENT

In what ways, if any, are visitors engaging with the exhibit?

3a. How, if at all, did you engage with the reflective prompts of the Gaia exhibit, such as the signage on the floor or QR code?

3b. If yes, what did you do with the prompt? If not, why not?

INTEREST

In what ways, if any, does Gaia prompt further interest in climate change?

4. When did you first notice the globe?

EXHIBITION SPACE

How do visitors describe their experience?

5. If you could change something, or do something differently in the Gaia Exhibit, what would it be?

ETHICAL CONSIDERATIONS

Our team made extensive efforts to reduce the risks in our evaluation data collection and analysis processes. During our data collection process, we placed signage in the Blue Wing to be transparent about the occurrence of observations. Since many visitors come to the Museum of Science to spend time with their families, we were mindful of when and where we approached visitors for interviews, first communicating the purpose of our evaluation and how long we plan to engage with them. We provided the opportunity for visitors to refuse to be interviewed and to stop the interview at any point in the process, without reason. When interviewing children with families, we obtained consent from both the parent and the child. We did not ask visitors for identifiable information and anonymized our data.

To sample adults and families that accurately reflected the Museum of Science's visitor population, we sampled every third person entering the Blue Wing for observations and interviews. Furthermore, we intentionally collected data on weekend days (Saturday and

METHODS

Sunday), because we knew these are the days with the highest amount of traffic for the museum based on our stakeholder conversations. Therefore, we are aware our sample may not reflect the museum's typical visitor patterns on weekdays. However, we previously conducted pilot testing of our evaluation instruments on a weekday and utilized the data collected to adjust our instruments. Nonetheless, we believe our evaluation can inform exhibit decisions that will benefit both weekday and weekend visitors.

When presenting our findings, we reported percentages along with the counts and/or total visitors observed (N value). We were explicit about the distinction between direct quotes from our interviews and areas where we paraphrased common themes among interview responses. We clarified and omitted wording only when needed, such as providing additional context for the quote or to preserve privacy. Moreover, we made an effort to highlight the range of behaviors observed and interview responses of visitors from various demographics.

LIMITATIONS

This evaluation investigated visitors' experiences of an exhibit containing a massive art installation that hung from the ceiling within an exhibition hall housing 21 other exhibits. The large space and undefined exhibit boundaries posed complexities. The evaluation team made great efforts to standardize data for visitor recruitment and across data collection protocols under these conditions and time constraints. Regardless of the evaluation team's efforts, there were several limitations.

Observations are largely descriptive and dependent on the observer's attention and understanding of pre-determined coded behaviors. Although open-ended interviews were conducted following the observations, we did not follow up with the formally observed visitors from the sweeps nor did we follow up with formally observed visitors from the behavioral observations to gain additional insights into the nature of motivations behind their behaviors, or subconscious experiences.

During the sweeps trials, the evaluators did not record visitors' specific behavior that signaled that they were engaging with the exhibit. Therefore, we were unable to retroactively review if visitors recorded as 'engaged' were in accordance with defined behavioral codes. Additionally, the sweep protocol required three evaluators to conduct sweeps across the three levels at the same time. During the second observation period, only two elevators were present; one evaluator completed the sweep across two floors, potentially missing engaged visitors while transitioning floors.

Lastly, the primary limitation was the potential for selection bias during the recruitment of visitors for the observations and interviews. While the evaluation team attempted for proper randomization across all data collection methods, the sample of interviewed visitors was selected based on the interviewer finding the visitor as an engaged visitor.

FINDINGS

Sweeps

Sweeps were conducted across all three levels of the museum during the same 5-minute period (Image 1): lower Level (LL), level 1 (L1), and level 2 (L2). The location of visitors displaying behaviors of observing the globe (e.g. looking at the globe or floor prompts, gesturing at the globe, etc.) were counted in our sweeps. We conducted sweeps on two different days, Saturday and Sunday, as these were the busiest days at the museum based on conversations with our stakeholders. We conducted one sweep on a Saturday from 11:55am to 12:00pm and two sweeps on a Sunday from 11:31am to 11:44am and 3:25pm to 3:30pm.

Table 2. Total Visitors per Floor Across All Sweeps

Floor Level	Total Visitors	% of all observed visitors
LEVEL 2	33	28%
LEVEL 1	59	50%
LOWER LEVEL	27	23%
TOTAL VISITORS OBSERVED	119	100%

**Note: Percentages rounded to the nearest whole number*

Table 2 shows the counts for the total number and corresponding percentages of visitors who engaged with Gaia. When looking across all sweeps, we observed the most people engaging with Gaia on the level 1 (59 people). We observed the least amount of people engaging with Gaia on the lower level (27 people).

When comparing between Saturday and Sunday, we observed a similar total number of people (Table 3). On Saturday we observed 40 and 44 people in two Saturday sweeps and 35 people in a Sunday sweep. This suggests that among those observed, the total number of people engaging with Gaia is consistent between weekend days.

Table 3. Total Number of People by Day of the Week

Day of the Week and Time	Total Visitors
SATURDAY 11:55am to 12:00pm	40
SUNDAY 11:39am to 11:44am	44
SUNDAY 3:25pm to 3:30pm	35
TOTAL VISITORS OBSERVED	119

Clusters were based on visitors' proximity to other visitors (Diamond & Uttal, 2016) and visitor groups larger than four. For L2 and L1, the breakdown of clusters was based on the four sides of the balcony, since this is where most of our observations occurred. The following floor plans display where visitors viewed Gaia on each level (3 levels in total) of the Museum of Science's Blue Wing. We provided two floor plans for each floor: the first floor plan shows the numeric count of the visitors in the clusters identified (Figure 1-3); the second floor plan shows the location of each visitor observed (Appendix E) .

As seen in Figure 1, we observed most visitors engaged with Gaia near the balcony area closest to the elevator on L2. Across all sweeps, we observed 29 out of 33 people viewing Gaia from this area. The majority of visitors (16 visitors) viewed Gaia from the middle and bottom right balcony area closest to the elevators and 4-D Theater exhibit.

As seen in Figure 2, we observed visitors engaging with Gaia along the balcony areas closest to the elevators and the Arctic Adventure and Wicked Smart exhibits on L1. Across all sweeps on this level, the majority of visitors (19 visitors) viewed Gaia from the area of the balcony closest to the Wicked Smart exhibit, followed by the corner of the balcony closest to Arctic

FINDINGS

Adventure (10 visitors). Other areas where visitors engaged with Gaia include the side of the balcony area near Arctic Adventure and the Engineering Design Workshop exhibits (9 visitors) and the area near the performance stage where there are benches (6 visitors).

As seen in Figure 3, most visitors engaged with Gaia in the areas near the floor prompts—represented by circles on the floor plans, above—on the lower level. Across all sweeps on this level, 7 visitors viewed Gaia in the area with three floor prompts and 9 visitors viewed Gaia in the area with two floor prompts. While engagement with the floor prompts were not explicitly observed during the sweeps, we noticed few to no visitors observed viewing the prompts during our sweeps.

Figure 1. Level 2 Sweep Clusters by Counts

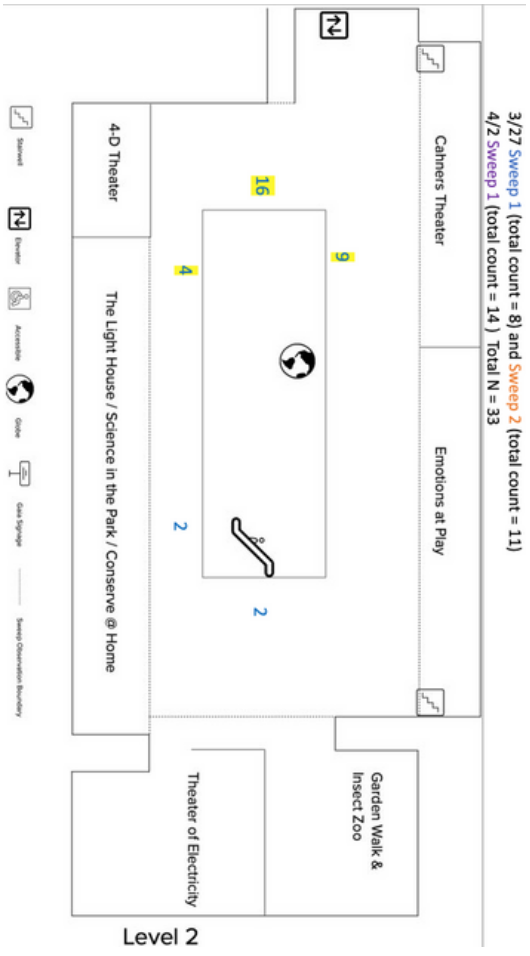


Figure 2. Level 1 Sweep Clusters by Counts

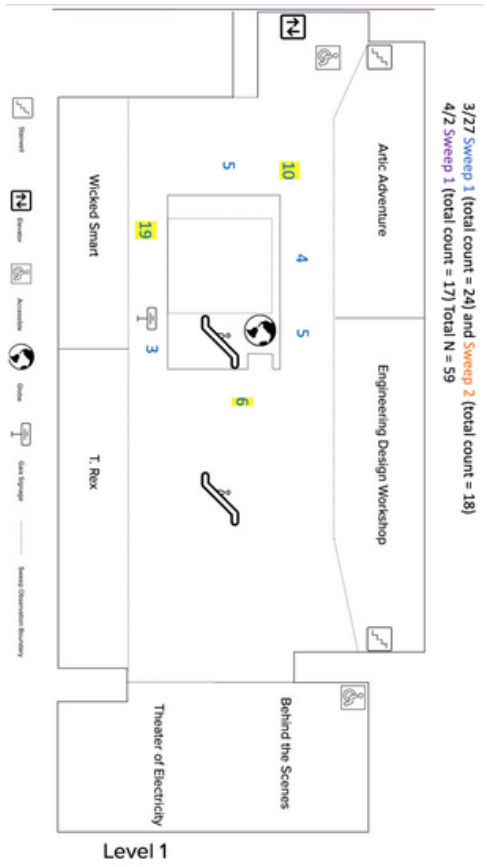
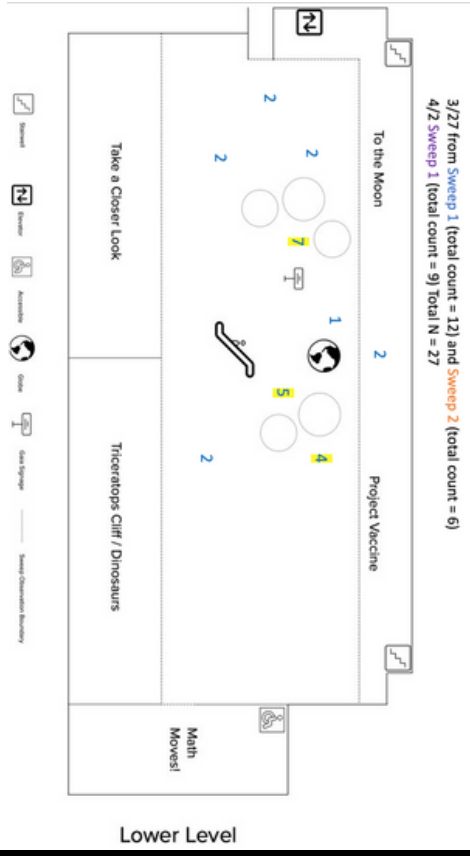


Figure 3. Lower Level Sweep Clusters by Counts



FINDINGS

Observations

Of the visitors observed (n=52), 83% of visitors demonstrated behaviors indicative of engagement and/or contemplation in relation to the Gaia exhibit. As you see in Figure 4, across the visitors who were observed to engage with Gaia, 23% demonstrated contemplative behaviors while the majority of behaviors observed were brief interactions such as brief glances or gestures towards the Gaia globe while visitors walked to and from other exhibits in the Blue Wing. Proportion across the types of behaviors displayed are detailed in Figure 6.

Figure 4. Percentage of Engaged Visitors

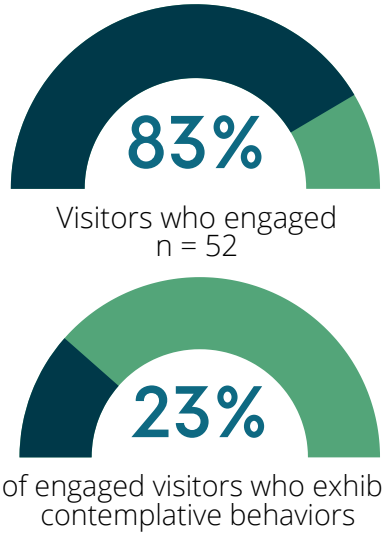
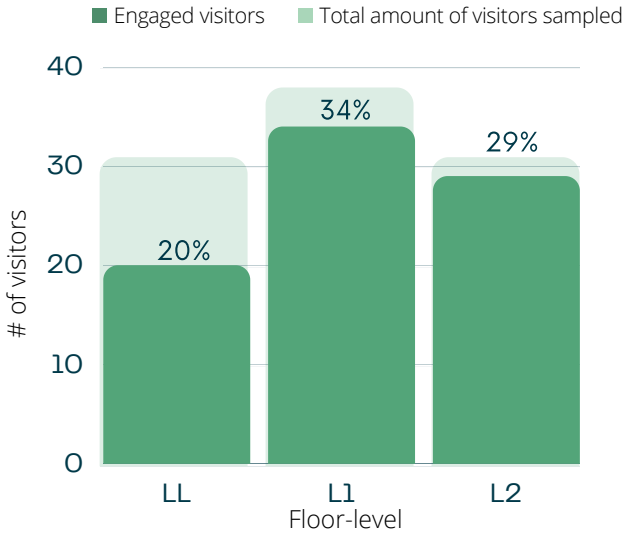


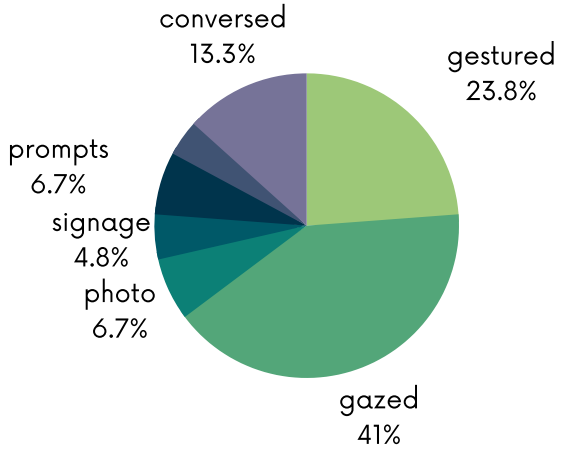
Figure 5. Proportion of engaged visitors across floor-levels



The main stakeholder discussed wanting to understand the difference in engagement across the floor-levels. Figure 5 and Figure 7 provide floor-level specific details pertaining to how many of the visitors observed on each level engaged with the exhibit, the average duration of a visitor's engagement, the number of visitors whose interaction lasted 10 seconds or less or longer than 10 seconds, and the variation of behaviors observed.

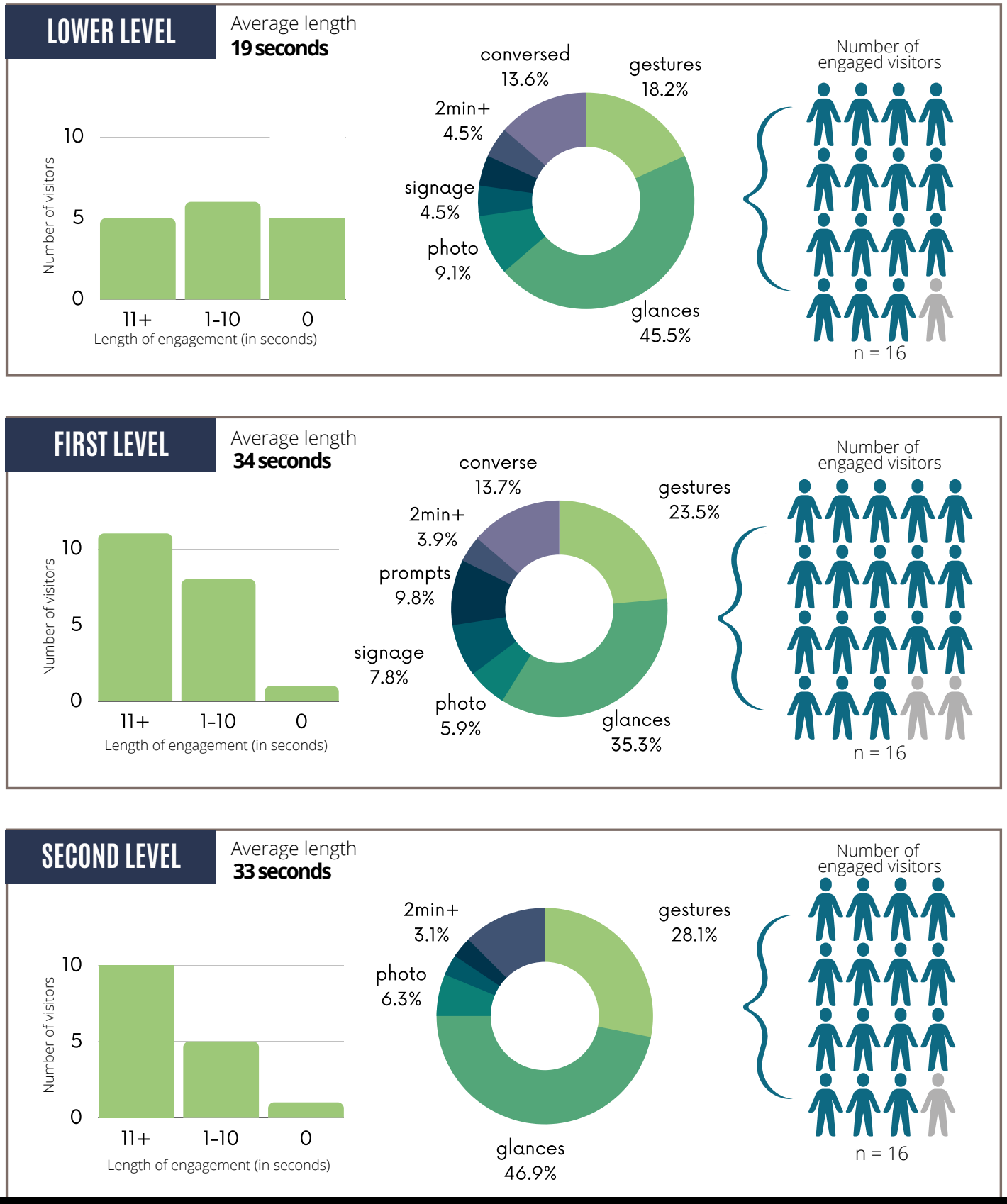
Comparing engagement across floor-levels, visitors on the LL engaged with the Gaia exhibit the least and for the shortest amount of time. Visitors across all levels demonstrated a range of engagement and contemplative behaviors, with L2 having the largest percentage (93%) of sample visitors being observed to engage with the Gaia exhibit. It appears that the visitors on L2 exhibited less variety of behaviors, however, this cannot be assumed to be true as there was no explicit exhibit signage present that was comparable to the Gaia signage on LL and L1 that displayed reflective prompts and a QR code to further visitor's exploration of climate change. Additionally, over the period of two months (February 1st to April 6th), the Gaia exhibit signage QR code was scanned a total of 26 times, with an average session length of 10 seconds. This access rate should be considered with caution as with further investigation it is known that the evaluators and MoS staff members contributed to this number.

Figure 6. Proportion of behaviors (by type) observed by engaged visitors



FINDINGS

Figure 4. Floor Level Specific Data (left to right). Data displays the number of visitors who engaged with Gaia for more or less than 10 seconds, the average length of engagement, the proportion of behaviors observed (by type), and the number of engaged visitors in the sampled visitor group.



FINDINGS

Mood Matrix

The mood meter matrix was chosen as the method to investigate how visitors are connecting with the Gaia exhibit; specifically, identifying emotions that the exhibit evokes and to what extent. Quantitative data (i.e. ordinates of visitors' mood meter) and qualitative data (i.e. thematic concepts extracted from interview responses and mood meter emotions) were analyzed using descriptive analysis statistics (counts and percentages). The statistics were used to identify what emotions the exhibit evokes, the prevalence of emotion a across visitors, and the relation between emotions identified on the mood meter and visitors' mood meter and visitors' interview responses.

Visitors were randomly selected to participate in an interview, across all three floor-levels. Each evaluator started visitor interviews by presenting participants with a blank graph and asking them to plot their current emotions in relation to the Gaia exhibit across two dimensions, pleasantness (x-axis) and energy (y-axis). The mood meter matrix is divided into four color quadrants (Figure 8.)—red, blue, green, and yellow—each representing a different set of feelings. Emotions are grouped within these quadrants based on pleasantness and energy levels (Brackett, 2020). In Figure 9., 61% of words plotted fell in the yellow (top-right) quadrant indicating that the majority of sampled visitors (n=18) were experiencing high-pleasantness, high-energy feelings such as focused (n=3), motivated

Figure 8. Mapping of visitor emotions onto the mood meter. Level of transparency indicates frequency of word mapped by visitors; red box is the highest frequency word plotted.

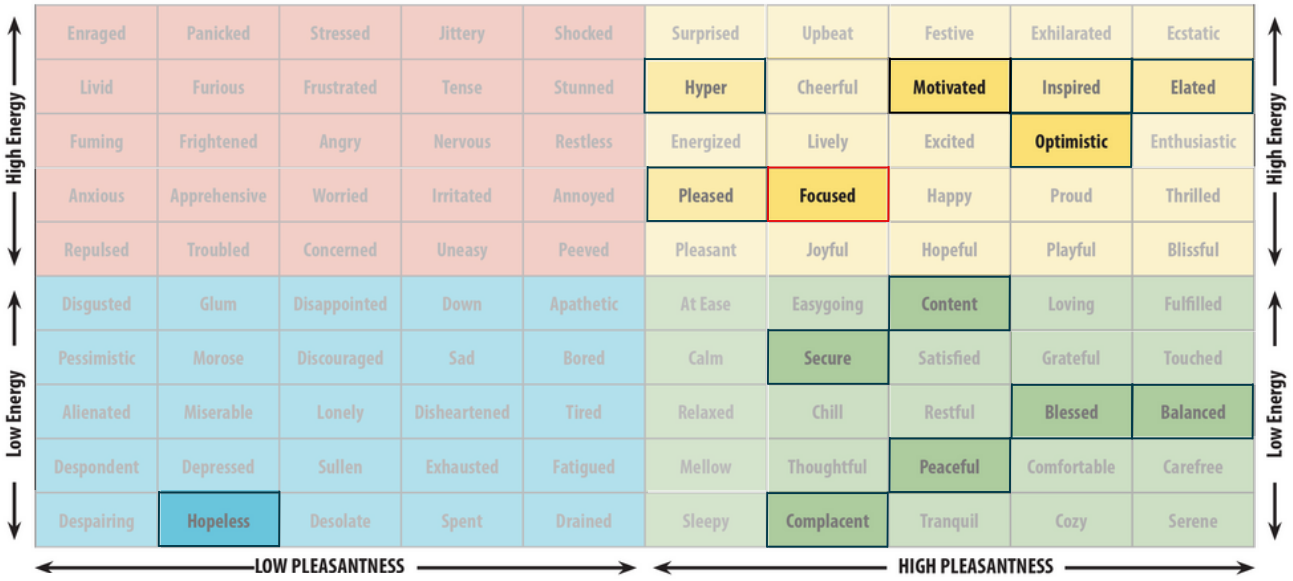
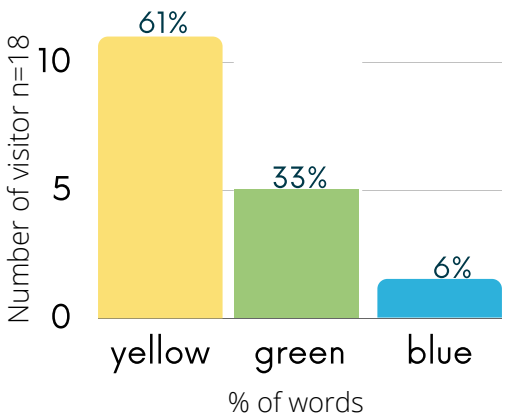


Figure 9. Distribution of visitor's emotions across quadrants



(n=2), and optimistic (n=2)—only these three plotted emotions occurred across multiple visitors. The green quadrant represents feelings of contentment and peace while the blue quadrant is for unpleasant, low energy emotions like hopelessness. No visitor plotted within the red quadrant that represents unpleasant, high-energy emotions, like anxiety and rage.

FINDINGS

Structured Interviews

We completed 21 on-site interviews, with each interview taking around 3-5 minutes. We made an effort to design an interview that was bias-free and without leading questions to obtain authentic answers from participants (Diamond, Horn, & Uttal, 2016). To analyze the interview answer data, we used a thematic analysis approach for each question. We developed the appropriate codes for each question, wherein every question has its own unique set of codes (Rosala, 2019). We decided to analyze each question individually, because each interview question provides key insight on their respective evaluation objectives. With these question-specific codes, we identified themes that relate to the evaluation objectives.

Note that each response could be tagged with several codes, so the third column does not always add up to the total N value. While we conducted 21 total interviews, the total interviewees per question may vary, given how not every interviewee answered each question. The interview findings below list (1) a brief discussion of the findings and (2) a graphic that illustrates the code and notable quote, ranked in order of number of times the coded response was mentioned in interviews.

Question 1. Why does the Gaia exhibit make you feel this way? (Awareness)

Code	Notable Quote	N Value
Exhibit aesthetic (subjective interpretation)	"I got to see the whole earth, a huge globe. It puts things into scale and is 3-D"	11 of 21
Immediate internal state (subjective interpretation)	"The level of light makes it feel magical but not overwhelming"	11 of 21
Confusion	"What way? umm"	2 of 21
Reflective toward the collective	"I hope people get the idea about what is happening"	2 of 21

Immediately after the visitors marked the mood meter, this initial interview question was asked to further investigate what connections the visitors were making between themselves, their emotions, and the Gaia exhibit. This specific interview question was highly structured as it was in reference to the visitor's mood meter marking. During the initial review of the 21 responses collected, 9 codes were identified; however, upon further review, these categories were condensed into five categories. The majority of participants' responses were subjective descriptions of Gaia's aesthetic and personal feelings toward the globe. Two participants discussed their feelings in relation to how the exhibit may impact others. These statements included the noun 'people' in reference to the larger population versus personal or subjective pronouns.

FINDINGS

Question 2a. What, if anything, did you learn from this exhibit? (Awareness)

Code	Notable Quote	N Value
Nothing/not much	"Nothing. It looks cool, but doesn't feel very educational."	5 of 16
How earth, clouds, and ocean look	"Get to see a perspective of the world and the size of the water and countries."	4 of 16
Scale (expansive distance, size, perspective of world)	"It puts everything to scale, with the distance and perspective."	3 of 16
Confused about the exhibit	"I did not realize it was an exhibit"	3 of 16

For Question 2a, we had a total of 10 codes and these were the top 4 codes with the most number of participants tagged. Overall, five of sixteen visitors described that they did not learn much when experiencing the Gaia exhibit, stating "I learned nothing" or "not much". Four visitors discussed connections to learning about the earth, such as how the earth, clouds, and ocean look. Three visitors noted how they got to better understand the scale of the earth, stating the exhibit as "expansive". These visitors noted how they could see the distance between countries and size of the countries and ocean water. Three visitors also felt confused about the exhibit, stating that they "did not realize it was an exhibit" and "I thought there was a formal exhibit station for the globe".

Question 2b. How do you think the Gaia exhibit connects with climate change, if at all? (Awareness)

Code	Notable Quote	N Value
Not sure	"Not sure about how it's about climate change"	4 of 17
Didn't think about climate change	"Wasn't thinking [about climate change] when looking at it"	4 of 17
Finds it difficult to connect to climate change	"Not much. It would be cool to see the sea levels change."	4 of 17
Sees some relationship between Gaia and climate change	"There are ice caps that are visible. I'm curious what year this is modeled after."	3 of 17
Not connected	"Not at all", "It does not"	3 of 17

Overall, visitors did not connect the Gaia exhibit to climate change. There were 7 codes created for this question and only one reflects a positive connection to climate change: "Sees some relationship between Gaia and climate change". Four of seventeen visitors stated that they were "not sure" about the connection to climate change. Four guests also explicitly stated they did not think about climate change, stating they "haven't figured [out the connection yet]" or "didn't discuss [climate change] in our discussion". Three guests described connections to climate change. One guest under this code noted the evident ice caps. The second guest stated that seeing the Gaia exhibit helps "realize what we are destroying". The third guest described how the scale of the globe could show the amount of trash in the oceans.

FINDINGS

Question 3. How, if at all, did you engage with the reflective prompts of the Gaia exhibit, such as the signage on the floor or QR code? If yes, what did you do with the prompt? If no, why not? (Engagement)

Code	Notable Quote	N Value
Did not see signage	"I didn't see it", "Read what? Where? Oh!"	10 of 16
Only read the projected floor prompt	"I read the big question and answered it in my head", "Read when on the upper floor"	4 of 16
Saw them but did not read signage	"Noticed the signage, but didn't read"	2 of 16

The majority of the interviewed visitors did not engage with the reflective prompts, which includes signage projected on the floor or QR code signage. Six visitors engaged with the signage. Of these six visitors, four of the visitors read the projected floor prompt and did not engage with other signage, such as the QR code. Two of these six visitors saw the signage, but did not read or answer them. One of these six visitors did not know the question was connected to the Gaia exhibit, and "was wondering what the questions were connected to". Another one of these guests read the question and answered the question in his head. No interviewed guests engaged with the standing signs that include the QR code.

Question 4. When did you first notice the globe? (Interest) (b. did you find yourself coming back to the globe between exhibits?)

Code	Notable Quote	N Value
First thing noticed when entering Blue Wing	"As soon as I came in [the Blue Wing]", "First thing we saw [in the Blue Wing]"	10 of 10

This question has a lower sample size of 10, because the question was implemented during the second round of interviewing at the museum. This question was added to further reflect visitor interest in Gaia. Of the 10 visitors interviewed, all 10 visitors stated that the Gaia globe was the first thing they noticed upon entering the Blue Wing from their respective floor levels. Other codes for this question consist of codes detailing which floor the guests first saw Gaia. Of these 10 visitors, 2 visitors first noticed the Gaia globe when entering from Lower Level (LL), 2 visitors noticed the Gaia globe when entering from 1L, and 2 visitors noticed the Gaia globe when entering from 2L.

FINDINGS

Question 5. If you could change something, or do something differently in the Gaia Exhibit, what would it be? (Exhibition Space)

Code	Notable Quote	N Value
More dynamic weather showing Earth's change over time	"I want to see change over the years and see how climate is impacted", "If it's a projection then it needs to be more dynamic"	5 of 21
More interactivity for kids	"Hands on for kids as they learn more from experiencing", "More interactive for the kids"	5 of 21
Nothing	"Leave it alone", "There's lots going on in the museum and it's a nice calming factor"	5 of 21
Change cloud formation design	"[I] want the clouds to change, clouds could be more dynamic", "Get rid of the clouds [as they block the continents]"	4 of 21
More seating	"Seating would be nice"	3 of 21

Overall, if visitors could change elements of Gaia, they would want to make a wide range of changes to the exhibit, from making it more dynamic and interactive to opting to change nothing. Five guests would change the exhibit to be more dynamic. For instance, they recommended showing the impact of climate change on the globe over time. A visitor also suggested changing the lighting of the globe based on the time of day and the weather. In addition, four guests recommended more dynamic cloud formations, noting that the clouds blocked the view of some countries. Some visitors recommended "get rid of the clouds" and "I want to see some of the countries but the clouds block them".

Five visitors recommended making the Gaia exhibit more interactive. Specifically, three of these five visitors wanted more interactivity for their kids, stating that their kids "learn from experiencing." Five visitors also made comments about not changing the exhibit, such as "nothing to change" or "nothing". One of these visitors noted, "There's lots going on in the museum and it's a nice calming factor." Three visitors made comments recommending more seating to view the globe, such as seating placed along the walls of floor LL.

DISCUSSION

In this section, we will discuss the overall findings as they relate to each evaluation question, highlighting and expanding upon information discussed in the previous sections.

High Pleasantness & Minimal Reflection

Out of the visitors observed (n=52), 83% of visitors demonstrated behaviors indicative of engagement and/or contemplation in relation to the Gaia exhibit. Across the visitors who were observed to engage with the exhibit, 23% demonstrated contemplative behaviors while the majority of behaviors observed were brief interactions such as brief glances or gestures towards the Gaia globe while visitors walked to and from other exhibits in the Blue Wing.

The Gaia globe was created by an artist to evoke feelings that mirror the "overview effect" felt by astronauts, and MoS hopes that Gaia will inspire awe, and promote interconnectedness and climate change awareness among its visitors. Therefore, it was essential for this evaluation to investigate what emotions are being evoked across visitors who engage with the Gaia exhibit. When reviewing the findings from the Mood Meter prompt, there appears to be an affirming relationship between visitor's plotted emotions and feelings expressed during interviews. Out of the visitors who plotted emotions, 94% of the visitors made markings within the yellow or green quadrant, both quadrants represent feelings that are highly associated with pleasantness. When asked "why do you feel that way?", 83% of visitor's responses were coded into themes that correlate with the emotions listed within the yellow and green quadrants.

Further structured interviewing allowed us to obtain more detailed information regarding visitors' emotions and their overall experience. All visitors interviewed reported the Gaia globe was the "first thing" they saw upon entering the Blue Wing. Thematic analysis revealed that the most prevalent theme found across visitors was their responses related to a 'lack of connection' or awareness of how the Gaia exhibit connects to climate change. The second most prevalent theme arose from visitors' descriptive statements about the globe, often referencing the globe's scale, coloring, and overall aesthetics. Words such as 'beautiful' and 'cool' were also used, strengthening the evidence regarding visitors' having a pleasant exhibit experience. It is important to recognize that although the large Gaia globe is highly visible and striking, aesthetic beauty or pleasing visuals by themselves do not exert the same kind of long-term changes found in more meaningful experiences (Cohen & Gruber, 2010). Two visitors discussed their feelings in relation to how the exhibit may impact others showing the exhibit has the potential to evoke reflective thinking.

When considering interview responses and the average exhibit dwell time, being 26 seconds across floors, this reveals that the positive emotions expressed may not solely be to the Gaia exhibit. There are 21 other exhibits, most are interactive in nature, in close proximity to the Gaia globe and its components (signage and floor prompts) which may have influenced visitors' feelings of high pleasantness and high energy. Additionally, interview responses revealed that the vast majority of participants did not seem to recognize the globe as a formal MoS exhibit or connect it to climate change without an external prompt from the interviewer. Overall, the findings reveal that the Gaia exhibit evokes positive emotions, which are associated with higher levels of motivation and engagement. The Gaia exhibit immediately draws visitors' attention upon entering the exhibit, this initial level of engagement and positive emotions are the ideal combinations for learning. However, our behavioral observation findings suggest that this visitor's attention towards the exhibit is fleeting, only sustaining attention across small durations of time.

DISCUSSION

Cursory Behaviors

Understanding visitors' behaviors is a crucial component in designing exhibits that aim to provide visitors with meaningful experiences (Serrell, 2020). Overall, the behavioral observations revealed that 83% of visitors were observed to engage with the Gaia exhibit to some extent, however, less than a fourth of the visitors engaged in contemplative behaviors. The majority of behaviors exhibited were under 10 seconds in duration and consisted mainly of cursory glances and gestures; with minimal demonstration of longer more reflective practices such as sustained attention towards a single exhibit element or conversation with others. Additionally, the behavioral observations and interviews revealed a lack in visitors' awareness of the content-rich exhibit elements, such as the signage, QR code and floor prompts. Multiple visitors mentioned not noticing the signage on floor prompts and those who did read the floor prompts expressed confusion regarding the content and purpose, this further demonstrates the disconnect between the exhibit and climate change.

Tracking visitors' positioning and behaviors allowed us to identify patterns and increase our understanding of how and to what extent visitors were engaging with Gaia. Completing multiple sweeps across days and times, allowed us to identify that the entrance area on 1L of Blue Wing was the most active floor for visitors to engage with the Gaia exhibit. Observations also revealed that visitors on 1L displayed a greater variety of engagement behaviors across longer durations of time. The exhibit is 'promoted' to be on the ground level of the museum, where the lowest amount of engagement activity was recorded across visitors, both in frequency and duration. Visitors who spend the most time exploring different exhibit elements and whose interactions are longer in duration are also observed to partake in activities associated with more meaningful learning such as reading, talking, and taking and sharing photos (Serrell, 2020). As the majority of visitors' engagements engagements were short, and future iterations of this exhibit should consider adapting the modality, placement, and content of specific exhibit components.

Content Connections

Our evaluation question " *In what ways, if any, does Gaia prompt further interest in climate change?*" was initially designed to obtain more specific information regarding 'how' this exhibit inspired independent exploration of climate change concepts, which is also one of the exhibit's key objectives. However, our findings indicate that Gaia alone did/does not spontaneously motivate visitors to further explore the topic of climate change. Interview responses revealed a notable confusion and lack of connection between the exhibit and climate change across all sampled visitors. Approximately 10% of the visitors engaged with the exhibit components (signages and floor prompt), which may have impacted their ability to successfully connect Gaia to climate change. The low access rate to the website linked to the QR code on the exhibits' signage and the minimal photo-sharing behavior observed further support the findings from the interview.

Visitors may not be spontaneously relating the Gaia globe to climate change; however, when explicitly prompted to share their thoughts on this connection, 38% of visitors provided responses reflecting a curious mentality by discussing an earth-climate connection and 50% offered ideas on how to improve this connection for visitors. Therefore, it appears that with minimal explicit additional support, visitors have the ability to relate the Gaia exhibit to climate change to some extent.

Visitors also expressed connecting to the exhibit in different ways that were not specifically related to climate. While conducting interviews, two visitors shared that their engagement with the globe centered around labeling and searching for different countries with their children, this

DISCUSSION

behavior was also informally observed by two of the evaluators. Visitors also made connections to other subject areas such as meteorology, astronomy, and geophysics.

Visitor Orientation & Experience

Museum studies have shown how effective exhibit-specific boundaries and informational components can enhance a visitor's engagement and learning (Serrell, 2020). The Gaia exhibit is housed in a large exhibit hall without defined parameters, unlike many of the other exhibits. Due to the large scale of the globe, typical wall-like boundaries are not possible. Therefore, the signage and floor prompts are essential to the visitors' experience, supporting them in orientating themselves to the purpose of the exhibit while also providing guidance on how to engage with and climate change content.

The floor prompts were designed in a clever manner as they were easily readable across all floors and did not interrupt visitors' experience of the surrounding exhibits. Unfortunately, their projected nature made them easy to walk over, often going unnoticed by ground floor visitors. Additionally, because the floor prompts are on the floor and the globe is hanging from the ceiling, this contrasting factor may have also impacted the visitors' awareness of the prompts. The exhibit signage was also underwhelming in comparison to the scale of the Gaia globe. The traditional style of the signage may have not draw visitors' attention. In instances when the signage was acknowledged, the QR code was not observed to be scanned. This may have been due to the relatively small size of the QR code.

Lastly, visitors offered a range of ideas for how to improve upon or enhance the Gaia experience mainly involving changing visual displays on the globe itself, additional seating and interactive museum floor components were discussed. We acknowledge that the MoS is unable to modify the Gaia globe itself. However, ideas can be adapted to generate supporting content that allow visitors to further engage with the globe and climate change.

CONCLUSION

This evaluation was completed to increase the MoS's understanding of visitors' impressions and perceptions of the art-science exhibit, Gaia, and to inform future design and curation strategies that further support visitors' interest and curiosity in climate change. Through behavioral observations and interviewing we gathered information to better understand if and how the Gaia exhibit evokes feelings of awe and motivates prosocial behaviors related to climate change. We analyzed and synthesized information about visitors' experiences to reveal that 94% of visitors reported feelings of a high degree of pleasantness towards the exhibit. However, the majority of visitors engaged with the Gaia exhibit in a cursory manner. Many visitors discussed the pleasing aesthetics of the large Gaia globe, however, there was a limited amount of evidence regarding visitors' ability to successfully connect the Gaia exhibit to climate change. Based on the evaluation findings and conversations with MoS stakeholders, the following recommendations are provided to support the design and development of future iterations of the Gaia exhibit:

Increase explicit informational exhibit elements to increase visitors' awareness and intentionality. The design and positioning of the exhibit elements (signage, floor prompt, a standing object or introductory panel) can help orient visitors to the Gaia exhibit space, draw visitors' attention to the exhibit's intended purpose, guide visitors into engaging in contemplative and prosocial behavior and build connection to climate change.

Explore additional tangible multi-modal exhibit-specific components to increase visitor interest and curiosity in/about climate change. The addition of immersive or interactive exhibit elements could help bridge the connection between Gaia and climate change for visitors. These elements could be low-tech or high-tech. Low-tech examples may be adding questions prompts to the railings, or a booth to 'transmit' a message to mission control regarding the Earth's status. A high-tech example may be an AR component on the exhibit signage within the exhibit space.

Define a space that invites visitors to engage in prosocial behaviors. Create spaces for visitors to share their feelings and learnings with others by engaging in conversation and reflection. For example, provide more intentional exhibit-specific seating or add glass wall decals that invite parents with small children to sit and look at the globe through the glass as if they were in a spaceship. Additionally, highlighting spaces where visitors can take the 'ideal photo' could inspire more information sharing and photo posting.

LESSONS LEARNED

Overall, the formative evaluation process has allowed us to gain a deeper understanding of the design and methods involved in conducting a successful evaluation. We have highlighted some of the lessons learned, below:

Importance of structured flexibility. Detailed protocols and flexible depositions are necessary in order to execute an evaluation, particularly in the event of unforeseen circumstances. For instance, our thorough protocols allowed team members to utilize any of the evaluation instruments and to do so even when the team was missing a team member on a data collection day.

Emphasis on participant contribution. It is important to allow participants to feel like they are contributing to something bigger than themselves. At the beginning of our interviews, we made sure to highlight how participants should feel comfortable giving their honest opinion about the exhibit, because their thoughts would ultimately improve the experience for other visitors. Moreover, visitors were very enthusiastic to share their insights when we asked them how they would improve the Gaia exhibit.

Different approaches needed for open vs closed exhibits. The literature and research we reviewed for conducting formative evaluation in museums were in exhibits with defined boundaries (e.g. large rooms). Therefore, we needed to adapt existing methods used in research to develop our evaluation instruments and analysis methods for the Gaia exhibit—an exhibit that spanned three floors and lacked distinct boundaries of where visitors could engage with it.

Have a variety of methods. Onsite content is dependent on many factors, which therefore determines the data collection process. Being able to collect data in multiple ways allowed us to have quality data and gain different perspectives on interaction with the Gaia exhibit.

REFERENECES

Beyer, M., Curio, A., Dougherty, J., Walker, J., & Wilcox, E. (2010, June 7). A Summative Evaluation of Exhibit, 'East by Northwest'. Informal Science. Retrieved April 17, 2022, from https://www.informalscience.org/summative-evaluation-exhibit-east-northwest

Diamond, J. (1986). The Behavior of Family Groups in Science Museums. Curator, 29(2), 139-154.

Chiozzi, Giorgio & Andreotti, Lidia. (2001). Behavior vs. Time: Understanding How Visitors Utilize the Milan Natural History Museum. Curator: The Museum Journal. 44. 153 - 165. 10.1111/j.2151-6952.2001.tb00038.

Diamond, J., Horn, M. & Uttal, D. (2016). Practical Evaluation Guide: Tools for Museums and Other Informal Educational Settings (3rd ed.). Lanham, MD: Rowman & Littlefield.

Friedman, A. (Ed.). (March 12, 2008). Framework for Evaluating Impacts of Informal Science Education Projects. Retrieved from http://insci.org/resources/Eval_Framework.pdf. *Gaia | Museum of Science, Boston (Gaia-MoS)*. (n.d.). Retrieved from https://www.mos.org/explore/exhibits/explore/exhibits/gaia

Marc Brackett. (2020). The Colors of Our Emotions. Retrieved from https://www.marcbrackett.com/the-colors-of-our-emotions/

Piff, P. K., Dietze, P., Feinberg, M., Stancato, D. M., & Keltner, D. (2015). Awe, the Small Self, and Prosocial Behavior. Journal of Personality and Social Psychology, 108(6), 883–899. https://doi.org/10.1037/pspi000001

Roeser, R., & Peck, S. (2009). An Education in Awareness: Self, Motivation, and Self-Regulated Learning in Contemplative Perspective. Educational Psychologist, 44(2), 119–136. https://doi-org.ezp-prod1.hul.harvard.edu/10.1080/00461520902832376

Rosala, M. (2019, September 29). How to Analyze Qualitative Data from UX research: Thematic Analysis. Nielsen Norman Group. Retrieved https://www.nngroup.com/articles/thematic-analysis/

Serrell, B. (2010). Paying Attention: The Duration and Allocation of Visitors' Time in Museum Exhibitions. Curator: The Museum Journal. 40. 108 - 113. 10.1111/j.2151-6952.1997.tb01292.x.

Serrell, B. (2020). The Aggregation of Tracking-and-Timing Visitor-Use Data of Museum Exhibitions for Benchmarks of "Thorough Use". *Visitor Studies*, 23(1), 1-17, https://doi.org/10.1080/10645578.2020.1750830

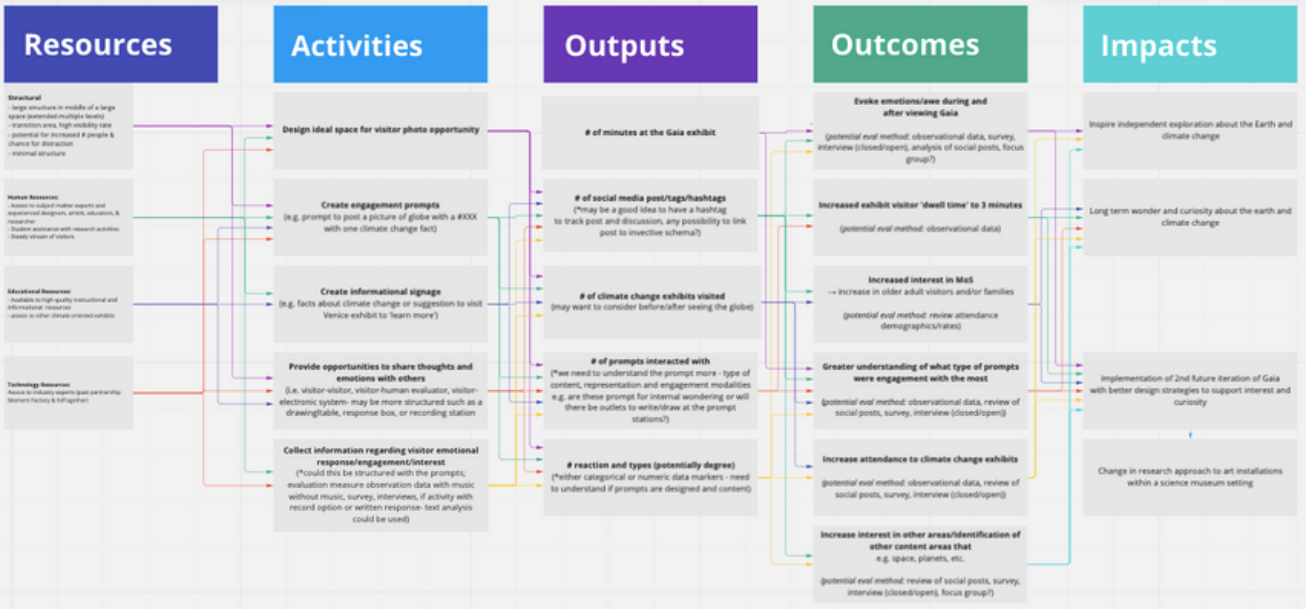
Yaden, D. B., Iwry, J., Slack, K. J., Eichstaedt, J. C., Zhao, Y., Vaillant, G. E., & Newberg, A. B. (2016). The Overview Effect: Awe and Self-Transcendent Experience in Space Flight. *Psychology of Consciousness: Theory, Research, and Practice, 3*(1), 1–11. https://doi.org/10.1037/cns0000086

Yalowitzm, S., & Bronnenkant, K. (2009) Timing and Tracking: Unlocking Visitor Behavior, Visitor Studies, 12:1, 47-64, DOI: 10.1080/10645570902769134

APPENDIX

Appendix A: Logic Model

Below is a logic model that visualizes the elements required to reach the intended short-term outcomes and long-term impacts of the Gaia exhibit. This was developed using the information and supplementary readings collected during the initial stakeholder meeting. Read more here.



APPENDIX

Appendix B: Data Collection Instruments

The following pages, below, display the original instruments used for our data collection. Instruments include: sweep floor plans, observation sheet, and the mood matrix with accompanying interview questions.

APPENDIX

Appendix C: Sweep Protocol

Protocol:

1. Place sign on the lower level of the exhibit to notify people that observations are being conducted
2. Each team member (3 people) is assigned a different floor of the Blue Wing
3. Designate a start time which everyone will begin their observation of their assigned floor
4. For team members assigned to the lower level and first floor, mark the location of the QR code sign on the floor plan (since sign is sometimes in a different location on different days)
5. Each team member goes to their assigned floor of the Blue Wing and begins to observe visitors at the designated start time
6. Using their floor plan of their assigned floor, team members will use behavior sampling and mark the floor plan where people are engaging with the exhibit (e.g. body oriented towards the globe, pointing, facing the globe, looking at the prompts on the lower level floor etc.)
    a. Designated areas of interest for the upper levels are the hallways that border the other museum exhibits
    b. Designated areas of interest for the ground level include the area below the globe to the perimeter of the other exhibits
7. After our evaluation session at the museum, each member scans their floor plan and uploads images into a designated folder on One Drive. Each member also inputs the total counts for the areas of interest on each floor plan and input the data into a designated spreadsheet stored in OneDrive for analysis

Materials:

- Floor plans of the Museum of Science Boston Blue Wing
- A sturdy mobile writing surface (clipboard)
- A writing utensil (e.g. marker, pen)
- An easily accessible timer (e.g. stopwatch or phone)
- Signage, on the back of the clipboard or within the Gaia exhibit area, alerting visitors that observations are taking place.

APPENDIX

Appendix D: Observation Protocol

Purpose: The primary focus is to document the frequency of specific behavioral "Events" that are indicative of engagement toward the Gaia globe and the duration of contemplative states in relation to the globe.

Sampling method: The main method will be behavior sampling. The observer will inconspicuously watch one individual, primarily recording each occurrence of the pre-determined target behaviors listed on the checklist, noting some context regarding the behavior with additional space to elaborate on unexpected behaviors (Diamond, 2016).

Visitor selection: The default selection approach will be to target every 3rd visitor entering into the exhibition space on the ground or first floor. Additionally, if there appears to be someone engaging with Gaia while sitting with the bench area on the first level, then that visitor may also be intentionally selected—this area was highlighted by the key stakeholder to be an area of interest. Demographics will be estimated or recorded through observation (Yalowitz, 2009).

Length of the observation period: Complete 50 observations, each being 5-10 minutes in duration or until visitor leaves the exhibition space. The observation period will begin as soon as the target visitor enters into the Blue Wing on the lower level, first level or second level. Alternatively, the observer may be determined the start time if choosing to observe a visitor near the seating area on the first level, as discussed above.

Observer's starting position & behavior: Due to the large open environment that Gaia is displayed in and its proximity to approximately 21 other exhibits and multiple restrooms, three primary observer start-positions have been identified, which are 1) in the main entry hallway into the Blue Wing on the first level, 2) near the first level benches, and 3) on the ground level near the floor prompts. These positions were chosen based on the evaluation goals, conversations with stakeholders and the teaching team, and experiences while piloting the evaluation instruments.

Additionally, the observers or data collectors should be mindful of their behavior when collecting data during the observation period such as keeping a normal distance between themselves and their target visitors. It is important to be unobtrusive during behavioral sampling as to not influence the visitors' behavior in a way that will impact the data being collected.

Materials: Materials needed to complete this evaluation are relatively minimal, items required are:

- The formalized observation checklist
- A writing utensil
- An easily accessible clock (e.g. watch or phone)
- A sturdy mobile writing surface (clipboard)
- Signage, on the back of the clipboard or within the Gaia exhibit area, alerting visitors that observations are taking place.

APPENDIX

Appendix E: Sweep Clusters