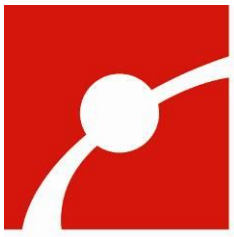
HALL OF HUMAN LIFE
Summative Evaluation Report

Report written by Maria Barth, Sunewan Chunhasuwan Paneto, Allison Anderson, Elizabeth Kunz Kollmann, Katie Todd, & Ariadne Nelson
February 2018
Report #2018-1



Museum of Science®

Science Park
Boston, MA 02114-1099

ACKNOWLEDGEMENTS

Without the help of many people, this evaluation would not have been possible.

Special thanks to:

- The Museum of Science Hall of Human Life content team, Kat Bevington, Katie Gilligan, Duane Hill, Tim Kardatzke, Lucy Kirshner, Emily O'Hara, and Dan Smith, for facilitating and developing the activities that were tested;
- Other members of the Museum of Science Hall of Human Life team: Larry Bell, Emily Bottis, Caroline Angel Burke, Clara Cahill, Peter Ford, BarB Harvey, Mike Horvath, Liz Kong, Malorie Landgreen, Beth Malandain, Emily Marsh, Kevin McEleney, Chelsea Murphy, Boob Rayle, Joseph Rivers, Emily Robertson, Keith Simmons, and Ben Wilson for their help and support throughout this evaluation;
- Lew Stevens, Bunny Watson, and the rest of the Live Animal Center;
- Anna Lindgren-Streicher, former Manager of Research and evaluation, for the initial planning stages of this evaluation;
- Assistant Researchers: Samantha Lubrano, Noora Abdulkerim, and Kristina Wang for helping to collect and enter data, and all former staff who contributed to this exhibit.

Research and Evaluation Department
Museum of Science
Science Park
Boston, MA 02114
(617) 589-0302
researcheval@mos.org

EXECUTIVE SUMMARY

The *Hall of Human Life* (*HHL*) is a 9,700 square foot exhibition about human biology and human health. This permanent exhibition is located on the second floor of Green Wing in the Museum of Science, Boston. Educational messaging for the exhibition centers around one central theme: "Humans are changing in a changing environment." In the *Hall of Human Life*, visitors are able to use their own bodies and behaviors to understand biological mechanisms. The exhibition contains a wide range of interactive activities, information about health conditions, animations, graphics, live animals, staffed experiences, and more. One unique aspect of the exhibition is the wristband system that allows visitors to record and compare their personal data to large Museum data sets at a series of Link Stations around the space.

The Research & Evaluation Department at the Museum of Science, Boston conducted the summative evaluation for the *Hall of Human Life.* This evaluation gathered data that assessed the exhibition's ability to meet its objectives and also provided insight to inform ongoing decision-making about this permanent exhibition. Data collection included tracking-and-timing observations; post-exhibition interviews; pre-, post-, and follow-up surveys; and data from the Museum's ongoing Visitor Experience Monitoring surveys (VXM). The evaluation addressed four questions:

1. Who is using the *Hall of Human Life?*
2. How do visitors perceive the *Hall of Human Life?*
3. How are visitors using the *Hall of Human Life?*
4. What are visitors learning from the *Hall of Human Life*?

In summarizing the findings from this report, there are four overarching themes to consider:

- *HHL visitor demographics were similar, but not identical, to the rest of the Museum's audience.* About 40% of respondents to the Museum's overall VXM survey reported that they went to *HHL* during the period of summative evaluation data collection. During this time, the racial and ethnic identities as well as the disability status of *HHL* visitors were similar to non-*HHL* visitors. However, there were slightly higher proportions of non-members and family groups with children ages 10-17 among *HHL* visitors than among non-*HHL* visitors.
- *Visitors saw HHL as suitable for all ages, unique, and up-to-date.* When asked who they thought the exhibition was designed for, most respondents indicated that they thought it was intended for visitors of all ages. Most respondents felt *HHL* was somewhat or very different from the rest of the Museum, largely due to its interactivity and use of technology. Visitors saw the exhibition as more up-to-date than other exhibitions in the Museum, often citing current content, Link Stations, and technology.
- *Visitors used HHL in a similar way to other large exhibitions at science museums.* This included dwell time and thoroughness of use, which was similar to benchmarks for this type of exhibition. All areas of *HHL* were well visited, although visitors rarely recognized the exhibition's organization. Few visitors used the *HHL* website.
- *The Link Stations, the "Exploration Hub," and live animals were key exhibition components that contributed to visitors' perceptions of and educational takeaways from HHL.* Interaction with these exhibits—especially the Link Stations—was associated with visitors' recognition of the exhibition's main messages and learning goals, especially those related to practicing scientific processes.

TABLE OF CONTENTS

1. INTRODUCTION

The *Hall of Human Life* (*HHL*) is a 9,700 square foot exhibition about human biology and human health. This permanent exhibition is located on the second floor of Green Wing in the Museum of Science, Boston. Educational messaging for the exhibition centers around one central theme: "Humans are changing in a changing environment."

In the *Hall of Human Life*, visitors are able to use their own bodies and behaviors in order to understand biological mechanisms. Upon entering the *Hall of Human Life*, visitors pass through a semitransparent wall—designed to symbolize a membrane—that surrounds the entrance. At the two hallway-facing entrances, kiosks greet visitors and invite them to take a wristband with a unique barcode that becomes their anonymous identifier and allows them to record their experiences at Link Stations in the exhibition, allowing them to observe their own biology in action and connect their personal data to larger Museum data sets.

1.1 Exhibition Components

To communicate the message that humans are changing in a changing environment, the *Hall of Human Life* is divided into five environmental areas, or factors of the environment that dynamically interact with human beings. Visitors learn about changing human biology from the micro to macro level in the following five areas:

- Physical Forces
- Food
- Communities
- Organisms
- Time

Each of the five areas displays recent research findings and new technological innovations in human health and biology from local universities, life sciences, and healthcare organizations. A complete list of exhibits can be found in Appendix I.

Within each of the five environment areas are five types of components. Three of the five areas (Communities, Organisms, and Time) also include live animals – tamarins, bees, and baby chicks, respectively. The following five component types are present in each area:

1. An Introductory Wall, which includes a title, video, three statements that relate to the area's Link Stations, and an introductory activity;
2. A DNA Wall, which includes a hands-on interactive activity introducing the genetic core concepts featured in the environmental lens, a 3D animation of a fundamental DNA mechanism explored in the environmental lens, a table-top spinner featuring three DNA research population case studies, and three additional examples of DNA changes;
3. A Health Condition Wall, which includes a graphic about a featured health condition that has increased in incidence over time, an interactive animation about the mechanism behind the health condition, featured research findings on the condition from Boston-area universities and life sciences organizations, and three video stories featuring individuals who have this health condition or physicians treating this condition;
4. Three Link Stations, where visitors log in with their anonymous wristband, complete an activity, and contribute their data. These unique features allow visitors to complete

activities that collect their biological data, read graphs presenting their data in comparison to other Museum visitors', and consider research hypotheses that use such data;
5. Two to four additional interactives under the environmental theme of the area.

In addition to the five areas, the *Hall of Human Life* features four additional experiences:

1. "The Biogen Foundation Exploration Hub" ("Exploration Hub")**,** staffed by Museum educators and volunteers, introduces biological research questions and allows visitors to respond to these questions by participating in hands-on staff-led experiences.
2. "Provocative Questions" is a group of interactive components designed for groups of two or more visitors to evaluate scientific evidence, social values, and their personal experiences as they actively discuss current socio-scientific issues.
3. "Living Laboratory®" is a national community (founded at the Museum of Science) that fosters partnerships between museums and local university scientists such that there can be real research studies that take place in museum settings, with consenting visitors acting as participants in these studies. *HHL*'s Living Laboratory includes researchers working in the fields of human health, biology, and cognition.
4. "The Human Body Theater," an enclosed circular theater space, features five short films related to change agents of the five environmental lenses and their impact on human biology, such as human evolution and endurance running abilities, aggression, and epigenetics.

1.2 Learning Goals and Messages

Developers focused on a set of goals and educational messages to create the educational components of this exhibition. The lists of goals and messages was a living document that went through many iterations, from its development at the beginning of the planning phases through the time of the summative evaluation. For the purposes of the summative evaluation, the team prioritized a number of educational messages and goals to focus the evaluation of visitor learning in the exhibit. The complete lists as of the time of writing this summative report are in Appendix F. Evaluators worked with the exhibition team to pare down the lists for the sake of the summative evaluation, and these shortened versions are below.

The primary educational goals of the *Hall of Human Life* are:

- *Knowledge, awareness and understanding:* Visitors will understand that changes in themselves and in the human population can be observed, described, and measured.
- *Knowledge, awareness and understanding:* Visitors will learn that understanding and utilizing aspects of the scientific method is critical in our understanding human variation and human change.
- *Knowledge, awareness and understanding:* Visitors will learn that human anatomy, human evolution, and our environment are all dynamically interconnected.
- *Engagement and interest:* Visitors will become more interested in learning about their bodies in unique ways that will stimulate interest in their interconnectedness with the environment and the future of our species.
- *Skills:* Visitors will use their own bodies and experiences to observe, describe, and measure changes in themselves and in the human population.
- *Behavior:* Visitors will begin to think critically about health issues, environmental issues, and impacts on both.

As mentioned above, the main educational message of the exhibition is, "Humans are changing in a changing environment." There are four additional primary educational messages:

1. My body physically interacts with the rest of the world in surprising ways.
2. My DNA is at the center of all changes in my body.
3. My species, Homo sapiens, has evolved and continues to evolve.
4. I can observe, describe, communicate, and measure changes in me and in the population.

1.3 Evaluation Overview

The Research & Evaluation Department at the Museum of Science, Boston conducted the summative evaluation for the *Hall of Human Life.* This evaluation focused on gathering data that assessed the exhibition's ability to meet its objectives while also providing valuable insight to inform ongoing decision-making about this permanent exhibition. The evaluation addressed four key evaluation questions:

1. Who is using the *Hall of Human Life?*
2. How do visitors perceive the *Hall of Human Life?*
3. How are visitors using the *Hall of Human Life?*
4. What are visitors learning from the *Hall of Human Life*?

2. METHODS

Data collection for this summative evaluation took place between June 22, 2016 and January 16, 2017. The Research & Evaluation Team used several methods to address the evaluation questions, as described below. The data described in this report address the primary target audience for the evaluation: general Museum visitors. This includes a diverse audience composed of family groups, adult-only groups, sightseeing groups, individuals, and others. A secondary target audience for this report is school groups that visit through a single reservation. Data was collected from two school groups during the course of this evaluation. These two school data sets should be taken as case studies, rather than a representation of all school groups' experiences. The data about school groups provides a glimpse of two groups' experiences and is shared throughout this report in vignettes.

2.1 DATA COLLECTION

Four main data collection instruments were used in this study:

- Tracking-and-timing observations
- Post-exhibition public interviews and student flash interviews
- Pre-, post-, and follow-up surveys
- Visitor Experience Monitoring surveys (VXM)

A description of each type of instrument and their associated sampling approaches can be found below. Copies of the interviews and survey instruments can be found in Appendix B. Table 1 summarize the samples from each instrument.

Table 1: Summary of data collection methods and sample sizes

	General public audiences (groups)	Students (individuals)	Teachers (individuals)	Total # collected
Tracking-and-timing observations	76	7	-	83
Post-exhibition interviews	71	24	-	95
Pre-surveys	75	-	-	75
Post- surveys	61	-	-	61
Follow-up surveys	30	26	2	58
VXM surveys	931	-	-	931

In addition to the methods and samples mentioned above, a separate case study was done in order to investigate how families with young children used *Hall of Human Life*. Data for this case study were collected prior to the main summative evaluation and are not included in this report. A write-up of this study is in Appendix A, titled *Case study of Families with Young Children in the Hall of Human Life.*

2.1.1 Tracking-and-timing observations

Overview
Tracking-and-timing (T&T) observations focused on how visitors experienced *HHL*. Visitors were recruited at one of the three entrances of the exhibition and a single group member was observed during the entirety of her or his visit. The data collector logged interactions with individual exhibits, focusing on the dwell time at each exhibit, social behaviors, use of different exhibit elements, interactions with data visualizations, and any challenges the visitor had with usability. This data collection instrument was designed based on guidelines from Beverly Serrell, who has established field-wide benchmarks for T&T studies (1998, 2016).

Sampling
As the exhibition primarily targeted older children and teens, data collectors used a combination of random and selective sampling. Visitors were randomly selected unless a group with teens was visible, in which case the data collector approached the group that included a teen. Data was collected at one of three entrances: the main entrance (nearest to the bridge), the "Exploration Hub" entrance (in front of the "Exploration Hub"), and the gallery entrance (closest to the *HHL* gallery space). Data collectors approached every other group with members who appeared to be ages 10 and older as they began to enter the exhibition. Children were only approached if a parent or guardian was present, as both adult consent and child assent were required for participation. As an incentive, visitors were offered small gifts for participating, namely a dinosaur-shaped eraser or a Museum of Science themed pencil. After agreeing to the study, data collectors identified a focus individual within the group. Evaluators selected a child in the group if there was a willing participant under the age of 18. The focus individual or parent (if the focus individual was a child) then completed a demographic survey.

Two school groups participated in the T&T data collection, an 8th grade middle school class and an 11th grade high school class. These schools were chosen because their grade level matched the target demographic for the exhibition. Before coming to the exhibition, students were informed of the study and parental consent was gained ahead of time. Upon arriving on-site, verbal assent was gained from the youth participants. The instrument for students was identical to the general public data collection tool. Students in this report are identified using pseudonyms.

2.1.2 Post-exhibition interviews

Overview
Post-exhibition interviews were conducted upon completion of the tracking-and-timing. The interview for general audiences was semi-structured and sought to learn about visitors' perceptions of the exhibition, what they learned, and how they engaged with the exhibition. General public audiences shared their thoughts about the Link Station activities, as well as staffed areas such as the "Exploration Hub" and "Living Laboratory." The interview also provided visitors with opportunities to talk about any usability issues or areas of confusion. In general, the interview took between five and eight minutes. Students in school groups

participated in a shorter "flash interview" instead of completing the full-length interview for the general public audience. This flash interview consisted of four brief questions about students' experiences. The flash interviews allowed evaluators to gather data from a large number of students in a short amount of time so as to minimize students' time spent away from field trip activities.

Sampling
After T&T subjects completed their visit of *HHL*, data collectors asked the subjects if they and their group would like to participate in the interview. The majority of public groups agreed to participate; there was a 9% refusal rate. For students, data collectors conducted flash interviews with all students who had parental consent and gave verbal assent for the interview.

2.1.3 Pre-, post-, and follow-up surveys

Overview
Evaluators gathered pre- and post-surveys from general public audiences to assess whether visitors' take-away understanding of the exhibition related to *HHL*'s educational goals. The pre- and post- surveys were identical to one another, but were completed by different groups of visitors. Post-surveys were given to all groups who participated in the tracking-and-timing data collection, while pre-surveys were given to individuals before they entered the exhibit, allowing evaluators to compare the survey responses between the two different visitor groups.

A separate online survey was also available to general audiences, including the pre-survey sample and the visitors who were tracked-and-timed. After taking the pre-survey or filling out the demographics sheet prior to T&T data collection, visitors were asked if they would like to take part in a follow-up online survey about their visit. This follow-up survey captured visitor usage of the *HHL* website after their visit, their feelings about the Link Stations, and if and how they had thought about the exhibition following their visit.

School groups were also asked to complete a follow-up survey following the field trip. Like general audiences, these follow-up surveys aimed to get an understanding of what students learned from the exhibit, and to see how they used or thought about the exhibition after leaving the Museum. Teachers were also given a post-questionnaire after their visit. This was to gain a better understanding of how teachers incorporated *HHL* into their classroom, their perspectives about the exhibition, and any resources they may have used relating to it.

Sampling
Pre-surveys were collected separately as groups entered the exhibition using the same criteria as the T&T participants; using a combination of random and selective sampling, groups were randomly selected unless a group with teens was visible, in which case the data collector approached the group that included a teen. Post-survey sampling followed the process described in the tracking-and-timing section; all focus individuals who participated in the T&T data collection were invited to complete the post-survey. Data collectors offered the follow-up online survey to visitors who completed the pre-survey and subjects of the T&T data collection. A total of 90 individuals indicated interest in the survey, and 30 took the survey. For the school group follow-up survey, all students from the participating schools who obtained parental consent were invited to take the survey. The teacher survey was sent to both teachers who brought school groups as part of the study. Two of these surveys were completed.

2.1.4 Visitor Experience Monitoring Surveys (VXM)

Overview
The Visitor Experience Monitoring (VXM) survey is an ongoing data collection effort about visitor experience, loyalty, demographics, and motivations. These surveys are used to better understand the MOS audience. Data collected from VXM was used for this summative to understand any similarities and differences between audiences that attended *HHL*.

Sampling
Data collection for VXM occurred throughout the year, with scheduled collection sessions fluctuating in response to anticipated monthly attendance at the Museum. A random, continuous sampling strategy is used when approaching visitors and data is collected on weekdays, Friday evenings, weekends, and holidays in order to gather a representative sample of the general public audience. One adult from each eligible group is asked if she or he would be interested in providing an email address to participate in this one-time visitor experience survey after their visit to the Museum. For the purposes of this evaluation, only VXM data collected at the same time of the summative evaluation (June 22, 2016 to January 16, 2017) was used for comparisons.

2.2 ANALYSIS

This evaluation involved analysis of both qualitative and quantitative data. Qualitative data analysis included both inductive and deductive coding. Inductive coding involves reviewing the data and identifying the most frequent themes (Patton, 2002). Deductive coding involves the creation or use of a codebook before reviewing the data. This allows evaluators to find confirming or disconfirming evidence to assess their hypotheses. For this study, deductive coding was used to look for evidence of the educational messages and learning goals; the team defined criteria about what would be required to meet each goal, and then noted which comments met that criteria.

Quantitative analysis consisted of descriptive and inferential statistics. Descriptive statistics included counts, percentages, medians, and averages. Where appropriate, inferential tests were used to assess differences within the data (for example, differences between people who visited *HHL* and those who did not). Chi-square ($\chi 2$) tests were used to assess potential differences between two or more categories of frequency counts. When conducting 2x2 $\chi 2$ tests, evaluators provided the conservative Fischer's Exact p-value due to low expected cell counts in some cases. Statistically significant differences—defined by an alpha level of .05—are marked with an asterisk (*). The details of these inferential statistics are included in footnotes throughout the text. For the sake of brevity, non-significant differences are not mentioned.

2.3 LIMITATIONS

Readers may wish to consider several study limitations when reviewing the data in this report. One thing to keep in mind is that the amount of data about school groups is not sufficient to merit direct comparisons to the general public visitors. Due to the low sample size, generalizations cannot be made about how field trip participants use *HHL*.

Though the demographic questions from the VXM survey were identical to the demographic questions visitors completed on the pre- and post-survey, it is important to note the differing data collection methods may affect who was able to provide data, particularly among teens. VXM is

an online follow-up survey with a random sample, while the summative evaluation demographic survey was completed on a paper survey at the Museum. This summative evaluation was interested in teen audiences, as that age group was of particular relevance for *HHL*. However, it was difficult to include this group within our sample because some young adults attended the Museum without adult supervision. In this case, the groups would be ineligible to contribute data to either VXM or this study because they cannot provide consent. However, there is no reason to believe that this bias in the sample would disproportionately affect responses from *HHL* or non-*HHL* attendees.

Another potential limitation arises in the data examining how visitors used the exhibition. Evaluators depended on Serrell's (1998) commonly accepted benchmarks for thorough use. While these benchmarks are highly valuable because they allow cross-museum comparison, the standards around visitors using more than 50% of exhibition components may not align directly with the *HHL* team's goals.

The design of the study presented some limitations when addressing learning goals. The study's instruments and analyses primarily focused on content goals rather than skill-based goals . Learning goals were primarily analyzed by looking across visitor responses during the interview. When visitors mentioned content, skills, or having practiced these skills during their visit within their response they were considered to have achieved the relevant goal. This presents a problem as certain skill or behavioral goals may not naturally occur during conversation and achievement of these goals were not directly addressed in the interview questions. While there are some observed indications of skills and behavioral goals, we cannot make definitive claims about these goals being met.

Beyond these project-specific limitations, this study (and all research and evaluation work) is inherently influenced by the authors' cultural positioning. While the evaluators on this team took care to be as objective as possible, their own backgrounds influenced the planning, implementation, and interpretation of this report.

3. FINDINGS

This section covers summative analysis results for data collected from general public audiences at the *Hall of Human Life* exhibition. Details on methods used for this sample can be found in the Methods section.

Based on this data, this section focuses on the following questions:

- Who is using *HHL?*
- How do visitors perceive *HHL?*
- How are visitors using *HHL?*
- What are visitors learning from the exhibition?

3.1 WHO IS USING HHL?

In order to understand whether *HHL* reaches its target audience and what types of visitors are engaging with the exhibition's educational materials, the evaluation team analyzed data from the Visitor Experience Monitoring (VXM) survey. These data were used to characterize the visitors that did visit *HHL* and those that did not. Four main findings emerged in response to this evaluation question, details about these findings are provided on the following pages. The four findings are as follows:

3.1.1 About 40% of Museum visitors reported they went to *HHL*.

In order to learn about the audiences who visit *HHL* and how those audiences compared to the rest of the Museum population, the evaluation team used data from the Museum's ongoing VXM survey. As described in the Methods section, this is an online follow-up survey of a random selection of Museum visitors. In order to allow for meaningful comparisons, the evaluation team analyzed the sample of VXM data that were collected during the window of data collection for this summative evaluation, June 22, 2016 through January 16, 2017, (*N*=931).

As mentioned above, the VXM survey asked visitors what they saw and did during their last visit to the Museum. The survey question provided a list of Museum exhibitions and experiences from which visitors could select all that applied. As shown in Figure 1, 40% of respondents indicated that they had visited *HHL*. If data collected during this evaluation reflects typical visitation patterns, and given approximately 1.5 million people visit the Museum annually (Museum of Science, Boston, 2016), *HHL* may expect 600,000 visitors per year. One limitation of the VXM survey is that it is unclear how well visitors are able to report that they did or did not go to *HHL*, but it may be reasonable to expect that members, in particular, would be familiar with Museum exhibitions like *HHL*.

Figure 1: Percentage of visitors that reported using *HHL*, VXM survey (*N*=931)

3.1.2 The demographics of *HHL* visitors were similar to overall Museum visitors in terms of racial and ethnic identities as well as disability status.

HHL was designed to be welcoming to all visitors, particularly underserved populations. Audience demographics were characterized using the VXM survey, in which visitors were given close-ended question and asked to select all the races and ethnicities that applied to them (*N*=931 groups). As shown in Table 2, *HHL* visitors and non-*HHL* visitors were generally similar in terms of their race and ethnicities. While fewer Asian or Asian-American visitors went to *HHL*, low standard residuals indicate that the difference, although statistically significant, is small. In addition to analyzing VXM data, the evaluation team used the post interview to gauge if *HHL* achieved its goal of being welcoming to underserved minorities. The discussion of the data in Section 3.2 shows that visitors felt *HHL* was "for" everyone, suggesting that visitors do feel this exhibition is designed for diverse audiences.

Table 2: Race/Ethnicity of Non-*HHL* and *HHL* visitors, VXM survey (*N*=931) [1]

Race/Ethnicity	*HHL* visitors (*n*=376)	Non-*HHL* visitors (*n*=555)
White	84%	81%
Hispanic/Latino	6%	5%
Asian/Asian-American*	5%	9%
Black/African American	3%	3%
Multiple response	3%	5%
Other	2%	3%

[1] Asian or Asian-American: $\chi^2(1, N=931)=6.77$, Fisher's Exact p=.01.

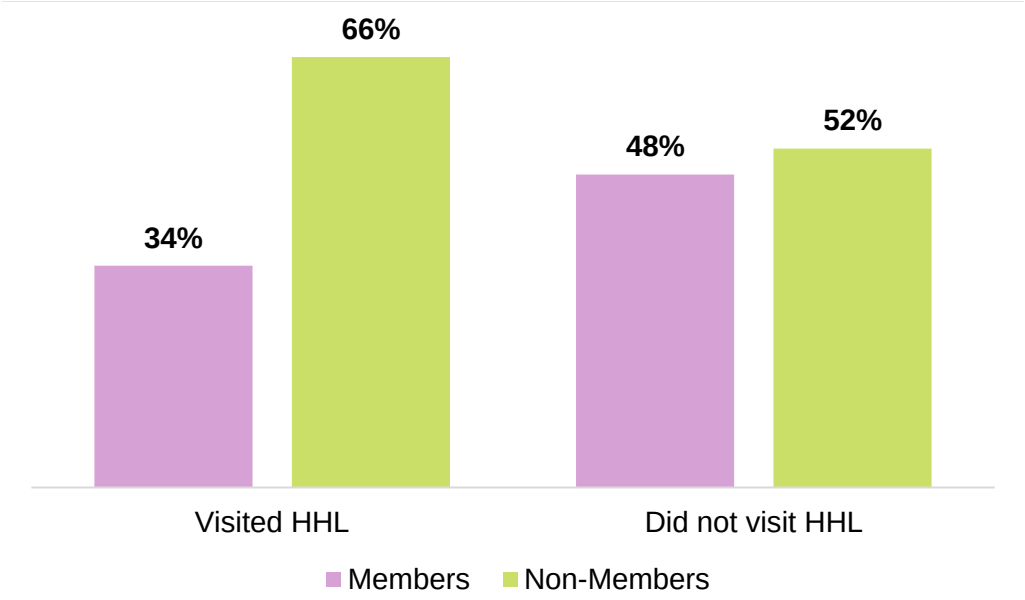
American Indian or Alaskan Native	1%	0.5%
No response	2%	4%

HHL was developed using Universal Design principles to make the exhibition accessible to all visitors. The VXM survey asked whether the visitor or any member of her or his group had a temporary or permanent disability (*n*=920). No statistically significant difference was found between the proportion of *HHL* and non-*HHL* visitors with disabilities, with 10% of *HHL* visitors and 7% of non-*HHL* visitors reporting a disability. The similar usage rates of visitors with disabilities between *HHL* and the rest of the Museum suggest that the integration of Universal Design may be evident both in *HHL* and across the Museum.

3.1.3 *HHL* attracted more non-members than members.

The evaluation team was interested in the role membership status played in *HHL* attendance. In the VXM survey visitors are asked to self-report their membership status (*N*=931). As shown in Figure 2, non-members (66% of *HHL* visitors) were significantly more likely to visit *HHL* than members (34% of *HHL* visitors).[2]

Figure 2: Member and non-member *HHL* visitation, VXM survey (*N*=931)



3.1.4 *HHL* attracted more family groups with children ages 10 to 17.

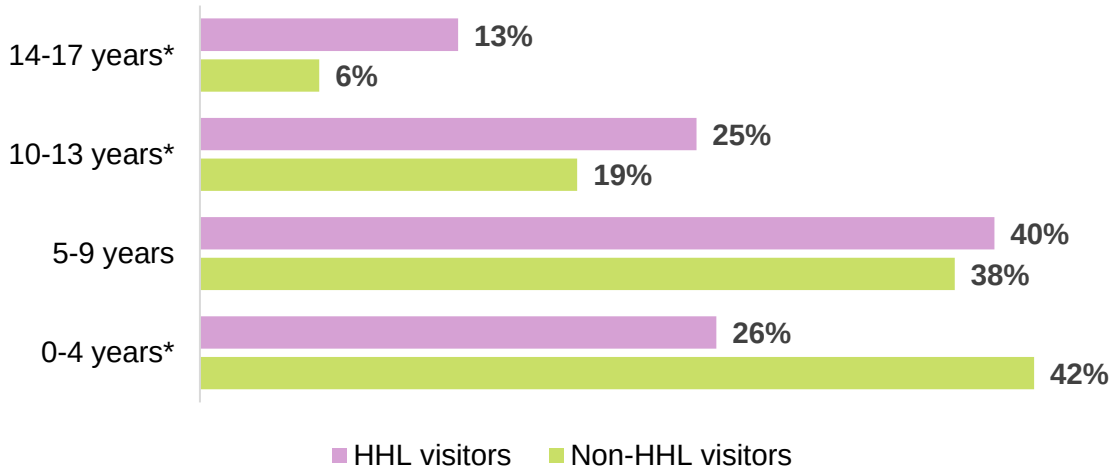
HHL was designed to attract adults and family groups with older children and teenagers, ages 10-17. The VXM survey collects information on group composition, including whether the group includes only adults or adults with children, along with the survey taker's age and the ages of the children in their group, when applicable. There was no statistically significant difference

[2] Membership status: $\chi^2(1, N=931)=18.4$, Fisher's Exact $p<.001$.

between the proportion of adult-only groups who visited *HHL* (17% of *HHL* visitors) and those who did not (15% of non-*HHL* visitors).

Significantly more family groups with older children, ages 10-13 (25% *HHL* visitors versus 19% non-*HHL* visitors), and teenagers, ages 14-17, went to *HHL* (13% *HHL* visitors compared to 6% non-*HHL* visitors). Fewer family groups with young learners, aged 0-4 years, went to *HHL* (26%, compared to 42% non-*HHL* visitors), as seen in Figure 3. The content and design of *HHL*, which was meant to attract older children, is thus well-suited for the youth (ages 10-17) who are visiting the exhibition at higher rates than the rest of the Museum. It is interesting that the proportion of adult-only groups attending HHL is not higher given that the exhibition was designed with a focus on these older audiences. It is interesting to note that while a larger percentage of groups with young children attended *HHL* than groups with older children and teenagers, this proportion is significantly lower than for visitation to other parts of the Museum, see Figure 3. As described in the next section, visitors perceive the exhibition as being suitable for all ages, so it is felt to be appropriate for all ages even if it was designed for visitors 10 and up.

Figure 3: Child age ranges present in family groups, VXM survey (*N*=931)[3]



[3] Age ranges includes groups with at least one child per age bracket.
0-4 years: $\chi^2(1, N=931)=23.42$, Fisher's Exact $p<.001$
10-13 years: $\chi^2(1, N=931)=4.63$, Fisher's Exact $p=.04$
14-17 years: $\chi^2(1, N=931)=13.96$, Fisher's Exact $p<.001$

3.2 HOW DO VISITORS PERCIEVE HHL?

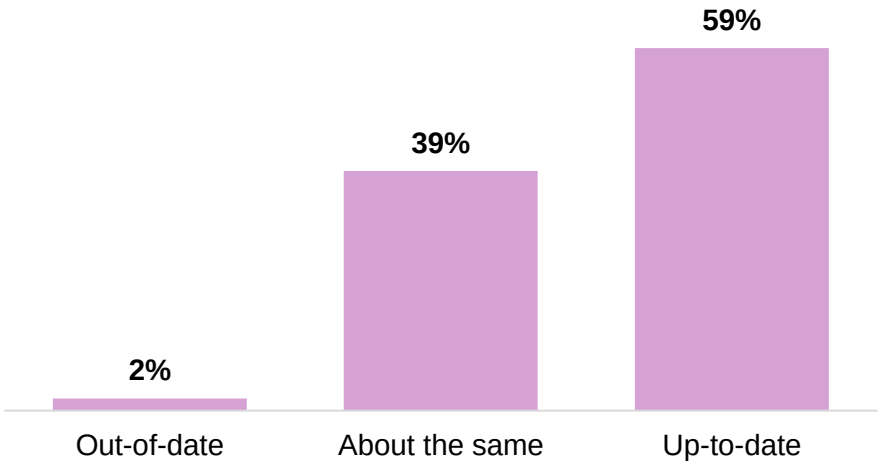
As of the time of the summative evaluation, the *Hall of Human Life* had been open for 4 years, and the exhibition team wished to know how the exhibition was perceived amongst visitors. The evaluation team analyzed data from post-interviews performed after a visitor was tracked-and-timed. Additional information about this evaluation's data collection processes can be found in the Methods section of the report. Three findings are covered in this section, which include:

3.2.1 Visitors saw *HHL* as an up-to-date exhibition.
3.2.2 Visitors felt that *HHL* was unique from the rest of the Museum.
3.2.3 Visitors perceived *HHL* as being for all ages.

3.2.1 Visitors saw *HHL* as an up-to-date exhibition.

During the post-interview, visitors were asked the question, "How would you rate the *Hall of Human Life* compared to other exhibits at the Museum?" Respondents rated whether it was more out of date, about the same, or more up to date by comparison. Over half of visitors (59%, *n*=64) indicated that they saw *HHL* as up-to-date in comparison to the rest of the Museum (See Figure 4, below).

Figure 4: How would you rate the *Hall of Human Life* compared to other exhibits at the Museum? Post-interview (*n*=64)



As shown in Table 3, when asked to explain why they thought the exhibition was up-to-date (38 of 64 groups), visitors most often referred to the exhibition's content (50%), the wristbands and Link Stations (32%), and other exhibit technology (29%). Visitors who said that the exhibit's content contributed to their perception remarked that the content felt current *("…the information that it provides, the health stuff is newer. It's about people now rather than old statues*," *female, 60*), or felt that certain topics related to current events, such as the Zika virus ("*The information on the Zika virus [was current]*," *female, 39*). The *Hall of Human Life* was created with areas that have changing content on a semi-regular basis. These areas—Provocative Questions, Living

Laboratory, and the Biogen Exploration Hub–rotate their content in order to reflect current science news. This may influence the fact that people perceive the content as current.[4]

Groups that mentioned Link Stations and wristbands spoke about the ability to compare their own data to other museum visitors as being an up-to-date feature (*"…here you can see your stats in a broader scale," male, 23)*, while comments about technology revolved around the exhibits themselves and their components ("*It's got more technology in it, like the Kinect. There are more screens," female, 15).* As technology has developed significantly since the exhibition's inception, it is noteworthy to see visitors' positive reaction to technology despite the age of the exhibition. A breakdown of responses for "up-to-date" responses and example quotations are in Table 3, below.

Table 3: Visitor responses for why *HHL* seems up-to-date, post-interview (*N*=71)

Code	% of visitors (*n*=38)	Example quotations
The topics covered in *HHL* were current, including recent research and changing content.	50%	*"Seems to reflect most recent facts and discoveries about society and life," female, 37.*
The wristbands and Link Stations made *HHL* up to date	32%	*"You can see everyone else's data and see it compiled to see the averages," male, 14.*
The exhibition's technology helped *HHL* look or feel up-to-date.	29%	*"It's very technologically up to date," female, 18.*
***HHL* allowed visitors to find relevance through personal information about themselves.**	16%	*"…it tells you about yourself," male, 26.*
***HHL* seems up to date when compared to other Museum exhibits (ex. *Natural Mysteries* and *A Bird's World*).**	13%	*"Some of the things out there feel kinda stale, and the exhibits in here are fresher," female, 38.*
The exhibits were interactive	13%	*"I feel the level of interaction is more than in the animals' one," male, 39.*
I don't know	13%	*"I don't know. Just feels like it. Maybe the colors, the videos. Everything seems to be working," female, 34.*

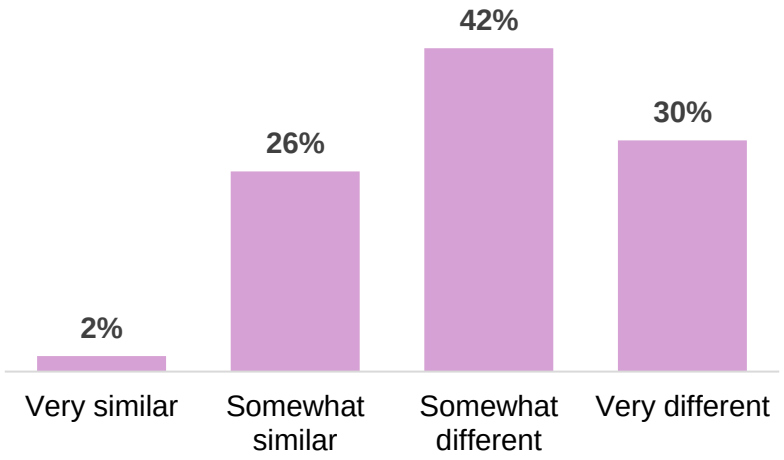
[4] The team wanted to know how, if at all, this approach to changing content affected visitor's perceptions of *HHL*. During the post-interview, visitors were asked if they had visited *HHL* in the past, and if so, did they notice any new content. However, from the evaluation sample less than half of groups (34% of 67 groups) reported being repeat visitors and less than half of the repeat visitors (9 of 23 groups) noticed any changing content. Due to these small numbers, the current evaluation cannot make any claims regarding the effects of changing content on visitor perceptions. Additional information on this topic can be found in Appendix D.

In addition to this data, visitors who said *HHL* was "about the same" in comparison to the rest of the Museum (25 of 64 groups) most often said so because they saw the whole Museum of Science as up-to-date, including *HHL* (9 of 25 groups). For example, one 21-year old female said, "*Everything in this exhibit is up to date with current research and that's similar to the rest of the exhibits in the Museum."* Only one person noted that *HHL* was out of date compared to the Museum. One 60-year-old female described the content going out of date, saying, "*Given how quickly things in science are progressing. Genetics will stay the same, but things like mosquitoes are moving quickly.*" A chart outlining all themes for "about the same" and "out-of-date" responses can be found in Appendix D.

3.2.2 Visitors felt that HHL was unique from the rest of the Museum.

During the post-interview, visitors were asked to rate how similar or different *HHL* was from the rest of the Museum. Overall, the majority of visitors (72%, *n*=66) said that it was "somewhat different" (42%) or "very different" (30%) compared to the rest of the Museum (See Figure 5 below).

Figure 5: Visitor responses to how similar/different *HHL* is in comparison to the rest of the Museum, post-interview (*n*=66)



For those that saw the exhibition as somewhat or very different, over half (27 of the 48 groups) said that they saw *HHL* as more interactive than other areas of the Museum. For example, a 15-year-old male said, *"There are more interactives here, interactives that involve your whole body."* Twenty groups (of 48) mentioned the wristbands or Link Stations as factors that defined the exhibition's differences from the rest of the Museum. For instance, one 25-year-old female shared, *"The wrist band makes it more personal."* A summary of responses is in Table 4, below.

Table 4: Visitor responses for why *HHL* is seen as somewhat or very different from the rest of the Museum, post-interview (*N*=71)

Theme	% of visitors (*n*=48)	Example quotations
HHL is more interactive than other Museum areas.	56%	*"Other exhibits are more just standing and reading stuff. This is more interactive," female, 13.*
Wristbands and Link Stations are unique to the exhibit.	42%	*"Wristbands are unique," female, 23.*
Exhibit content was different than other areas of the Museum.	38%	*"It's all about different things about the human body, it's not about animals or habitats," female, 10.*
Visitors were able to make a connection to themselves in the exhibition.	13%	*"All the stuff like for your feet, how you walk differently. You get to learn about how you walk." male, 10.*
HHL contains live animals.	10%	*"There are actual live things. For me, the most interesting thing was bringing things [animals and insects] from the outside world," female, 15.*
Visitors are able to see Link Station data from other Museum visitors	10%	*"[HHL was] different than the other exhibits where you just do the activity because here you can see your stats in a broader scale," male, 22.*

Interactivity is not unique to *HHL*; it is a characteristic of many of the Museum's exhibitions. However, it is notable that the interactive nature of the exhibition and the Link Stations — which contain much of the exhibition's interactive components — were the two most common reasons why visitors felt the exhibition was different from the rest of the Museum. Visitors seemed to notice the exhibition team's efforts to foster new types of interaction through *HHL*, and felt that these efforts set the exhibition apart in a positive way.

Student comparisons between *HHL* and school

In a follow up survey, students were asked to reflect on their visit to *HHL* 2-4 weeks after their field trip to the Museum. They were asked to compare their experiences in *HHL* to their experiences in school by talking about something from *HHL* that was similar to or different from their school. Tables with codes and example responses can be found in Appendix D.

When asked about something they did at *HHL* that was different to what they have done at school (*n*=26), students talked primarily about the learning format (13), the content or topic (8), and specific Link Stations (7). One student thought the learning format in *HHL* was different because *"I got to do hands-on things that we don't do in school," (female, 17).* For other students it was details about content they learned in *HHL* that stood out as different ("*The food stations, at my school we don't really learn about different foods, we just learn what category they are in," male, 13*).The students that discussed Link Stations each brought up a different exhibit. One 13 year-old female explained "*I got to measure my ear which was fun and I don't get to do stuff like that at school, so it was different."*

Students were also asked about something they did in *HHL* that was similar to what they have done in school (*n*=26). They primarily connected their experience to topics covered in school (15) or talked about activities and experiments (10). Students recognized topics such as the human body (*"How the brain functions and the different shapes of the brain…" female, 17*), food (*"What's inside food that we eat. On Fridays we break down the food and see what's made out of," female, 14*), and health (*"Learned how to prevent the flu," female, 13*). A few students thought that some of the activities were similar to what they have done in school, particularly those at the Exploration Hub. The middle school class participated in an activity that demonstrated the presence of a gene that allows those who have it to taste a bitter chemical. Students referenced this activity when talking about activities in *HHL* that were similar to something that they had done in school (*"The lady that talked about taste testing," female, 14).*

3.2.3 Visitors perceived *HHL* as being for all ages.

In order to see who visitors perceived to be the audience for the exhibition, the post-interview asked, "Who do you think the Museum had in mind when designing *HHL*?" *HHL* was seen as appealing to all ages, with over half of visitors (57%; *n*=65) stating that it was for everyone (*"Everybody, all age groups," female, 66*). Other specific age groups such as kids and teens, kids only, teens and adults, and adults only were each mentioned by 10% of groups or less (See Figure 6 below). While the majority of visitors responded to this question in terms of age groups, 10% of groups talked about people with specific interests. Examples included people with health conditions (*"People with conditions," female, 15*), and those with interest in specific topics ("*People interested in biology," female, 15*).

Figure 6: "Who do you think *HHL* was designed for?" responses, post-interview (*N*=71)

Theme	% of visitors (*n*=65)	Example quotations
Everyone	57%	*"Everyone! Everyone can come and look at it," female, 14.*
People with specific interests	10%	*"People who want to learn about humans and other species like bees and tamarins…" female, 10.*
Kids and teens	10%	*"It spans quite a few age ranges. Excellent for 10 through 15…" female, 41.*
I don't know	9%	*"I don't know," male, 8.*
Kids only	7%	*"4-12 year olds. Lots of things were basic," female, 37.*
Teens and adults	6%	*"High school and above," female, 39.*
Adults only	4%	*"Adults. It's less* hands-on*. It's more that you have to sit, read, and learn," female, 24.*
Teens only	4%	*"Teens. It seemed like it was for older groups, more information," male, 20.*

Results from this question are encouraging. As mentioned in the Introduction, *HHL* was developed with teens, older children, and adults being the target audience. Few visitors felt that the exhibition was not designed for this audience: only 7% said the exhibition was designed for "kids only." The first findings section describes the actual attendance of the exhibition, noting that groups with older children and teens were more likely to attend the exhibition than not, but that a sizable portion of the visitation nonetheless includes younger children. The perception of the exhibition as being suitable for everyone suggests that the exhibition team's design is inclusive for all ages.

Student reflections on whether or not they would recommend *HHL*

Students were asked to indicate on the follow up survey whether or not they thought other students would enjoy visiting *HHL* by circling yes, no, or maybe (*n*=25). All students replied either "yes" (16) or "maybe" (9), possibly indicating they thought that *HHL* was age appropriate and for people like themselves. They were then asked to explain their response and prompted to listed both good and bad experiences they had during their visit. Most students identified what they liked about *HHL* (15), some included comments about what they didn't enjoy (6), and a few thought it depended on the person (3). Tables with codes and example responses can be found in Appendix D.

When discussing what they liked about *HHL* many students had general comments about their experience, that *HHL* was fun (6) as one 13-year-old male stated *"It was fun and I loved it,"* or that they liked everything (5) as another 13-year-old male wrote *"I enjoyed the whole thing*." Link Stations and the wristbands used to track their data (5) were appealing to school groups (*"I think all the stations were really cool…I liked the bracelets too." female, 13*).

In addition to praise for *HHL*, a few students included comments about what they didn't like in *HHL*. One student thought the activities were too short (*"…the part that I didn't really like was how short the activities were." Female, 13*), while another thought that "Break it down" in the Provocative Questions section could use improvement (*"…The only thing is to maybe improve the 3 player game." Male, 13*). Although a few students found some parts of the exhibition boring *("For me some parts were fun and other parts were really boring." Female, 13*), most students focused on the parts of *HHL* that they liked.

3.3 HOW ARE VISITORS USING HHL?

HHL is a large exhibition organized into five areas, each of which contains multiple components. In order to better understand how visitors use the various areas and components of *HHL*, the evaluation team looked at data from tracking-and-timing (T&T) observations, post-exhibition interviews, and online follow-up surveys, as described in the Methods section. Five main findings arose from these data that revealed how visitors interact with *HHL*. These five findings include:

3.3.1 Thoroughness of use patterns in *HHL* were similar to other large exhibits at science museums.
3.3.2 All areas of *HHL* were well visited, but not well recognized, by visitors.
3.3.3 Link Stations and live animal exhibits were key aspects to visitors' *HHL* experiences.
3.3.4 When used, the Exploration Hub had long dwell times and was memorable for visitors.
3.3.5 About 10% visitors go to the *HHL* website.

3.3.1 Thoroughness of use patterns in *HHL* were similar to other large exhibits at science museums.

HHL is a large exhibition, 9,700 square feet, with 61 exhibits.[5] The exhibition's usage was characterized using Serrell's (1998) benchmarks for exhibition use: "Sweep Rate Index" (SRI) and "percentage of diligent visitors" (%DV). SRI compares the time spent in an exhibition to the square footage of the space, while %DV calculates how many visitors stopped at more than 50% of exhibits.[6] Together, these benchmarks are used to place an exhibition in one of four usage categories: quadrant A "been there, done that," quadrant B "really large real estate," quadrant C "too much information," and quadrant D "stayed, engaged, lots" (Serrell 2016, 6-8). Quadrant C, defined as an SRI of less than 300 and %DV less than 26%, primarily includes exhibitions that have large numbers of components, many of which were also in science museums.

Visitors' experiences in *HHL* were varied in both dwell times and diligent use. Dwell times varied widely, with visitors spending from roughly 6 to 92 minutes in *HHL*. Visitors spent an average of 34 minutes in the exhibition, resulting in an SRI of 282. The 34 minute dwell time was longer than average for the exhibitions in Serrell's survey, which found that 53% of exhibitions had average dwell times of less than 20 minutes (2010). Four of the 76 timed-and-tracked visitors in the *Hall of Human Life* stopped at 31 or more components, resulting in 5% DV. Visitor dwell times and number of exhibits visited, used to calculate SRI and %DV, are displayed in Figures 6, 7, and 8, below. Combining SRI and %DV together, *HHL* fell into Serrell's "Quadrant C," in which most visitors used fewer than half of the exhibits, but stayed in the exhibition for long periods of time. With many components to see and to do, visitors went to fewer exhibits but spent a longer percentage of their time at each one.

[5] Timing and tracking recorded a 62nd component, "In between exhibits," which involves wayfinding and/or briefly leaving Hall of Human Life to engage with an adjacent exhibit, and is not used in calculating %DV
[6] SRI = exhibit square feet / average dwell time, %DV = % of visitors that stopped at 31 or more elements.

Figure 7: Frequency of visitor dwell time in minutes, T&T observation data (*N*=76)

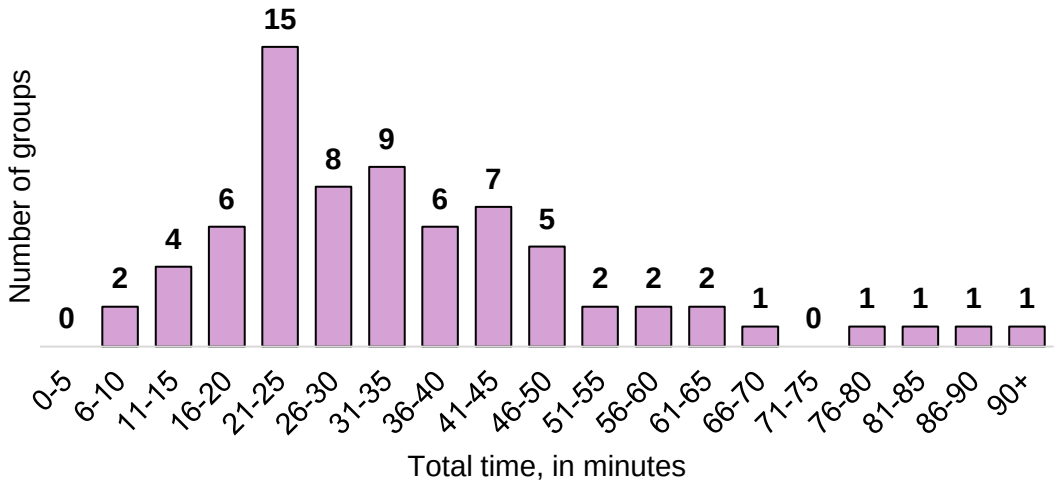


Figure 8: Frequency of total exhibits visited, T&T observation data (*N*=76)

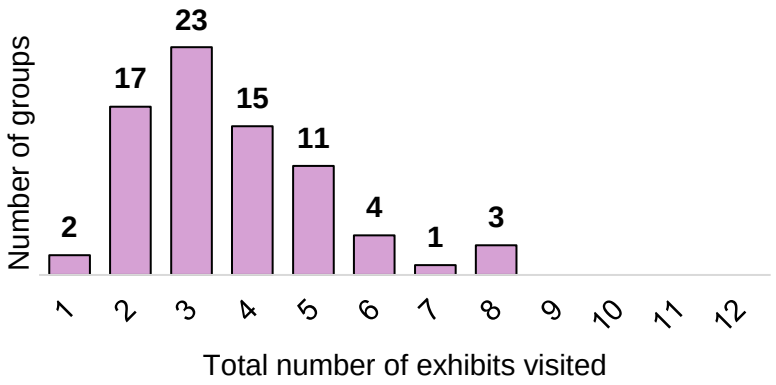
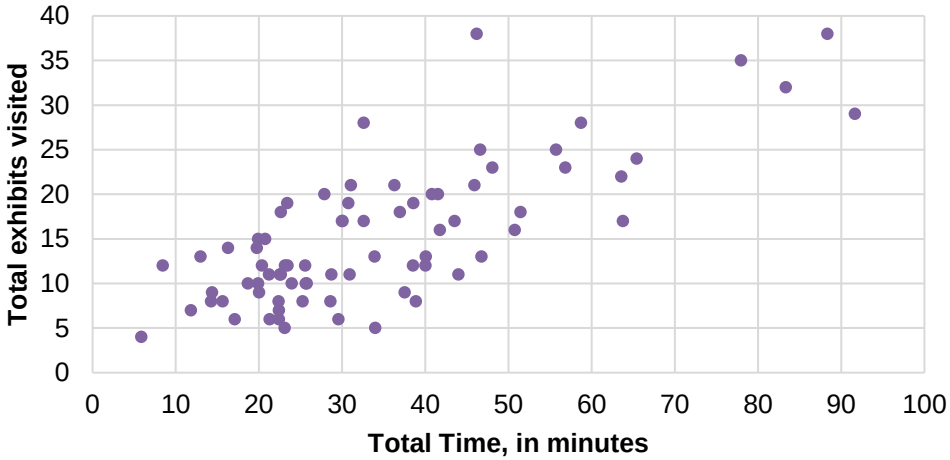


Figure 9: Total exhibits visited and time spent, T&T observation (*N*=76)



The %DV is low compared to other exhibitions in Serrell's study, although when combined with SRI *HHL* is similar to other large exhibits in science museums (Serrell 2010). Multiple factors likely contributed to the 5% DV, in which few visitors stopped at more than half of the exhibits. On average, visitors spent approximately 2 minutes per exhibit, with the dwell time per exhibit ranging from 30 seconds to 4 minutes, 30 seconds. Assuming a visitor spent 2 minutes at each exhibit, it would take over 2 hours to visit every exhibit in *HHL*. Considering that the average dwell time for *HHL* was around 34 minutes, it is unsurprising that most visitors were not diligent users. Additionally, the modular design of *HHL* encourages non-linear use of the space, with multiple exhibit types that allowed visitors to pick and choose what they wanted to see. Link Stations and other interactive exhibits encouraged movement between the five exhibition areas (Physical Forces, Communities, Organisms, Food, and Time), which were all well visited. The following sections elaborate on how visitors used *HHL*.

3.3.2 All areas of *HHL* were well visited, but not well recognized, by visitors.

Each of the five exhibit areas (Physical Forces, Communities, Organisms, Food, and Time) of *HHL* were well visited. Using T&T observation data for individual exhibits, the evaluation team assessed the frequency with which visitors visited each area, counting whether someone visited at least one exhibit per area. As shown in Figure 10, each area attracted over 51% of T&T visitors, a metric used by Serrell to evaluate thorough exhibition use (1998). Time was the most frequently visited area, most likely because it was by the main entrance to *HHL*. All T&T visitors went to at least two of the five areas, going to 4 areas on average. This reflects the %DV, as visitors moved around the exhibition freely, possibly drawn to Link Stations and additional interactive exhibits.

Figure 10: Visitation of exhibition areas in *HHL* by T&T visitors (*N*=76)

While each area was well visited, visitors did not recognize that *HHL* was organized by environmental factors that affect human change. During the post-exhibition interview, visitors were asked if they noticed any particular way the exhibition was organized (*n*=64). Over half of these groups (58%) recognized that there was some sort of organization, but they were related to subtopics rather than the broader environmental factors. One-third of visitors identified one or two of the of the exhibit areas, most commonly recognizing that exhibits about food were grouped together, as shown in Table 5. Although visitors went to multiple areas, they did not use all of the exhibits in each area, which could be why they missed the broader organizational patterns in *HHL*.

Table 5: Visitor identification of the five exhibition areas, post-exhibition interview (*N*=71)[7]

Exhibition area	% of visitors (*n*=64)	Example quotations
Food	17%	*"The food stuff was with the food stuff," male, 28.*
Organisms	9%	*"Microbes around allergies were in a similar scale,"[8] female, 37.*
Communities	6%	*"Social-emotional [in] one area," female, 44.*
Physical forces	5%	*"More walking and feet here, so this is more physical things," female, 21.*
Time	3%	*"They were organized by sections…and another part with baby development, and then sectioned off depending on what they were about," female, 15.*

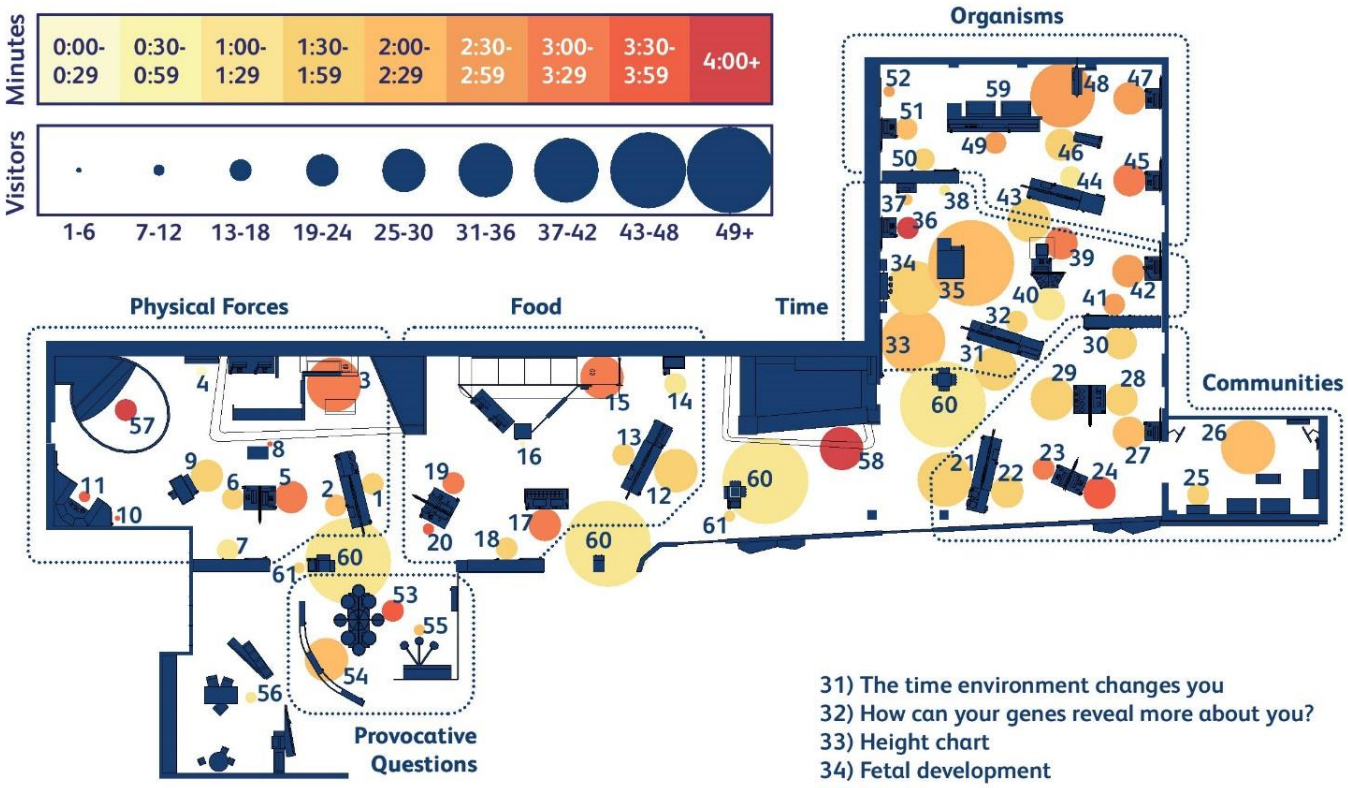
Some groups (14%) vaguely identified that exhibits were grouped together but did not clearly describe what the topics or ideas were (*"Yeah, grouped according to commonalities," female, 67*). Most commonly (22%), visitors thought that *HHL* was organized by parts of the human body (*"Face stuff was over there, foot and walking were here," female, 19*). Two visitors thought that *HHL* was organized by color (*"I noticed the different colors," male, 22*), two visitors thought component type (*"A lot of interactives were over there," male, 12*), and three visitors thought it was organized from the inside to outside the human body (*"They had it in order, so it starts with DNA and shows you the small things and then gets bigger until it's your whole body," female, 11*). The coding rubric for this interview question can be found in Appendix E.

Overall, visitors demonstrated usage patterns that exposed them to many parts of the exhibition. However, this usage was rarely systematic and represented more breadth across the range of areas rather than depth within a single one. The map in Figure 11, displaying the number of visitors for each exhibit along with the average duration of time spent at each exhibit, illustrates the general patterns of visitors in *HHL*. This type of use may have implications for visitors' awareness of the organization as well as learning and perceptions, as described in the different findings sections. Visitors were likely to gain exposure to many pieces of the exhibition's content, but in some cases the lack of depth in usage may have prevented visitors from making deeper learning connections.

[7] Positive identification included groups that listed exhibits together as a group, but did not name or describe the topic.

[8] The Organisms area includes exhibits about allergies ("Why might you suffer seasonally?") and microbial diseases such as flu ("How are you feeling today?") and malaria ("How does disease travel?").

Figure 11: Floorplan of HHL with visitor frequency and duration (*N*=71)



Physical Forces

1) The physical environment changes you
2) How do your genes help you survive in the sun?
3) How high is your foot arch?
4) Walking in their footsteps
5) Are your fingers the first to freeze?
6) Is it hot in here or is it just me?
7) Hypertension
8) Human torso puzzle
9) Transparent woman
10) How does light affect our sleep?
11) What keeps you awake?

Food

12) The food environment changes you
13) How can food turn your genes on or off?
14) Nariokotome Boy
15) How efficient is your walk?
16) What revs your metabolic rate?
17) What makes you hungry?
18) Type 2 Diabetes
19) What food grows from your decisions? (Broccoli)
20) What food grows from your decisions? (Chicken)

Communities

21) The social environment changes you
22) How can a gene mutation be good?
23) How does your circle of friends change your brain?
24) Do you ever forget a face?
25) Human skeletons
26) Cotton-Top Tamarins
27) How do you relate to your family?
28) Do you see what I see?
29) What is going on inside your social brain?
30) Major Depression

Time

31) The time environment changes you
32) How can your genes reveal more about you?
33) Height chart
34) Fetal development
35) Chicks
36) Are you paying attention?
37) How did your body grow?
38) What do you stem from?
39) Is your balance as good as it gets?
40) Are your teeth in transition?
41) Cancer
42) Can you lend an ear?

Organisms

43) The living environment changes you
44) How do your genes help you fight infection?
45) Do you look scared?
46) Why might you suffer seasonally?
47) Why is your body overreacting?
48) Honey bees
49) How does disease travel?
50) Antibiotic-resistant infection
51) How are you feeling today?
52) Monitoring infectious diseases

Provocative Questions

53) Form your opinion: discuss with a partner
54) PQ panels
55) Break it down

Other

56) Living Lab
57) Human Body Theater
58) Exploration Hub
59) Koch Art Gallery
60) Wristband Kiosk
61) Postcard Kiosk

Student use of *HHL*

The middle school teacher provided a worksheet for their students to complete during their field trip, included in Appendix E. Students were asked to use three Link Stations, take a picture while using at least one Link Station, keep their wristband to use later in class, and write down four facts from the activity. The observed middle school students visited between 8 and 16 exhibits in total. The high school class was not given an assignment to complete while visiting *HHL*. These students also had about an hour to explore *HHL*, and visited between 19 and 22 exhibits. Following is a description of one student's experience in *HHL*.

Maddison[9] was a thirteen-year-old white female who visited the Museum with her 8th grade class. Maddison's class used the Exploration Hub as a meeting spot to wait for the rest their teacher and other classmates. While waiting for the rest of their group, the students participated in or watched an activity about taste with a Museum educator, spending from 6 minutes 45 seconds to 8 minutes 30 seconds at the Exploration Hub. While at the Exploration Hub, Maddison watched her classmates interact with the educator, hanging at the back of the group while talking to friends. After finishing at the Exploration Hub, the 8th grade class broke into small groups of about 3 or 4 students, each accompanied by a chaperone, to explore *HHL* and complete their assignment.

Maddison's group went to "How high is your foot arch?" after stopping at a wristband kiosk and getting wristbands for everyone in their group. While waiting she looked at the nearby footprint display and read labels. The group moved to their next Link Station, "What makes you hungry?" which had another group from their school using it. While waiting for the other group to finish, Maddison stopped at nearby exhibits, including "Nariokotome Boy" and the Food DNA wall "Epigenetics." Rather than waiting, her group found their next Link Station, stopping on their way at the Time introduction wall. She and her classmates took turns using the "Are you scared?" Link Station, laughing and discussing their results. Once the station was free, her group returned to "What makes you hungry?", where they took turns using the Link Station. At all three Link Stations, Maddison was the last in her group to use the activity. After her group stopped at their three assigned Link Stations, the chaperone told the students they could continue to explore *HHL*. Maddison stopped briefly at the Food introduction wall, before finishing her visit. During the flash survey directly after her visit, Maddison said that the "What makes you hungry?" Link Station was the most interesting part of *HHL*.

Maddison and her classmates completed a follow up survey 2-4 weeks after her visit. She described *HHL* as *"…a place where you can interact with many things and learn more about your body and mind, and compare it with other people."* The Link Station "What makes you hungry?" that she identified as engaging and interesting during her flash interview maintained relevance to her life after her visit as it made her *"…think about what I eat and how much my calorie intake is."* Maddison and some of her classmates used the *HHL* website, where she *"learned what my data was compared to other [students'], and I was able to see my data again."* Her impression of *HHL* and the Museum as a whole was "*overall, it was a great + informative visit."*

[9] All subjects' names in this report are pseudonyms.

3.3.3 Link Stations and live animal exhibits were key aspects to visitors' *HHL* experiences.

Within *HHL* there are five component types (Introduction Wall, DNA Wall, Health Condition Wall, Link Stations, and additional interactives) in each exhibition area and live animal exhibits, which can be found in the three areas Communities, Time, and Organisms. All of these component types were well visited, as shown in Table 6. Link Stations and live animal exhibits stood out as positive across criteria, including long dwell times, high exhibit use frequencies, and being mentioned in visitors' reports about what was memorable in the exhibition.

Table 6: Visitation by component type, T&T observation data (*N*=76)[10]

Component type	% of visitors	Average dwell time (min:sec)
Link Station	93%	2:48
Additional Interactives	80%	1:26
Animals (bees, chicks, tamarins)	79%	1:51
Introduction Wall	79%	1:18
Health Condition Wall	63%	1:17
DNA Wall	63%	1:14

As shown in Table 7, the most popular component in *HHL* was the wristband kiosk, (71% of T&T visitors) where visitors took wristbands to use at the Link Stations. Three wristband kiosks were spread out in the exhibit, allowing for multiple opportunities to take a wristband. [11] Link Stations were the most frequently visited component type (93% of T&T visitors) and also had the longest dwell time (an average of just under three minutes). These Link Stations were actively used, as T&T observations recorded that 68% of visitors scanned their wristband at a Link Station. "How high is your foot arch?" (45% of T&T visitors) and "How efficient is your walk?" (36% of T&T visitors) were the most frequently used Link Stations. Interest in "How high is your foot arch" (45% of T&T visitors) may have contributed to the high visitation of the Physical Forces area, which was unexpected due to its location in the back of *HHL*. Complete tables of visitor frequency and dwell times for all exhibits can be found in Appendix E.

[10] Visitors visited at least one exhibit type across all five areas.
[11] The three wristband kiosks were spread out in the exhibition space. These kiosks were identical and therefore treated as a single component during T&T observations. As no distinctions were made during observations, the wristband kiosks are also considered a single exhibit in all analyses.

Table 7: Most frequently visited exhibits, T&T observation data (*N*=76)

Exhibit	Exhibit type	% of visitors
Wristband Kiosk	Other	71%
“Chicks”	Live animal	66%
“Height chart”	Additional interactive	55%
“Honey Bees”	Live animal	53%
“Tamarin Monkeys”	Live animal	47%
“How high is your foot arch?”	Link Station	45%
“The Social environment changes you”	Intro wall	43%
“Fetal development”	Additional Interactive	41%
“The food environment changes you”	Intro wall	39%
Exploration Hub	Other	37%

Along with being well visited, Link Stations were memorable for visitors, who mentioned them when asked in the post-exhibition interview what they considered the most interesting or engaging parts of *HHL*. Individual Link Stations were most commonly referenced when visitors talked about the most interesting parts of *HHL*, with 29% of visitors mentioning at least one Link Station, as shown in Table 8. Unsurprisingly, the most frequently visited Link Station (“How high is your foot arch?”) was also the most memorable, which 11% of visitors mentioned during the post-exhibition interview.

Table 8: Component types visitors thought were most memorable, post-interview (*N*=71)

Component type	% of visitors	Example quotations
Link Stations	29%	*"When you got to walk across to see your arch. Never seen it before. I knew about high and low arches, but I didn't know how they measured them," female, 10.*
Animals (bees, chicks, tamarins)	25%	*"The chicks were interesting to me because it shows a fleeting moment which you don't get to see that often," male, 28.*
Additional Interactives	18%	*"I liked a lot of the different activities- the height chart was fun to do!" female, 12.*
DNA Walls	7%	*"Probably the things about genetics. It's an area that's always interested me," female, 67.*
Introduction Walls	7%	*"I liked the food station area- the one with the hostess and grapes on display," male, 52.*
Health Condition Walls	4%	*"Cancer. I have a friend going through it. Interesting to learn about chemotherapy," male, 43.*

Most visitors continued to have a positive impression of Link Stations after their visit. On the follow-up online survey, visitors were asked if they had used the Link Stations (*n*=28). Those that visited Link Stations were asked to pick two words from a list that best described their Link Station experience; all possible responses can be found in Appendix E. Overall, the majority of visitors (87%) had positive impressions of the Link Stations, with half of the respondents saying they were "interactive" and one-third saying it they were "fun." The three respondents that picked negative descriptors—such as drab, not educational, or disappointing—had criticism about the design of the exhibits or did not feel the data was as useful to them as they would have liked.

Figure 12: Visitors' descriptions of the Link Stations, follow-up survey, (*N*=71)

Selected Words	# of visitors (*n*=22)	Example quotations
Interactive	11	*"Interesting way of engaging with the exhibit. Got kids involved and allowed them to test their own traits, etc."*
Fun	8	*"It was neat to use applied data collection and see yourself in the exhibit. It felt interactive and some of it felt 'game-like.'"*
Informative	5	*"Good to have the connection between individual/personal data and those from the other visitors. Helps contextualize the experience."*
Easy to understand	5	*"Could follow the directions without any problems."*
Disappointing	2	*"I'm not sure how I benefit from using it. Clearly, the museum is using it to collect data somehow. If we were locals, maybe this would be more interesting."*
Not educational	1	*"With the wristband, one can "collect" the stations. That is all my kids are interested in. I like seeing the spread of other responses, but I would prefer to see expected data from a larger sampling."*
Drab	1	*"Understanding how expensive it can be to get technology right, I'd have to say that the wristband and displays are okay - on a museum budget, maybe…The button-interfaces look very 1980s and there's no reason why those controls couldn't be built in more into a touch-screen interface."*

Visitors were also drawn to live animal exhibits (Chicks, Bees, and Tamarin Monkeys); all three were within the five most frequently visited exhibits as shown in Table 7. Even though animal exhibits are some of the older components in *HHL*, visitors were still are drawn to them and spent just under 2 minutes at them on average. Animals were also very memorable for visitors, with 25% of visitors talking about at least one animal exhibit when asked which parts of *HHL* were the most interesting or engaging during the post-exhibition interview (*n*=71). Chicks were the most memorable, mentioned by 11% of visitors, ("*The one with the baby chicks. It was cute. I liked to watch them," female, 15*). The complete list of codes and counts from this question about interest may be found in Appendix E.

Students continue to talk about Link Stations

Students referred to Link Stations throughout their flash interviews and follow-up surveys even when not directly asked about Link Stations. Students from both classes completed flash interviews (*N*=23) at the end of their visit which included a question about which part of the exhibition was most interesting or engaging. Most students (17) identified a Link Station as the most engaging part of their visit.

The most commonly mentioned Link Station was "What makes you hungry?" Seven of the students described this Link Station. One 13-year-old female said, *"Probably the food one, like how much calories you eat for breakfast. Because I wouldn't have thought that's how much you eat for breakfast for one day, how many calories [that is]."* Four students mentioned, "How high is your foot arch?" For instance, a 17-year-old female shared, *"The one you had to walk through. Because it told me how your arch was."* Other student responses were evenly split among the rest of the Link Stations.

Link Stations were memorable for students after they returned home from their fieldtrip. Although none of the questions directly asked about Link Stations, 15 students referred to Link Stations in at least one question when talking about their experiences in *HHL* on the follow-up survey (*N*=26). Example quotations are shared below.

For one 13-year-old female, Link Station-related experiences, such as learning about their body while comparing their data to others, were central to the exhibition. She described *HHL* as a *"place where you can interact with many things and learn more about your body and mind, and compare it with other people."*

Eight students felt that Link Stations stood out as different, when asked to share how *HHL* different from their normal school experience. For example, one 14 year-old female said "the walking rate in *Hall of Human Life*"[12] was different from school. Five students talked about Link Stations when asked to share something that was similar to their school experiences; as one 13-year-old female said she *"learned how to prevent the flu."*[13]

While the prevalence of Link Stations as engaging components of *HHL* is consistent with data from the general public audience, it is important to note that the 8th grade class visit primarily revolved around the Link Stations as specified in their assignment, which can be found in Appendix E. Thus, it is unclear how much teacher input influenced students' experiences and memories, and generalizations about all students should be avoided.

[12] Food Link Station, "How efficient is your walk?"
[13] Organisms Link Station, "How are you feeling today?"

3.3.4 When used, the Exploration Hub had long dwell times and was memorable for visitors.

Additional experiences, including the Exploration Hub and Living Laboratory, were distinct exhibits spread out in *HHL* and not directly connected to any of the five exhibit areas. The Exploration Hub was not always staffed during T&T observation data collection. Despite this, it was the tenth most frequently visited exhibit, as previously shown in Table 7, attracting 37% of T&T visitors. On average, visitors spent the longest time at the Exploration Hub, with an average dwell time of 4 min, 39 sec, as shown in Table 9. In addition to being well visited, 14% of all interviewed visitors talked about Exploration Hub activities when asked what part of *HHL* was most memorable during the post-exhibition interview (*"The exhibit with the lungs and the heart, when she put the tube in so they could feel what it was like when a breath gets taken," female, 37*).

Table 9: Exhibits with the longest dwell times, T&T observation data (*N*=76)

Exhibit Name	Dwell time (min:sec)
Exploration Hub	4:39
Time: Are you paying attention?	4:25
Human Body Theater	4:20
Provocative Questions Kiosk (Form Your Opinion)	3:21
Food: What food grows from your decisions? (Rotisserie chicken)	3:21
Physical Forces: Human torso puzzle	3:17
Communities: Do you ever forget a face?	3:15
Physical Forces: What keeps you awake?	3:12
Physical Forces: How high is your foot arch?	2:58
Organisms: Do you look scared?	2:56

When asked what they were thinking or talking about when they used the Exploration Hub, visitors had a positive reaction, though a few experienced disgust by seeing real organs. Most visitors commented on how they thought the activity was "interesting" or "cool," as shown in Table 10.

Table 10: Visitor responses when asked what they were thinking about when they visited the Exploration Hub, post-exhibition interview (*N*=71)

Code	# of visitors (*n*=19)	Example quotations
Visitor liked the activity, or thought it was "interesting" or "cool."	8	*"Super cool, especially when she pumped the lungs," male, 19.*
Visitor learned something new.	5	*"I thought it would be more shaped like a [cartoon] heart and the lungs were really spread out, it was a lot [bigger] and wider than I thought it would be," male, 10.*
Visitor talked about educator experience.	3	*"They helped give us interesting things to think about, and asked questions we wouldn't think to ask," female, 28.*
Visitor experienced something new.	2	*"Yeah, that was awesome. I've dissected worms before in class but I've never seen a heart before," male, 11*
Visitor wanted to know more about the activity.	2	*"I was wondering what animal it was," male, 71.*
Other	4	*"Looks nice. Didn't talk to anyone though," male, 34.*

Almost all T&T visitors (17 out of 19 groups) that discussed going to the Exploration Hub in the post-exhibition interview saw or participated in organ-related activities. These activities presented real animal organs, such as eyes, hearts, and lungs from pigs, deer, and sheep. As almost all of the observed visitors experienced similar activities, it is unclear whether interest in the Exploration Hub is connected to the exhibit as a whole or the type of activity presented.

3.3.5 About 10% visitors go to the *HHL* website.

HHL has a website (www.mos.org/*HHL*) where visitors are able to input their wristband's unique ID and see their data for the Link Stations they used during their visit. In doing so, visitors are able to compare their results to recent visitors at the Museum. The follow-up online survey (*N*=30) included a question asking visitors if they used the website, their reasons for doing so or not doing so, and their impressions of the website if they visited it. Overall, 3 of 30 visitors reported using the website and selected positive responses (easy to understand, informative, and fun). For those that did not visit the website (*n*=23), the most common reasons were because they had forgotten to visit (7 groups) or were unaware it existed (6 groups). There are few comparative data points to put the level of website usage in context; *HHL* is the only exhibition at the Museum that prompts website visitation in this way. Furthermore, the sample size for the survey question about website usage is small, so interpretation of these findings should be considered with caution.

3.4 WHAT ARE VISITORS LEARNING FROM HHL?

In order to better understand what visitors were learning during their time in *HHL*, the evaluation team analyzed data from observations and interviews to assess the extent to which visitors engaged with the exhibition's educational goals and messages. This section covers the following findings:

3.4.1 Visitors recognized all key messages, especially those related to science processes.
3.4.2 Evidence of visitors meeting the learning goals was mixed, with the strongest support for goals related to science process behaviors.

3.4.1 Visitors recognized all key messages, especially those related to science processes.

The exhibition messages focused on visitors' behaviors as they engaged in *HHL*. During this evaluation, researchers looked at observation data and interview responses to assess how thoroughly exhibit messages were demonstrated and recognized. The five focal messages of the exhibition's evaluation are listed below:

- Main message: Human beings are changing in a changing environment.
- My body physically interacts with the rest of the world in surprising ways.
- My DNA is at the center of all changes in my body.
- My species, *Homo sapiens*, has evolved and continues to evolve.
- I can observe, describe, communicate, and measure changes in me and in the population.

Visitors were asked questions pertaining to their perceptions of the exhibition; what they had learned; what, if anything, they found personally relevant; and what conversations or thoughts they may have had in the exhibition (see Appendix F for full interview). Evaluators looked at responses for all of these questions and identified evidence of visitors mentioning the exhibition messages. Thirty-four percent of groups (24 of 71) mentioned all or part of the main message, *Humans are changing in a changing environment*, when looking across responses in the post-interview. Other messages ranged from 7% to 59%, as seen in Table 11, below.

The message that was mentioned most frequently (59%, *N*=71) was, "I can observe, describe, communicate, and measure changes in me and the human population." Seventy-nine percent of visitors who recognized this message also referenced Link Stations within their reply (33 of 42 groups). For example, a 14-year-old male referenced comparing his own family and age-related data to others at Link Stations, saying he was "thinking about how I relate to different demographics and whether I take care of my family more than other people my age and to see if my social circles are larger than other people my age."

Table 11: Visitors who addressed exhibition messages across the entire interview, post-interview (*N*=71)

Messages	% of groups	Explanation	Example quotation
Main message: Human beings are changing in a changing environment	34%	Visitor talks about human change over time or based on environmental factors.	*"The difference between the 3 year old identical twin chromosomes and the 50 year old identical twin chromosomes," female, 39.*
I can observe, describe, communicate, and measure changes in me and the human population.	59%	Visitor makes comparisons between themselves and the population.	*"The quizzes with the band, it was cool to see how your life compares to other people and learn about how you are the same or different," female, 15.*
My body physically interacts with the rest of the world in surprising ways.	32%	Visitor talks about how her or his body interacts with the world.	*"Yeah. Stuff about genes. They can be on or off depending on the environment," male, 13.*
My DNA is at the center of all changes in my body	11%	Visitor talks about DNA or genetics and its effects on the human body.	*"Running. The part about the VO2 Max. Genetics plays a part in why people might not be a marathon runner," male, 39.*
My species, Homo sapiens, has evolved and continues to evolve.	7%	Visitor talks about evolution.	*"Instead of things that are in the world It's about humans and our ancestors," male, 12.*

In addition to the interview data, there was observational evidence that visitors were "observing, describing, communicating, and measuring" while in the exhibition. During timing and tracking, data collectors observed if visitors scanned a wristband at the Link Station exhibits. As, all Link Station exhibits need a wristband scanned in order to begin, this indicated that visitors used the activity. Engaging with the Link Station was interpreted to mean visitors practiced the skills present in the activity, which included making observations from personal data and making measurements, either through physical engagement or by answering questions about their life experiences at the exhibit. As described in the findings section about exhibition usage, 68% of visitors scanned a wristband at a Link Station exhibit. All Link Station activities involved self-measurement, in alignment with the fifth educational message. These data support the importance of Link Stations in allowing visitors to recognize science process messages in the exhibition, such as analyzing data, or making observations.

3.4.2 Evidence of visitors meeting the learning goals was mixed, with the strongest support for goals related to science process behaviors.

Exhibition learning goals focused on concepts that the visitors were expected to learn from the exhibition, interests that the exhibition were expected to be sparked, skills that the visitors were expected to practice, and follow-up behaviors that the visitors were expected to engage in. As there were numerous learning goals for this exhibition, only a subset were prioritized. A full list of learning goals for *HHL* can be found in Appendix F. The learning goals addressed during this evaluation were the following:

Knowledge, awareness and understanding

- Goal A: Visitors will understand that changes in themselves and in the human population can be observed, described, and measured.
- Goal B: Visitors will learn that understanding and utilizing aspects of the scientific method is critical in our understanding human variation and human change.
- Goal C: Visitors will learn that human anatomy, human evolution, and our environment are all dynamically interconnected.

Engagement and interest

- Goal D: Visitors will become more interested in learning about their bodies in unique ways that will stimulate interest in their interconnectedness with the environment and the future of our species.

Skills

- Goal E: Visitors will use their own bodies and experiences to observe, describe, and measure changes in themselves and in the human population.

Behavior

- Goal F: Visitors will begin to think critically about health issues, environmental issues, and impacts on both.

Researchers analyzed responses across visitor post-interview responses, and answers from the pre- and post-survey to see if learning goals were met. Guidelines for coding these learning goals are outlined in Table 12 below.[14] Post-interview and survey instruments can be found in Appendix B. Overall, while looking at all open-ended interview responses there was mixed evidence that visitors met the goals of the exhibition. However, similar to exhibition messages (see previous section) there was strong support that goals relating to knowledge and awareness of observing, describing, and measuring were achieved (Goals A and B). When looking across all visitor responses during the interview, over two-thirds of visitors had evidence of Goal A, that changes in themselves and in the human population can be observed, described, and measured (73%, *N*=71). Goal B, (visitors will learn that understanding and utilizing aspects of the scientific method is critical in our understanding human variation and change) was also met by nearly half of the interviewees (48%; *N*=71). As described in the previous section, Link Stations were crucial in supporting hands-on participation and so supported skill-based goals. Over half of the interviewees who showed evidence of meeting goals A and B (which focused on scientific behaviors) mentioned Link Stations in their responses about learning.

[14] There were limitations with the interpretation of these data, see section 2.3 Limitations for more information.

While Goal E (Visitors will use their own bodies and experiences to observe, describe, and measure changes in themselves and in the human population) was only mentioned by 41% of visitors in their response data, there is other evidence that this goal was achieved. Ove two-thirds (68%) of visitors scanned a wristband at a Link Station, and 63% looked at a Link Station chart. These actions are evidence that visitors practiced the skill of using their own bodies to observe, describe, or measure themselves. Additionally, while not a Link Station, 38% of visitors engaged with the Height Chart exhibit which is an exhibit experience where visitors can measure and compare their height to others in the group or other famous or locally well-known individuals.

Table 12: Visitors who addressed learning goals across the entire interview, post-interview (*N*=71)

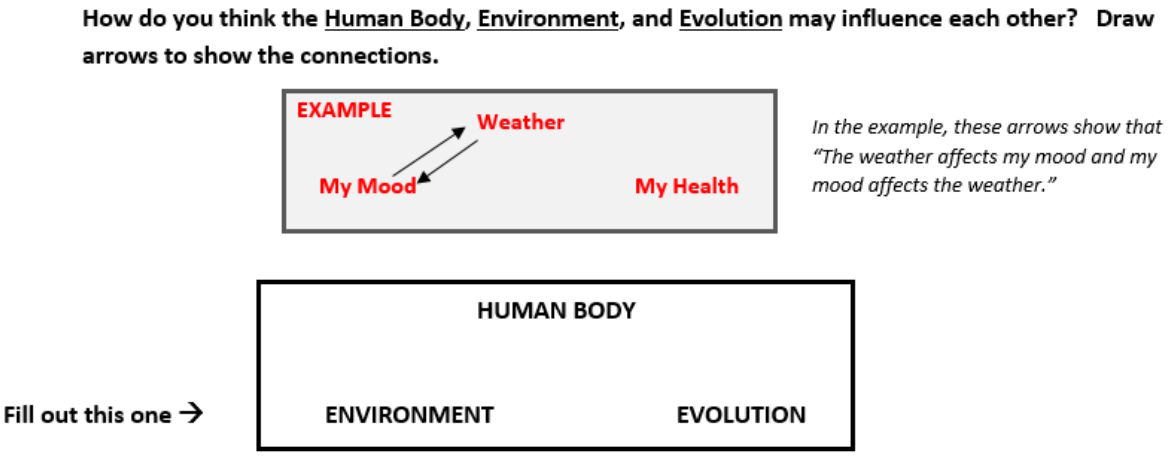
Goals	% of groups	Explanation	Example quotation
Knowledge, awareness and understanding			
Goal A. Visitors will understand that changes in themselves and in the human population can be observed, described, and measured.	73%	Visitor talks about observing, describing, or measuring change in themselves and others in the exhibit.	*"You have the wristbands. You can see personal comparisons to others," female, 22.*
Goal B. Visitors will learn that understanding and utilizing aspects of the scientific method is critical in our understanding human variation and change	48%	Visitor talks about looking at data, such as the charts, or making theories and hypotheses.	*"The attention deficit one was unexpected. Thought [playing] videogames would result in a better score," female, 44.*
Goal C. Visitors will learn that human anatomy, human evolution, and our environment are all dynamically interconnected.	42%	Visitor talks about the interconnection between human anatomy, human evolution, or the environment.	*"Different perspectives on the human body. How it interacts with the environment, how it interacts with it and evolves," female, 34.*
Engagement and interest			
Goal D. Visitors will become more interested in learning about their bodies in unique ways that will stimulate interest in their interconnectedness with	25%	Visitor mentions that as a result of their visit, they will do something outside of the Museum related to interconnectedness with the environment or talks	*"I learned that the more option I have to eat the more hungry I am!" female, 12.*

the environment and the future of our species.		about how choices affect future generations.	*"The genes, if they're switched off they can transmit to the next generation," female, 48.*
Skills			
Goal E. Visitors will use their own bodies and experiences to observe, describe, and measure changes in themselves and in the human population.	41%	Visitor talks about their exhibit experience and how they observed, described, or measured changes in themselves and in the human population.	*"The height chart. I got to see how tall I was and my age's average," male, 12.*
Behavior			
Goal F. Visitors will begin to think critically about health issues, environmental issues, and impacts on both.	41%	Visitor talks about health, environmental issues, or impacts on both.	*"The resistant bacteria is interesting and changing all the time," female, 28.*

Visitors were aware of the interconnection between anatomy, evolution, and the environment, but the data do not tell a clear story.

Goal C focuses on the interconnection between human anatomy, human evolution, and the environment. As shown in Table 12, 25% of visitors mentioned this content (*"How our bodies interact with the environment and how we feed it," male, 39*). A survey item was developed in order to see which connections were the most salient to visitors after visiting the exhibition. Visitors were presented with the words "human body," "evolution," and "environment," and then were asked to draw arrows indicating what aspects affected one another (see Figure 13 below).

Figure 13: Image of connectedness question



This survey was given to observed individuals after their interview and a separate group of individuals before they entered the exhibition. While there are six possible directions of impact for this diagram (the three sides of the triangle, each with a possible arrow drawn in each direction), the following connections are within *HHL*'s exhibit and label content and thus were the focus of the evaluation:

- The environment impacts the human body
- The human body impacts the environment (through decision-making)
- The environment impacts evolution
- Evolution impacts the human body

More than 50% of post-visitors recognized each of these four connections upon leaving the exhibit. The most salient connections for visitors were "evolution impacts anatomy" (80%), and "environment impacts anatomy" (78%). However, pre-survey results suggest that this may be knowledge that visitors had prior to exiting the exhibition: in general, there were no statistically significant differences between the pre- and post- groups' likelihood of drawing arrows representing these four connections. The one exception was that pre-groups were more likely to draw an arrow representing the environment impacting the human body than post-groups were.[15] These data can be seen in Table 13 below.

[15] Environment impacts body: $\chi 2(1, n=127)=6.72$, Fisher's Exact 2-tailed p=.017

Table 13: Connections made by group type between pre-survey and post-survey groups, (*N*=127)

	Pre-survey (*N*=67 groups)	Post-survey (*N*=60 groups)
Anatomy impacts environment	85%	60%
Environment impacts evolution	65%	55%
Environment impacts anatomy*	94%	78%
Evolution impacts anatomy	82%	80%

There was no evidence that attending the exhibition increased visitors' confidence in explaining how the human population can be observed, described, and measured, or in explaining how the environment affects anatomy.

On the survey, visitors were asked to indicate their confidence in being able to explain each learning goal using a Likert scale of "definitely could not," "probably could not," "probably could," and "definitely could." *HHL* visitors in general had high confidence in these statements, as did visitors who had not yet entered the exhibition. In some cases, pre-visit visitors had higher confidence than those who had left the exhibit, as shown in Table 14. Pre-visit groups were more likely to say they probably or definitely could talk about "two ways that the human population can be observed, described, and measured," and "how the environment can change anatomy" (91% of 67 pre-visit groups compared to 75% of 60 post-visit groups). One possible interpretation is that visitors may have left the exhibition with a broader realization of the complexity of the scientific process and environmental impacts, which in turn could lower their confidence in discussing the topics. This finding was similar in other exhibitions, such as *The Science Behind Pixar*, where visitors left the exhibition feeling lower self-efficacy in computer programming.

Table 14: Number of visitors by group type who said probably or definitely could discuss the following topics, pre- and post-survey

Topic	Pre-survey (*N*=67 groups)	Post-survey (*N*=60 groups)
…at least two ways that the human population can be observed, described, and measured.*[16]	91%	75%
…how the environment can change human anatomy.*[17]	91%	75%
…how the scientific method can help us understand human differences and human change.	81%	72%
…how the changing environment leads to changes in the human population over generations.	88%	82%
…how the choices humans make about our bodies lead to changes in the environment.	84%	82%
… how the environment leads to changes in human health and well-being.	90%	83%
…how evolution changes the human body.	87%	77%
…how a person's lifestyle can change his/her health.	94%	100%

[16] Pre-group more confident talking about ways the human population can be observed, described, and measured: $\chi 2(1, n=127)=5.90$, Fisher's Exact 2-tailed p=.018

[17] Pre-group more confident talking about how the environment can change human anatomy: $\chi 2(1, n=127)=5.90$, Fisher's Exact 2-tailed p=.018

School groups at the *Hall of Human Life*

Students participated in a flash interview at the end of their exhibition experience (*n*=24). During these interviews, students were asked the following questions:

- What did you learn at *HHL?*
- Which exhibit did you find most engaging and why?
- What were you thinking about when using the Link Stations?
- (If students spoke to an educator): What did you think or talk about?

Researchers analyzed responses across all of these questions in order to see if students mentioned the exhibition messages and learning goals.

Results from student responses were similar to public audiences. Some students (7 of 24) mentioned the main message, "Human beings are changing in a changing environment." For example, Wayne, a 13-year-old white male, spoke about how different abilities and behaviors were changed over time. When asked about what he had learned in *HHL* during his visit he replied, "*Age and gender affects certain things. I didn't know that before. [Things like] reaction time, family relations*." Like public audiences, students primarily mentioned messages related to science process skills. Over half of the interviewed students (16 of 24) mentioned the message "I can observe, describe, and measure changes in myself and the population." For example when Anya, a 13-year-old white female, was asked about her conversation with a Museum educator she shared Link Station experience. Anya talked about how she took measurements and compared other people's data, saying, *"[I] talked about the ear station and talked about how height affects ear size.*" Ten students also shared learning that aligned with the message, "My body physically interacts with the world in surprising ways." For instance, David, a 14-year-old Asian male, said, *"[I was surprised that] I have somewhat good balance*." A table with counts for the main messages can be found in Appendix F.

Learning goals related to science processing behaviors were also often mentioned by school groups. Over half (17 of 24) met Goal A, "Visitors will understand that changes in themselves and in the human population can be observed, described, and measured," and close to half (11 of 24) mentioned being able to "use to their own bodies and experiences to observe, describe, and measure changes in themselves and in the human population." For example, Penelope, a 13-year-old white female, reached both of these learning goals when she referenced the Exploration Hub activity. She said, "*It was cool when you plug your nose and you can't smell, like when you're sick, then you can't taste also*." In this activity, she used her own body to observe that her sense of taste was diminished when plugging her nose versus when it was open. Over one-quarter (7 of 24) said they learned "that understanding and utilizing aspects of the scientific method is critical in our understanding human variation and change." For example, Ashley, a 13 year-old white female, engaged in basic data analysis when referencing the Link Station charts, saying, "*I learned that most people are average in a lot of things like ear size. They eat the same foods and drink the same drinks*." Additional data about learning goals can be found in Appendix F.

4. DISCUSSION

In summarizing the findings from this report, four overarching themes were considered. The following pages describe these themes and their implications in additional detail:

4.1 *HHL* visitor demographics were similar, but not identical, to the rest of the Museum's audience.
4.2 Visitors saw *HHL* as suitable for all ages, unique, and up-to-date.
4.3 Visitors used *HHL* in a similar way to other large exhibitions at science museums.
4.4 Link Stations, live animals, and the "Exploration Hub," were key exhibition components that contributed to visitors' perceptions of and educational takeaways from *HHL*.

4.1 *HHL* visitor demographics were similar, but not identical, to the rest of the Museum's audience.

The first findings section describes the audience who attended *HHL* during the period of this summative evaluation, and compares it to the Museum audience during that same period that did not visit *HHL*. About 40% of Museum visitors during that period attended the exhibition. While there were some small differences between audiences who did and did not visit HHL (a slightly larger percentage of non-members and a slightly smaller percentage of Asian visitors attended *HHL*), in general the *HHL* audience is comparable to the Museum's overall population. This, of course, means that visitors to *HHL* are similarly diverse, representing a range of demographic categories; there is no one typical Museum visitor and as such there is no single "type" of *HHL* visitor.

The Museum of Science has collected data about its audience for many years and has a good sense of who visits the Museum. Knowing that the overall Museum audience is similar to the HHL audience and likely has similar motivations, group composition, and interests is important to understanding the exhibition as a whole. The *HHL* team can draw on this information moving forward to think about programming and changes to this exhibition as well as planning new exhibits across the Museum. At the same time, recognizing that audiences are diverse and ever-changing means that *HHL* could benefit from designing for multiple audiences to continue to think about and involve diverse visitors in testing new experiences moving forward.

One potentially surprising consideration from these data is that there is not clear evidence that the exhibition attracts a higher percentage of its target audience, youth between the ages of 10 and 17. While there is no direct marketing to this age group, the design of the space was intended to appeal to this audience. When this age group does attend, the data show positive outcomes, suggesting that the exhibition's design and educational components are appropriate for youth in ways that the designers intended. The positive outcomes are not limited to youth, though, and in fact, they seem to reflect the exhibition's actual diverse attendance patterns. In particular, it is interesting that attendees feel the exhibition is designed for visitors of all ages.

4.2 Visitors saw *HHL* as suitable for all ages, unique, and up-to-date.

Overall, *HHL* visitors had positive perceptions of the exhibition. As mentioned above, participants in the summative evaluation felt the exhibition was "for them" in that they thought the educational experience was suitable for all ages, including their own. This ability for the exhibition to appeal to many ages is a testament to the breadth of educational opportunities within the exhibition. *HHL* included a diverse range of experiences to communicate the main messages, such as labels, videos, live animals, educator-led experiences, and interaction with personal data through Link Stations. This wide variety of experiences was similarly found in the *Science Behind Pixar* exhibition to contribute to its success (Cahill, Mesiti, Paneto, Pfeifle, & Todd, 2017). As the Museum continues to think about developing exhibitions for wide age ranges, there may be applications for using a variety of experiences to support visitor learning and engagement.

Visitors were also given the opportunity to practice thinking skills through the Link Station activities and other interactive experiences. Almost three-quarters of summative evaluation interviewees felt *HHL* was different from the rest of the Museum, with many mentioning Link Stations or the interactive nature of the exhibition in general terms, ("*It's more hands on,*" *female, 13*). Given the Museum's overall philosophy to incorporate interactivity in many areas, it is notable that visitors see this as a standout component of *HHL*.

Visitors also felt that the exhibition was up-to-date, typically citing content and technology. With the summative evaluation happening several years after the exhibition's opening, it is encouraging that visitors continue to see the space as up-to-date. While there are some efforts to add changing content material (especially through "Provocative Questions" and live programming), much of the exhibition's content is fixed. The team's choices about what to include seem to have contributed to a lasting perception of newness. Similarly, the perception of what is "new" in terms of technology can change very quickly, but the team seems to have selected ways to integrate technology that avoids the appearance of being out-of-date and actively lead visitors to feel that they are new. In particular, visitors mentioned the Link Stations as technology that seemed up-to-date. These are discussed in further detail below.

4.3 Visitors used *HHL* in a similar way to other large exhibitions at science museums.

Using established benchmarks set forth by Beverly Serrell (1998), the ratio of dwell time to exhibition size and the percentage of components with which visitors engage in *HHL* is comparable to the percentage diligent visitors and sweep rate index values in other science museums' large exhibitions. The *HHL* visitors who participated in the summative evaluation's tracking-and-timing data collection spent an average of 34 minutes in the space, allowing them to explore a range of different components during their stay. Serrell's usage metric looks at the number of visitors who stop at more than 50% of exhibition's components. While only 5% of *HHL* visitors fell in this category, this is still within the range of other large exhibitions in similar museums.

Serrell's metrics are commonly used in the field and are useful to compare exhibitions. However, one consideration is whether stopping at 50% of an exhibition's components is something that makes sense as a goal for *HHL*. Over 60% of visitors went to each of the exhibition areas and went to four different areas, on average. This shows that they moved freely around the exhibition and experienced a variety of exhibit types. Additionally, as previously discussed, visitors

perceived *HHL* as suitable for all ages. This may be due in part to the diversity of opportunities that were available within the exhibition, with some attracting younger and some geared towards older audiences. It may be a valuable strategy to offer many activities so that visitors can gravitate towards different learning methods options that work best for them. However, it is still important that each component can work for the diverse audiences that attend the Museum. Applying Universal Design principles allows the Museum to meet the needs of diverse audiences and benefit many learners.

The relatively low rate of diligent visitors is typical of large footprint exhibitions in science museums (Serrell 2010). This, along with an exploratory floor plan may suggest that visitors were able to customize their experiences, which affects their exposure to the different learning goals. As see in the Use section, visitors were more likely to go to and spend more time at Link Stations and additional interactives (non-content walls). These types of exhibits focused on skill-based learning goals, which may have contributed to the fact that visitors did not always meet the exhibition's learning goals around content learning.

The exhibition was notably more successful in promoting learning goals around engagement with scientific skills, specifically Goals A, B, and E, related to observing, describing, and measuring as well as other scientific methods. The next section further describes some of the mechanisms through which visitors explored skills. The difference in outcomes—with visitors attaining skills goals more readily than content goals—fits well with the Museum's current agendas, and may reflect the process of exhibition development. The results from this study provide supportive evidence that visitors learn by doing. Between the time that the goals were written and the summative evaluation data collection, the Museum's focus has shifted more towards a desire to promote skill development. It is encouraging that these findings align with the Museums current trajectory despite being built before this shift in focus.

4.4 Link Stations, live animals, and the "Exploration Hub" were key exhibition components that contributed to visitors' perceptions of and educational takeaways from *HHL*.

Certain experiences—specifically Link Stations, live animals, and the "Exploration Hub"—were integral to visitors' experiences in HHL. The "Exploration Hub," which is positioned right at a main entrance, welcomes visitors with live programming. When visitors engaged with this programming, they showed particularly long dwell times. Link Stations and animals were present throughout the space and each had notably high visitation rates (93% and 79% of groups, respectively). These two exhibit types were the most memorable in post-exhibit interviews. Their spacing may have encouraged visitors to move around the exhibition to get from one to another. This strategy of having repeated types of experiences dispersed around the floorplan of the exhibition was also effective in *The Science Behind Pixar*. In *HHL*, it may have contributed to the fact that each of the five exhibition areas were well visited.

The Link Stations came up as highlights that contributed to many aspects of visitors' experiences. Not only were they commonly visited, but they were memorable and helped visitors make personal connections to the exhibition. As previously stated, many of the achieved learning goals were tied to Link Station activities. In some cases, the Link Stations even supported learning after visitors had left, as they were able to visit the website and further explore their data outside the Museum. Observation and interview data also showed that many visitors demonstrated the use of scientific skills at the Link Stations; the goals around doing scientific

processes were well integrated into the Link Station activities. The Link Stations were a new type of interaction for the Museum and the data show that they provided valuable and memorable experiences, especially in the area of promoting active participation in scientific processes which is important to think about as the Museum pursues future skill-based learning initiatives. Given that this exhibition was developed before these goals were in place, we can continue to look at *HHL's* successes for future exhibit development.

REFERENCES

Cahill, C., Mesiti, L. A., Paneto, S. C., Pfeifle, S., & Todd, K. (2017). *The Science Behind Pixar Summative Evaluation Report*. Boston, MA: Museum of Science, Boston.

Museum of Science, Boston. (2016) *2016 annual report*. Boston, MA. https://www.mos.org/sites/dev-elvis.mos.org/files/docs/about-us/mos_annual-report_2016.pdf

Serrell, B. (1998). Paying attention: Visitors and museum exhibitions. Washington, D.C.: American Association of Museums.

Serrell, B (2000). Does cuing visitors significantly increase the amount of time they spend in a museum exhibition? *Visitor Studies Today, III (July),* 3-6.

Serrell, B (2010). Paying more attention to paying attention. Retrieved 5/8/2017. http://www.informalscience.org/news-views/paying-more-attention-paying-attention

APPENDIX A: CASE STUDY OF FAMILIES WITH YOUNG CHILDREN IN THE *HALL OF HUMAN LIFE*

Written by Ariadne Nelson

INTRODUCTION

Museums offer rich learning environments for families with young children, providing opportunities for parents and young children to engage meaningfully with familiar and novel topics and develop shared knowledge (Dooley & Welch, 2014; Geerdts, Van de Walle, & LoBue, 2015; Shtulman & Checa, 2012). The Museum of Science has multiple exhibitions, programs, and resources designed specifically to meet the developmental needs and interests of young children. During their visit to the Museum, families with young children not only explore exhibitions tailored to promote young children's learning, but they also visit other exhibitions designed primarily for older audiences. These exhibitions, such as the *Hall of Human Life* (*HHL*), offer both unique learning opportunities and challenges for families with young children. With its focus on human biology and its live animal exhibits, *HHL* provides these families with the chance to explore topics relevant to young children's emerging understanding of themselves and their world. However, its interactive technology, advanced subject matter, and layout and design may also present challenges for young learners. The purpose of this exploratory case study was to examine how families with young children utilize and experience *HHL*.

Three primary research questions guided this investigation:

1) How do families with young children use *HHL*?
2) How do parents with young children perceive *HHL*?
3) Did families with young children experience any usability issues or challenges?

To answer the first question, a data collector conducted observations of families with young children as they used *HHL* to understand what exhibits they used, how they navigated the space and interacted with the exhibits, and what they talked about during their visit. Following their visit, children's parents were interviewed briefly about their perceptions of *HHL*, including what their family did and did not enjoy about *HHL* and what they felt was and was not age appropriate for their children. Additionally, both the observations and interviews were used to determine if families with young children experienced any particular usability issues or challenges during their time in *HHL*.

METHODS

Data collection for this case study took place during May and June of 2016 on two weekdays and five weekend days. Observational and interview data were collected to understand how families with young children utilized and experienced *HHL*. Family visitor groups with at least one child between the ages of 2 and 7 were recruited to participate in this case study from the main entrance of *HHL* (see Supplemental Materials for the recruitment scripts used). After obtaining consent, the data collector observed family members throughout their use of *HHL*. As families departed *HHL*, the data collector asked if she could interview one of the children's primary caregivers about her or his experience and perceptions of *HHL*. After the interview, caregivers

were asked to complete a brief survey that included questions about their families' demographics, their reasons for visiting the museum, their membership status, and previous experience visiting the Museum (see Supplemental Materials for interview protocol and survey). Seven families contributed data to this observational case study.

Family Observation

The focus of the observation was the family group as a unit. However, since families sometimes broke into smaller groups during their use of *HHL*, the data collector selected a target child to continue observing, while noting the whereabouts of other family members as much as possible. Target participants were selected generally as the older of the children age 2-7 years. During observations, the evaluator took unstructured field notes, trying to capture as much of what was happening as possible and focusing on:

- *Family Use of Exhibition Space:*
    - Do families navigate the entire exhibition space, or stay in particular areas?
    - Do they appear to have an agenda for their use of *HHL*?
- *Family Use of Exhibits*:[18]
    - What elements of *HHL* do families utilize or engage with?
    - What elements appear to attract the interest of families?
- *Family Use of Resources and Strategies*:
    - What strategies do caregivers use to engage their children in learning and exploration of space?
    - What are children and caregivers doing as they interact with space?
        - Asking and responding to questions
        - Providing explanations
        - Emotional reactions
        - Reading exhibits
        - Drawing attention to exhibit components
- *Family Engagement and Collaboration:*
    - How engaged do families appear? How long do they spend in the space?
    - How collaborative are families in *HHL*?
    - How, when, and why do families decide they are finished with the space?

Interview and Survey

While caregivers were generally willing to be contribute to the follow-up data collection, most of the young children were restless to move on, and not all questions were not asked of all families due to children's desires to leave the space. For this reason, it was hard to get a complete sense of

[18] Exhibit use was defined by one or more target children in family approaching the exhibit and looking at, touching, or vocalizing in reference to the exhibit. Coding was binary (i.e., families coded as "using exhibit" or "not using exhibit"). Note that this definition does not address the "quality" of family exhibit use, and includes a variety of types of interaction in terms of dwell time and depth of use. This approach was used because it was challenging to develop an "objective" measure of child engagement based on the field notes available.

how widespread particular perceptions were. The questions that ended up being the primary focus on the interviews were about:

- Caregivers' perceptions of what their family enjoyed or did not enjoy
- What they thought was and wasn't age appropriate

RESULTS

How did families with young children use *HHL*?

General patterns of HHL use: Five of the participating families voiced their intention of visiting one of the Live Animals before or upon entering *HHL*. Three of these families were members of the Museum and all had visited the Museum within the past year, with four of the families having visited in the past three months. Each of these families left *HHL* with the expressed intention to visit another exhibition. During the course of their visit, a target child in three of these families requested to leave in order to visit another exhibition. In general, the parents in these families appeared primarily focused on facilitating child exploration and learning, guiding their children to exhibits they thought would be interesting to them (often extending the amount of time spent in *HHL*) and stimulating conversation and interaction with exhibits in which children expressed interest. The general pattern of use of *HHL* for these families was to head directly to the Live Animal that prompted their visit, sometimes stopping to use another exhibit en route, and then exploring nearby exhibits that the adults or children found intriguing.

Two families did not enter *HHL* with an identified purpose. The first of these families consisted of a father and his two-year-old daughter. This family had a membership to the Museum and had visited in the past three months. In the interview, this father stated that his family usually visits the Blue Wing but he *"thought we'd go to the other section today with less people."* Upon entering *HHL*, the child headed in the direction of Food and Physical Forces and a large portion of this family's visit was spent visiting the "back section" of the exhibition. For much of this family's visit to *HHL*, the father followed his child's lead, engaging her in using the exhibits she approached. This child, being the youngest target child observed, was very active, moving quickly between exhibits that were attractive but not often developmentally appropriate (e.g., Provocative Questions, "What keeps you awake?") and engaging in superficial manipulation of exhibit components before losing interest. Part way through their visit to *HHL*, the father guided his daughter to the front of the exhibition to explore Communities and Time. The child appeared more engaged with the exhibits in these sections, spending more time at Tamarins and Chicks. After departing *HHL*, this family went to see the *T. Rex*.

The final family group consisted of a five-year-old boy, his mother and father, an adult family friend, and his one-year-old sister. This family had not previously visited the Museum. When interviewed, the mother stated that her family did not have any particular goals for their visit to *HHL* or the Museum in general. Instead, she explained they *"just wandered in [to HHL]"* and *"just wanted to see what was here [at the Museum]."* Upon entering *HHL*, this family approached the Communities Intro Wall, and then proceeded to use exhibits in Time, Communities, and Organisms before navigating to the back of the exhibition and using exhibits in Physical Forces. Unlike the other family groups who had previously visited the Museum, the adults in this group balanced their own interest in using Link Stations with supporting the five-year-old child's use of exhibits and caring for the one-year-old child. The adults took turns completing Link Stations, engaging the older child in exploring exhibits, and pushing the

younger child in her stroller or holding her. After departing *HHL*, this family visited *Spiders Alive!*

Sections visited: All seven families visited the "front section" of *HHL*, with five families using at least one exhibit in Time, Communities, and Organisms. Four families navigated to the "back section" of *HHL* where Food and Physical Forces are located, with two families using exhibits in both of these sections and two families using exhibits in only one of these sections (see Appendix E for a summary of overall exhibit use and Appendix F for the exhibits visited by each family group).

Exhibits used: Overall, families used more exhibits in Time, Communities, and Organisms than in Food and Physical Forces. In fact, all the specific exhibits visited by three or more families were located in one of these three sections (excluding the *HHL* Gallery). All families visited at least one Live Animal exhibit, with three families visiting all three, three families visiting two, and one family visiting only one. The top two exhibits used, each visited by six families, were Tamarins and Chicks. The next most utilized exhibits, visited by five families, were "What is going on in your social brain?" located in Communities, and "Are your teeth in transition?" located in Time. The following exhibits were also popular among the families observed, each used by four families:

- "The Time environment changes us" (introduction wall)
- "Can you lend an ear?"
- "Fetal development"
- "The Living environment changes us" (introduction wall)
- "Bees"

Six families used at least one Intro Wall, with the interactive components and videos on the Intro Walls for Time and Organisms being particularly attractive to children and their parents.

As evident in the examples below, *HHL* appeared to provide the participating families with opportunities to explore topics relevant to human biology, such as fetal development, the life cycle, and anatomy. During their interactions with exhibits, families connected exhibit content to children's previous experiences, with some children actively demonstrating existing knowledge. The exhibit content and design appeared to facilitate parents and children drawing comparisons, particularly based on age or maturation and gender. For instance, families compared children and adult hands to the display of hand X-rays on the Time Intro Wall and compared male and female height, anatomy, and skeletons using, respectively, the Height Chart, Anatomy Puzzle, and skeleton display in the Tamarin room.

Example: Families' Interactions with the Bee Exhibit

Four families visited "Bees". While more families visited Tamarins and Chicks (the other live animal exhibits in *HHL*), the families who visited "Bees" seemed to spend more time interacting with and conversing about bees. The children who visited "Bees" drew from previous experience (i.e., two children from separate families knew that sometimes bee keepers put a dot on the queen bee), asked questions, and made comments about the bees and their hive. Children's questions included, *"Why are the real bees trapped?" "Mommy, where's the queen bee?" "How do we get to eat honey?"* and *"Does the queen bee die?"* Child comments included statements like, *"Bees can make honey, Mom,"* and *"Yummy honey."*

Both adults and children appeared interested in the bees, and children appeared to be more active participants in the exploration of Bees, compared to other exhibits. All of the groups that visited Bees conversed about honey, saying things like, *"Bees come and go and store all the honey in here."* One adult and child conversation started with the child stating, *"They are making pollen."* The adult then asked, *"What else could they be making?"* The child then responded, *"Honey. Pollen makes honey."* Three of the groups discussed differences between bee castes. One adult encouraged observation skills by asking, *"This is what the queen would look like. [She is] bigger than the others. Do you see a really big bee?"* Another noticed, *"I think these are all worker bees because they are busy at work."* Three family groups talked about the life cycle of bees. One group talked about how a bee was carrying a dead bee, and another said, *"Even if they die, they go back to the soil."* Two of the four groups who visited Bees discussed bee anatomy. For example, one adult commented on how the bees have hairy legs.

Example: Families' Use of the Interactive Display "Are your teeth in transition?"

Most families (5 of 7) visited "Are your teeth in transition?" this example was selected because it offers a contrast from "Bees." The exhibit appeared to have relevance to young children, but discussion was mostly parent-driven. Children were not observed bringing in prior knowledge, as they were with "Bees." They did ask some question, including clarification about which teeth were "theirs" and which were "the parent's," and wondering what the "black stuff" was in the tooth decay model.

Caregivers led most of the conversations. In all five groups that visited this exhibit, adults discussed baby teeth and permanent teeth, sharing things like, *"These are baby teeth. These are grownup teeth."* Four of the groups talked about teeth over time. One group compared the number of teeth of two children in the group. Another adult stated, *"Big kids start losing their teeth."* Three groups talked about cavities and dental hygiene. In response to the child's question about "black stuff" on the model with tooth decay, the adult responded, *"That's not good. [They are] cavities. That's why we always take care of our teeth."* One group talked about orthodontics: in reference to the picture of a girl with braces, the adult discussed how an older sister recently had her braces removed.

Example: Families' Experiences with Link Stations

This third example was selected because Link Stations are a defining aspect of *HHL*, and are a type of experience that is unique within the Museum of Science, Boston. Overall, wristbands were not a primary aspect of the experience for most of the groups with young children who participated in this study. Three of the seven families (two groups with a five-year-old boy and one with a two-year-old girl) took wristbands from the kiosk. Three other groups approached "Time: Can you lend an ear?" and moved on when they realized it required a wristband. The seventh group did not get a wristband or use Link Stations.

The first group that took a wristband included a five-year old boy and his mother. They went to "Food: What food grows from your decisions?" but found it to be out of service. At "Physical Forces: What keeps you awake?" The group began the activity but ran into difficulty scanning the wristband. The child did finally get the wristband to scan, at which point the mother and child responded to questions together for about 15 seconds, until the boy decided he was done and they left before completing the activity.

A second group that took a wristband included a 5-year-old boy, his mother, father, an adult friend, and his smaller sister. At "Time: Is your balance as good as it gets?" the parents helped the child use the Link Station, teaching him to shift his balance. The child was only able to move the ball slowly, particularly on the horizontal sections of the maze. He tried to complete the activity twice, but the computer timed out both times. At "Time: Can you lend an ear?" The mother and child completed the activity together, comparing the child's ear to his dad's ear size. At "Organisms: Do you look scared?" the 5-year-old boy knelt on a stool to reach the eye tracker and was able to complete the activity with the rest of his group watching. Finally, at "Physical Forces: How high is your arch?" the child identified foot models that matched his feet and his little sister's feet. The parents completed the activity and then the mother instructed the child through the activity and showed the child video of his footsteps. Throughout the visit, the parents and adult friend took turns entertaining the child and completing the Link Stations themselves.

The last group that took a wristband was a family with a two-year-old child. While child and father did have some prolonged discussions about certain exhibits, this child seemed most interested in wandering *HHL*, touching exhibits, and watching other children use exhibits. After approaching the first two Link Stations, the child got a wristband when they walked by a kiosk one. The child did not necessarily have any intention to use the wristband. At "Food: How efficient is your walk?" and "Physical Forces: What keeps you awake?" the child went up to the activity and pushed buttons, but did not complete the activity. The father guided the child about how to use levers at "Physical Forces: What keeps you awake?" but eventually guided the child away from the station. At "Time: Are you paying attention?" the child approached a group using the Link Station, sat on an empty stool, and watched the group until her father guided her away.

How did parents of young children perceive *HHL*?

Enjoyment

Four caregivers expressed that they personally enjoyed *HHL*, while others specifically mentioned enjoying Model Organisms and the Human Torso Puzzle. One parent said *HHL* would be good for families with younger and older children. Two adults disliked the fact that wristbands were required to do the Link Station activities. One said, *"I wish you didn't need bracelets to do stuff. [It's] nice to be able to track yourself, but [it would be] better if you could do it without."* Another caregiver articulated a general overwhelmed feeling from the exhibition, saying, *"[It's] just too much to go back to start because there's way too much to look at."*

Age Appropriateness

When asked what about the exhibition was age-appropriate for the young children in their group, most adults described general characteristics of the experience. One mentioned the live educators, noting that they enhanced learning. Others described elements that were relevant to young children, including interactive components (e.g., the magnifying glass at the beehive); information about the life cycle (i.e., live animals, Fetal Development); content about germs; and the overall topic of human biology. One adult specifically mentioned the Model Organisms exhibit. Adults also discussed several things that were not age appropriate for their young children. Overall, several felt that the content and design was more for school age children. They mentioned that there were lots of printed words, advanced content, materials that were not designed for their young children's height, required faculty with technology at the Link Stations, and stimulating exhibits that attracted children but did not sustain their interest. Two specific exhibits were mentioned as being too advanced for young children: the Health Condition Wall about Major Depression and the Human Body Theater-"Brain Storm."

Did families with young children experience any usability issues or challenges?

The observer noticed several usability concerns among the groups with young children. Most of these challenges had to do with Link Stations. Some groups had difficulty scanning the wristbands. At "Do you look scared?" the eye tracker was not at the child's eye level, making it difficult for the young participant to engage with the activity. In "Is your balance as good as it gets?" a child could only move the ball slowly on the horizontal parts of the maze due to the child's low weight. At this same component, the computer did not provide enough time for the child to complete the activity before the computer timed out. In addition to these Link Station challenges, a couple of families experienced some wayfinding difficulty as they attempted to navigate to Bees.

CONCLUSION

The *Hall of Human Life* appears to provide families with young children opportunities to engage with familiar and developmentally appropriate scientific topics in novel ways. Many of the exhibits—particularly Live Animals and exhibits in Communities, Time, and Organisms—seemed to allow for making connections to children's previous knowledge and experience. Children were often active in this process, asking questions and making comments that demonstrated interest, personal relevance, and existing knowledge. The parents and other adults observed were active in facilitating their child's learning, helping them make connections between exhibit content and their daily lives. While many of the parents expressed awareness

that *HHL* was designed for an older audience and some families experienced usability issues or felt some material was not appropriate for their children, the parents interviewed all expressed that their family enjoyed their visit to *HHL* and articulated that *HHL* provided at least one exhibit that facilitated child interest and learning.

References

Dooley, C. M., & Welch, M. M. (2014). Nature of interactions among young children and adult caregivers in a children's museum. *Early Childhood Education Journal*, *42*, 125-132.

Geerdts, M. S., Van de Walle, G. A., & LoBue, V. (2015). Parent-child conversations about animals in informal learning environments. *Visitor Studies*, *18*, 39-63.

Shtulman, A. & Checa, I. (2012). Parent-child conversations about evolution in the context of an interactive museum display. *International Electronic Journal of Elementary Education*, *5*, 27-46.

SUPPLEMENTAL MATERIALS

Participating Families

Group	Target Children	Child Race/ Ethnicity	Other Group Members	Member Status?	Last Visit to Museum	Caregiver Interviewed
1	Female, 3, Female 3, Female 5	White	Mother	Yes (1-2 years)	Past 3 months	Mother
2	Female, 3	White, Middle Eastern	Mother, Father, Brother, 1	No	6 months - 1 year	Mother
3	Female, 6 Male, 4	White	Mother	Yes (< 1 year)	Past 3 months	Mother
4	Male, 5	Asian	Mother	No	Past 3 months	Mother
5	Female, 2	White	Father	Yes (< 1 year)	Past 3 months	Father
6	Male, 3	White, Asian	Father, Mother, Grandmother	Yes (1-2 years)	Past 3 months	Mother
7	Male, 5	Hispanic	Mother, Father, Adult Friend, Sister, 1	No	Never	Mother

Recruitment Scripts

Introductory Script:
"Hi, my name is [name], and I work for the Museum. The Museum is trying to get a better understanding of how the *Hall of Human Life* works for families with younger children. I was wondering if you would be willing to participate by allowing me to observe your group's visit today and to ask you a few questions at the end about your experience? We are really interested in hearing what families think about the exhibit."

After receiving initial agreement (from both the adult and child, if applicable), say,

- "Thank you! I want to let you know that this is completely voluntary and anonymous, and you can stop your participation at any time you wish. I don't want to interfere with your visit in any way, and I'll mainly be looking to see what how the exhibition works for you and your group. Do you have any questions for me?"

If the adult or child says no, say "Thanks for your time!"

Script for Initiating Interview

- "Thank you so much for letting me observe you! We would also be really interested in hearing your thoughts and ideas about the exhibit. We would like to learn more about how this exhibit works for families with younger children. Would you be willing to answer a few questions about your experience?"

After receiving initial agreement, say,

- "Before we start, I want to let you know that you don't have to answer the questions if you don't want to and that you can end the interview at any time. This is completely anonymous and voluntary. There are also no right or wrong answers to my questions. Any thoughts you share will help us improve how we design exhibits in the future."

If the adult or child says no, say "Thanks for your time!" and give "I helped!" stickers.

Interview Protocol

1. Before today, had anyone in your group visited the *Hall of Human Life*?
    a. What drew you into the *Hall of Human Life* today?
    b. Did you have any particular goals for your time in the *Hall of Human Life* or the Museum more generally*?*

2. What did you and your child(ren) like best about the *Hall of Human Life*? What makes you say this?
    a. Were there any other parts of the exhibit that your family enjoyed that you want to mention?
    b. What parts of the *Hall of Human Life* seemed the most age appropriate for your child(ren)? What makes you say this?
    c. What parts of the *Hall of Human Life* best supported your child's (children's) learning? What makes you say that?

3. What did you and your child(ren) not like about the *Hall of Human Life*? What makes your say this?
    a. Were there parts of the *Hall of Human Life* that you or your child(ren) found frustrating or challenging? What was it about these parts that made them frustrating or challenging? How did you address this?
    b. Were there parts that did not seem age appropriate for your child(ren)? How did this influence how your family used the exhibit space?

4. What (if anything) do you think your family will take away from your experience in the *Hall of Human Life*?

5. Do you mind if I ask your child(ren) about what he/she/they liked about the *Hall of Human Life*?
    a. What did you like about this area of the Museum? What did you like about it? I say you spent time _____, what did you like about that?

Experience Specific Questions: Choose only a couple as relevant.

1. I noticed you and your child(ren) used one/multiple link stations, including _____.
    a. What made you or your child(ren) interested in using this (component) ?
    b. What was your experience using this (component) ?
        i. What did you both like? What (if anything) worked well? What (if anything) was frustrating or challenging?
    c. What did you and your child take away from using this (component) ?

2. I noticed you and your child(ren) did not use any of the link stations.
    a. Was there any particular reason you choose not to use the link stations?

3. For both positive or frustrating experiences: I saw that you and your child(ren) spent some time using _____.
    a. Can you share any reflections on your experience using this component with your child?

Survey

1. **Please complete the table below about the members of your group. <u>Please list yourself first.</u>**

Gender	Age	Race/Ethnicity	Relationship to You

2. **Why did you decide to visit the Museum today? Please select up to <u>TWO</u> that most apply.**

❒ To spend time together as a group/family
❒ To bring out of town friends/family
❒ Something to do while visiting Boston
❒ Something to do in poor weather
❒ Had a coupon/free pass
❒ To see a specific exhibit, program, or show
❒ Educational experience for group members/children
❒ Educational experience for myself
❒ For fun/entertainment for group members/children
❒ For fun/entertainment for myself
❒ Other: Please specify:_____

3. **Are you a Museum of Science member?**
❒ Yes ❒ No

3a. If yes, how long have you been a member?
❑ Just became a member today
❑ Less than 1 year
❑ 1-2 years
❑ 3-5 years
❑ 5 or more years
❑ Not sure

4. **Prior to this visit, when was the last time you visited the Museum of Science?**
❑ Within the past three months
❑ 3-6 months
❑ 6 months to within the last year
❑ 1-2 years ago
❑ 2-5 years ago
❑ 5-10 years ago
❑ More than 10 years ago
❑ Never
❑ Not sure

5. **Do you or anyone you are visiting with have a permanent or temporary disability?**
❒ Yes ❒ No

6. **What is your ZIP code? _____**

Summary of Exhibit Use

Top Exhibits Used by Families	
Exhibit	**Number of families (*N* = 7)**
Communities: Tamarin Monkeys	6
Time: Chicks	6
Communities: What is going on inside your social brain?	5
Time: Are your teeth in transition?	5
Time: The Time environment changes you (Intro wall)	4
Time: Can you lend an ear?	4
Time: Fetal development	4
Organisms: The Living environment changes you? (Intro wall)	4
Organisms: Bees	4
Communities: Do you see what I see?	3
Communities: Human skeleton	3
Time: Height chart	3
Organisms: Why might you suffer seasonally?	3
Wristband Kiosk	3
HHL Gallery: 21 Diets	3

Exhibit Use by Section				
Section	**Number of Exhibits**	**Number of families who used 1+ exhibits**	**Range of exhibit interactions per family**	**Mean number of exhibit interactions per family**
Communities	10	6	1 to 7	3.14
Time	12	7	2 to 6	4.00
Organisms	10	6	0 to 5	2.43
Food	9	3	0 to 3	0.86
Physical Forces	10	3	0 to 2	1.00
Overall	-	-	-	11.43

Exhibit Use by Exhibit Type				
Exhibit Type	**Number of Exhibits**	**Number of families who used 1+ exhibits**	**Range of exhibit interactions per family**	**Mean number of exhibit interactions per family**
Intro Wall	5	6	0 to 3	1.86
DNA Wall	5	3	0 to 1	0.57
Health Condition Wall	5	2	0 to 2	0.43
Link Station	16	6	0 to 5	1.86
Interactive	9	5	0 to 6	2.29
Display	6	7	1 to 4	2.43
Live Animal	3	7	1 to 3	2.29
Case Study Videos	3	0	-	0.00
Overall	-	-	-	11.71

Exhibit Use by Family

Family Exhibit Use: Overview										
Group	**Visit length (Min)**	**Time of Visit**	**Communities: # of Exhibits**	**Time: # of Exhibits**	**Organisms: # of Exhibits**	**Food: # of Exhibits**	**Physical Forces: # of Exhibits**	**# of Live Animals**	**# of Link Stations**	**Total # of Exhibits**
1	30	Weekday morning	3	5	3	0	0	3	1	11
2	10	Weekend morning	1	2	1	0	0	3	0	4
3	15	Weekday afternoon	7	5	5	0	0	2	1	18
4	18	Weekend morning	0	2	1	3	2	2	2	9
5	45	Weekend morning	3	4	0	2	3	2	3	17
6	15	Weekend morning	3	4	2	1	0	1	1	11
7	75	Weekend morning	5	6	5	0	2	3	5	23

Family Exhibit Use: Communities Section								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**Total**
Intro Wall: The Social environment changes you			X				X	2
DNA Wall: How can a gene mutation be good?			X					1
Health Condition Wall: Major Depression			X					1
Link Station: Do you ever forget a face?							X	1
Link Station: How does your circle of friends change your brain?								0
Link Station: How do you relate to your family?								0
Interactive: Do you see what I see?			X			X	X	3
Display: What is going on inside your social brain?	X		X		X	X	X	5
Live Animal: Tamarin Monkeys	X	X	X		X	X	X	6
Display: Human skeleton	X		X		X			3

Family Exhibit Use: Communities Section								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**Total**
Intro Wall: The Social environment changes you			X				X	2
DNA Wall: How can a gene mutation be good?			X					1
Health Condition Wall: Major Depression			X					1
Link Station: Do you ever forget a face?							X	1
Link Station: How do you relate to your family?								0
Link Station: How does your circle of friends change your brain?								0
Live Animal: Tamarin Monkeys			X			X	X	3
Additional Interactive: Do you see what I see?	X		X		X	X	X	5
Additional Interactive: Human skeleton	X	X	X		X	X	X	6
Additional Interactive: What is going on inside your social brain?	X		X		X			3

Family Exhibit Use: Time Section								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**Total**
Intro Wall: The Time environment changes you	X		X			X	X	4
DNA Wall: How can your genes reveal more about you?								0
Health Condition Wall: Cancer								0
Link Station: Can you lend an ear?	X		X			X	X	4
Link Station: Is your balance as good as it gets?							X	1
Link Station: Are you paying attention?					X			1
Display: Are your teeth in transition?	X		X	X		X	X	5
Interactive: How does your body grow?								0
Case Study Videos: What do you stem from?								0
Display: Fetal Development		X	X		X	X		4
Interactive: Height Chart	X				X		X	3
Live Animal: Chicks	X	X	X	X	X		X	6

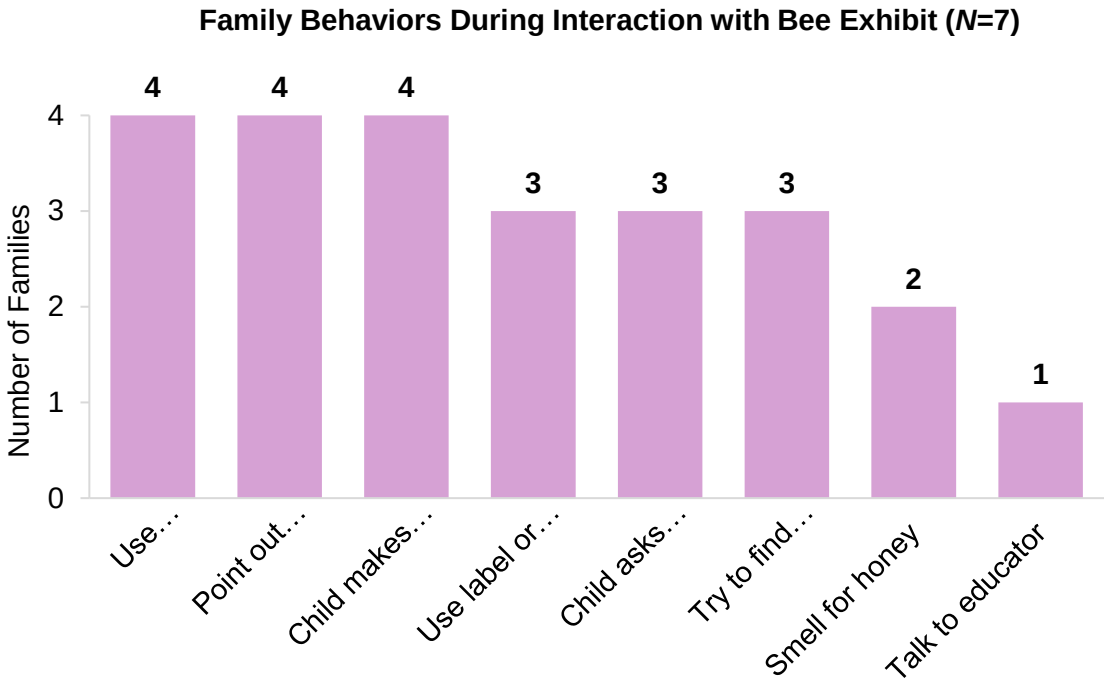
Family Exhibit Use: Organisms Section								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**Total**
Intro Wall: The living environment changes you	X		X			X	X	4
DNA Wall: How do your genes help you fight infection?	X		X					2
Health Condition Wall: Antibiotic resistant infection			X					1
Link Station: Do you look scared?							X	1
Link Station: Why is your body overreacting?								0
Link Station: How are you feeling today?								0
Interactive: Why might you suffer seasonally?			X			X	X	3
Case Study Videos: Monitoring infectious disease								0
Interactive: How does disease travel?			X				X	2
Live Animal: Bees	X	X		X			X	4

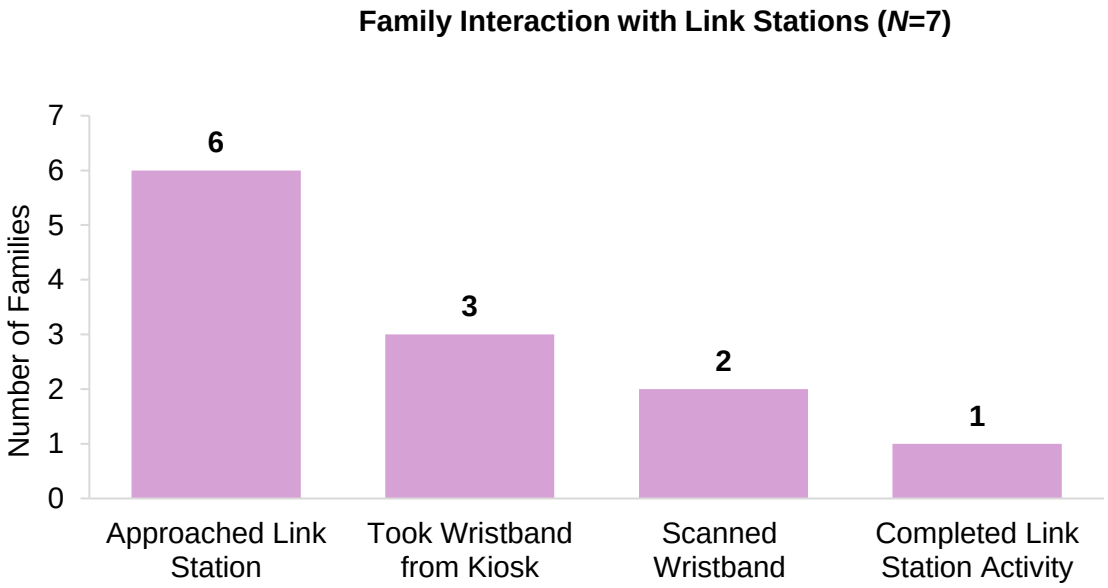
Family Exhibit Use: Food Section								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**Total**
Intro Wall: The food environment changes you				X	X			2
DNA Wall: How can food turn your genes on or off?						X		1
Health Condition Wall: Type 2 Diabetes				X				1
Link Station: What makes you hungry?								0
Link Station: How efficient is your walk?					X			1
Link Station: What food grows from your decisions? (Broccoli side)				X				1
Link Station: What food grows from your decisions? (Rotisserie chicken side)								0
Display: Nariokotome Boy								0
Interactive: What revs your metabolic rate?								0

Family Exhibit Use: Physical Forces Section								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**Total**
Intro Wall: The physical environment changes you				X				1
DNA Wall: How do your genes help you survive the sun?								0
Heath Condition Wall: Hypertension								0
Link Station: Are your fingers the first to freeze?								0
Link Station: How high is your foot arch?							X	1
Link Station: What keeps you awake?				X	X			2
Interactive: Is it hot in here or is it just me?					X			1
Display: Walking in their footsteps								0
Case Study Videos: How does light affect our sleep?								0
Interactive: Transparent woman					X		X	2

Family Exhibit Use: Other Exhibits								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**Total**
Human Torso Puzzle			X				X	2
Exploration Hub					X		X	2
Living Laboratory								0
Provocative Questions					X			1
Human Body Theater					X		X	2
Wristband Kiosk				X	X		X	3
Postcard Kiosk								0
HHL Gallery: 21 Diets					X	X	X	3
Human Torso Puzzle			X				X	2
Exploration Hub					X		X	2

Family Interactions with Exhibits





APPENDIX B: INSTRUMENTS

VISITOR DEMOGRAPHIC SURVEY

1. List the genders and ages of your group members. <u>Please list yourself first.</u>

Gender	Age

Gender	Age

Gender	Age

Gender	Age

2. Why did you decide to visit the Museum today? [<u>select all that apply</u>]

- ❒ To see an exhibit, program, or show other than *Hall of Human Life*
- ❒ Something to do in poor weather
- ❒ Had a coupon/free pass
- ❒ Something to do while visiting Boston
- ❒ To spend time together as a group/family
- ❒ For fun/entertainment for myself
- ❒ To visit *Hall of Human Life*
- ❒ To bring out of town friends/family
- ❒ Educational experience for group members/children
- ❒ Educational experience for myself
- ❒ For fun/entertainment for group members/children
- ❒ Other: Please specify: _____

3. Are you a Museum of Science member?

❒ Yes ❒ No

3a. If yes, how long have you been a member?

- ❒ Just became a member today
- ❒ Less than 1 year
- ❒ 1-2 years
- ❒ 3-5 years
- ❒ 5 or more years
- ❒ Not sure

4. Do you or anyone you are visiting with have a permanent or temporary disability?

❒ Yes ❒ No

5. What is your race or ethnicity? _____

6. What is your ZIP code? _____

Optional: Would you be willing to give us your email address so we could send you a brief online survey in 2-4 weeks to learn more about your experiences in the *Hall of Human Life*? We will randomly draw e-mail addresses to receive a $25 Amazon.com gift card and we anticipate a 1 in 10 chance of receiving a gift card. By entering your e-mail address below, you'll be entered into a drawing for a Amazon.com gift card regardless of whether you complete the online survey. We will not use or distribute your email in any way other than to send you the optional survey and the Amazon.com gift card if you are selected in the drawing.

7. What is your e-mail address?

_____

GENERAL PUBLIC INTERVIEW

1. When was the last time you've visited the Museum, if ever?

- ❒ Within the past three months
- ❒ 3-6 months
- ❒ 6 months to within the last year
- ❒ 1-2 years ago
- ❒ 2-5 years ago
- ❒ 5-10 years ago
- ❒ More than 10 years ago
- ❒ Never
- ❒ Not sure

2. [If red] Did you visit *HHL* on your last visit? **Yes** **No**

3. **a.** How would you rate *Hall of Human Life* compared to other exhibits at the Museum? Would you say it was…

Very similar **Somewhat similar** **Somewhat different** **Very different**

What makes you say that *HHL* is more **similar / different** compared to other exhibits at the Museum?

[Prompt if needed: Is your overall impression that *HHL* is similar to the rest of the museum or that it's different from the rest of the museum?] Why?

[Probe: If they say something that is generally featured in other areas of the MOS, e.g. Interactives. What about ____ are different from the rest of the museum?]

More out of date **About the same** **More up to date**

3b. What makes you say that *HHL* is **more out of date/ more up to date/ about the same** compared to other exhibits at the Museum? Why? [Probe: What about ___ makes you say it's up-to-date/out-of-date]

[Probe: If they say something that is general, e.g. "technology," ask them specifically, What parts of the exhibit specifically would you say have up-to-date _____?]

4. If visited *HHL* before: Did you notice any changes in *HHL* since your last visit? **Yes** **No**

4a. If so, what?

5. Why did you decide to visit the *Hall of Human Life* today? [Prompt: *HHL* specifically, not MOS overall.]

6. If you had to pick one part of the exhibit, which part of *HHL* was most engaging or interesting for you? Why? [Probe: To make sure you are clear exactly which experience they're discussing]

7. What do you think the **Museum** wants people to learn from *HHL*? [Prompt: What do you think are the educational take-home messages of *HHL*?]

8. Did **<u>you or your group</u>** learn anything new today in *HHL*? **[If not covered:** Was there anything you'd say you learned about human differences and human change?]

9. Did any part of *HHL* relate to your own life? How so?

10. How valuable was it for you to be able to talk with a museum educator at *HHL* today?
Not at all valuable A Little Bit Valuable Somewhat Valuable Extremely valuable
<u>Why?</u>

11. I have a few quick questions on some of the components of *HHL* you were using. Could you talk me through what you were thinking about or talking about when you used _____? [show photos of each component]
Link Stations and Link Station <u>Charts/Graphs</u>:

Exploration Hub and/or Living Lab– circle or label which one(s):

12. Who do you think the MOS had in mind when designing *HHL*? **What parts of the exhibit make you say/think that?**

13. Did you notice any particular way that the exhibit and themes were organized?

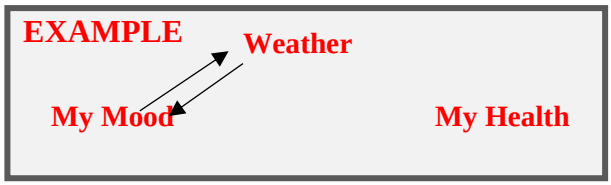
14. Was there anything you want to learn more about as a result of your visit to *HHL* today?

15. Was there anything confusing/frustrating? [Probe: Anything that was confusing/frustrating to use? **Which specific activity?**]

16. Is there anything else you would like to add?

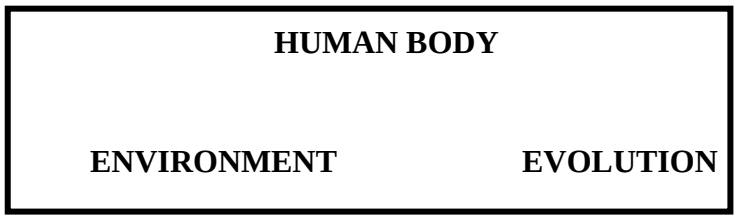
GENERAL PUBLIC, PRE/POST SURVEY AND SCHOOL POST SURVEY

How do you think the <u>Human Body</u>, <u>Environment</u>, and <u>Evolution</u> may influence each other? Draw arrows to show the connections.



In the example, these arrows show that "The weather affects my mood and my mood affects the weather."

Fill out this one →



How confident are you in your ability to do each of the following? (Circle one per line)

I can talk about…				
…at least two ways that the human population can be observed, described, and measured.	Definitely could not	Probably could not	Probably could	Definitely could
…how the environment can change human anatomy.	Definitely could not	Probably could not	Probably could	Definitely could
…how the scientific method can help us understand human differences and human change.	Definitely could not	Probably could not	Probably could	Definitely could
…how the changing environment leads to changes in the human population over generations.	Definitely could not	Probably could not	Probably could	Definitely could
…how the choices humans make about our bodies lead to changes in the environment.	Definitely could not	Probably could not	Probably could	Definitely could
… how the environment leads to changes in human health and well-being.	Definitely could not	Probably could not	Probably could	Definitely could
…how evolution changes the human body	Definitely could not	Probably could not	Probably could	Definitely could
…how a person's lifestyle can change his/her health.	Definitely could not	Probably could not	Probably could	Definitely could

ONLINE FOLLOW-UP SURVEY

Thank you for providing your e-mail address and taking the time to complete our survey! We have a few questions about your visit to the Museum of Science, Boston

1. Click the checkbox below if you are 18 years of age or older and wish to proceed:
   - ❑ [I am 18 years of age or older and agree to participate.]

2. Did you visit *Hall of Human Life* (pictured above) on your visit to the Museum?
   - ❑ Yes
   - ❑ No

3. [if yes] Did you use the Link Stations and/or wristbands in *Hall of Human Life*? (pictured above)
   - ❑ Yes
   - ❑ No

4. [If yes] What did you think about the Link Station and wristband experience? (Choose up to two words)
   - ❑ Comprehensive
   - ❑ Over-simplified
   - ❑ Inspiring
   - ❑ Disappointing
   - ❑ Informative
   - ❑ Not educational
   - ❑ Visually-appealing
   - ❑ Drab
   - ❑ Fun
   - ❑ Boring
   - ❑ Interactive
   - ❑ Not interactive
   - ❑ Easy to understand
   - ❑ Confusing
   - ❑ Other, please specify: _____

5. Why did you choose [First Link Station word] when asked about your Link Station and wristband experience? Please explain your answer below.

6. Why did you choose [Second Link Station word] when asked about your Link Station and wristband experience? Please explain your answer below.

7. After your visit, did you visit the website www.mos.org/hhl to look up your Link Station wristband data (pictured above)?
   - ❑ Yes
   - ❑ No

8. [If yes]: Why did you go to the *Hall of Human Life* Link Station website?

9. [If no]: Why did you not visit the *Hall of Human Life* Link Station website?

10. [If they went to the HHL website]: What did you think about the *Hall of Human Life* Link Station website (choose up to two words):
    - ❑ Comprehensive
    - ❑ Over-simplified
    - ❑ Inspiring
    - ❑ Disappointing
    - ❑ Informative
    - ❑ Not educational
    - ❑ Visually-appealing
    - ❑ Drab
    - ❑ Fun
    - ❑ Boring
    - ❑ Interactive
    - ❑ Not interactive
    - ❑ Easy to understand
    - ❑ Confusing
    - ❑ Other, please specify: _____

11. Since your visit to the Museum, have you thought about or talked about anything you saw in *Hall of Human Life*?
    - ❑ Yes
    - ❑ No

12. [If yes]: What did you think about or talk about?

13. Do you have any additional comments?

Thank you for taking part in our survey!

STUDENT FLASH INTERVIEW

Q1: What is one thing you learned at *HHL* today? [Prompt: Tell me more…]

Q2: If you had to pick one part of the exhibit, which part of *HHL* was most engaging or interesting for you? Why?

Q3: (If applicable) Did you interact with an educator in a red lab coat today? [Where?] What were you thinking about or talking about when you interacted with the educator?

Q4: (If there is time) What were you thinking about or talking about when you used the Link Stations? [Which Link Station?]

STUDENT FOLLOW-UP SURVEY

Thank you for completing this survey. There are no right or wrong answers. We want to hear what students think about these questions! Please fill out the front and back of both pages.

<u>PART I.</u> First, we have a few questions about your field trip to *Hall of Human Life*. Please answer these questions about *Hall of Human Life* only, and not other parts of the Museum. There will be space at the end if you want to tell us anything more about your experiences in the rest of the Museum.

As a reminder, here is what *Hall of Human Life* looks like:

What is your first name and last initial?

_____

1. **How would you explain what you learned at *Hall of Human Life* to your favorite teacher?**

2. **What's one thing you did at *Hall of Human Life* that is different from what you've done in school? Why?**

3. **What's one thing you did at *Hall of Human Life* that is similar to what you've done in school? Why?**

4. Have you thought about or talked about anything related to *Hall of Human Life* since your field trip? If so, what was it? Who did you talk with about it?

(a) Did any part of *Hall of Human Life* make you think about something in your own life?
Yes No
(b) If yes, what was it?

5. Did you use the website mos.org/*HHL* after your field trip? Circle which one(s) best describes you:

Yes – In my classroom Yes – at home No
If yes, what did you learn from it? What did you like about it? What did you not like about it?

(a) Do you think other students like you would enjoy visiting *Hall of Human Life* on a field trip?
Circle your answer: Yes Maybe No
(b) Why? Please tell us about both good and bad experiences at *Hall of Human Life* so we know what's working well and what we can make better.

Is there anything else you would like to add or want us to know? You can write about *Hall of Human Life* or any part of your visit to the Museum of Science.

First name and last initial: _____

SCHOOL DEMOGRAPHICS, FOLLOW-UP SURVEY

PART III. Please answer the following questions about yourself. These are optional questions, so you can skip them if you would like.

1. **How old are you? _____**
2. **What is your gender? _____**
3. **What grade level are you in? _____**
4. **BEFORE your school field trip, when was the last time you visited the Museum of Science, Boston?**

- ❑ Within the past three months
- ❑ 3-6 months
- ❑ 6 months to within the last year
- ❑ 1-2 years ago
- ❑ 2-5 years ago
- ❑ 5-10 years ago
- ❑ More than 10 years ago
- ❑ Never
- ❑ Not sure

5. **What is your race or ethnicity? _____**

Thank you for completing the survey!

TEACHER FOLLOW-UP SURVEY

The sample for the teacher follow-up survey only includes two teachers from one school during a single visit. As the team cannot make generalizations about teacher experiences from this sample, their responses are included with the survey instrument.

Thank you for choosing the Museum of Science and *Hall of Human Life* for your field trip!

Please complete this questionnaire to help us improve our exhibits and programs. We will not use your name or school's name in any reporting of your responses.

Thank you for sharing your thoughts and ideas with us!

Part I.

1. What do you feel your students **learned** from their field trip to *Hall of Human Life*?

Teacher A: *They learned a lot about how their own bodies work + how they compare to others. I think it helped expose them to the idea that we are all slightly different but that's normal!*

Teacher B: *I feel the students learned a lot about their own bodies. They learned why they do somethings they do. They really liked the chicks and the monkeys. Some groups wanted to learn more about babies and genetics.*

2. (a) What, if anything, did you think your students found most **interesting or inspiring** about *Hall of Human Life?*
   (b) Did your students connect *Hall of Human Life* to their personal lives in any way? If so, which topics did they mention?

Teacher A: *a) They enjoyed the exhibit + found many components of it interesting. b) Don't have a good answer to this one.*

Teacher B: *Most of the students found the interactive stations and the live presentations the best. They talked about the foot arch and picking their food to see about calories. They love the monkeys and the baby chicks.*

3. How, if at all, have you connected *Hall of Human Life* to your classroom **curriculum** (before or following your field trip)?

Teacher A: *I haven't been able to tie into it w/ my Physical Science curriculum.*

Teacher B: *Many of the different stations have been mentioned and most students have had previous knowledge.*

4. Educators plan field trips in a variety of ways. (a) Please describe how you planned your field trip to *Hall of Human Life*:

Teacher A: *As we had never done this before, we relied heavily on the website in planning. I also utilized the worksheets in the Teacher's Resource section.*

Teacher B: *The field trip to the hall was a part of a bigger trip but for the hall they were split into groups and they had to visit at least 3 different stations and participate in them. They had a packet they needed to complete.*

(b) If you used any materials or resources to help with planning (logistics and/or learning goals),
- please describe how - if at all - they were helpful, and
- check off whether you used each resource **before, during, and/or after the field trip**.

Please think of any software, online resources, curricular resources, Museum of Science resources, etc. that you might have used.

Resource	Before	During	After	How (if at all) was this resource helpful?
Teacher A: *Website*	X			*Timing, planning, organizing*
Teacher A: *Worksheets*	X	X	X	*Very!*

5. A. Did you use **mos.org/*HHL*** with your students after your field trip? **Yes** **No**

B. If **yes**, please describe your thoughts about the experience. If **no**, please describe why you did not choose to use **mos.org/*HHL*** with your students:

Teacher A: *No; No explanation given*

Teacher B: *Yes; The students thought it was really cool to see their data versus other students and museum attendees.*

6. Did you give your students any assignment(s) to complete in *Hall of Human Life*, e.g. a worksheet? If so, how well did the exhibit meet your expectations?

Teacher A: *The health teacher did.*

Teacher B: *The exhibit was my favorite because that's my whole life. I loved seeing a student connect with their health and body in a different way than they do at school.*

7. Who do you think the Museum of Science **had in mind** when designing *Hall of Human Life*? What parts of the exhibit make you say that?

Teacher A: *I think a little older student. I found the exhibits very interesting + read the post-activity infor[mation]. My 8th graders liked the activity + comparing their individual results but didn't sit long enough to fully read all the accompanying information afterwards.*

Teacher B: *I feel the museum was thinking of younger kids to high school students. Some of the information and stations were great while others were not so great.*

8. Do you feel any of your students (whole group or individual students) engaged with activities in *Hall of Human Life* differently than they typically engage with activities in the classroom? How so?

Teacher A: *We simply don't have the opportunity to present these types of technology so all of the Hall was different than typical.*

Teacher B: *The students loved the taste demo because they got to do something that my classroom doesn't have the resources for.*

9. Did your students use **smartphones/tablets** on the field trip? (Please circle.)
   Yes, for personal use **Yes, for educational purposes** **Yes, for both** **No**

If yes, please describe:

Teacher A: *Yes, both; We required them to take pictures of themselves interacting w/ stations.*

Teacher B: *Yes, both; They had to take pictures of them doing their stations*

10. What is your classroom's/school's policy toward **smartphone/tablet use** in school and on field trips?

Teacher A: *In school: teacher's permission; Field trip: No restrictions necessary.*

Teacher B: *In school they can use them with teacher's permission. On the field trip they could use them whenever they wanted.*

11. (a) Did your students interact with an educator **in *Hall of Human Life*?** **Yes** **No**

(b) **If yes**: How valuable was the experience of interacting with an educator? **If no:** How valuable would it have been to interact with an educator?

Not at all valuable A Little Bit Valuable Somewhat Valuable Extremely valuable

(c) Comments on your answer above:

Teacher A: a) *No*; b) *N/A*; c) *My group did not in Hall of Human Life. We did in other parts of the museum + it added a tremendous amount by prompting them to explore further + think deeper.*

Teacher B: a) *Yes*; b) *Extremely valuable*; c) *Most went to the taste testing one while others waited for the dissection one to happen. It opened their eyes to what class could be like if we had the funds.*

12. Was there anything confusing or frustrating about your experience in the *Hall of Human Life*?

Teacher A: *No - very easy to navigate + interact with.*

Teacher B: *No, it was great :)*

13. Would you recommend *HHL* to a colleague for a field trip? Why or why not?

Teacher A: *Absolutely! Because it's awesome! It engaged the kids. They were psyched about it. My goal is to make science + learning fun + your resources provided that opportunity in a way I can't in my district.*

Teacher B: *Yes. It is interactive and I learned a lot and I'm the teacher.*

14. Anything else you'd like to add about your experience at *Hall of Human Life* and/or the Museum of Science?

Teacher A: *We had a fabulous experience! I was pleased my kids not only engaged but absorbed their time at the museum. As 8th graders, their attention span is usually that of a squirrel, but we were at the museum from 9-5 + they were engaged the entire time. That is success!*

Teacher B: *The 4d movie was awesome :)*

If you or your group would like to submit comments about your overall experience at the Museum of Science, you can submit them online at: https://www.mos.org/connect/comment-card

Part II.

1. What is your previous experience with Museum of Science field trips, prior to your most recent field trip?
   - ❒ I had attended, but not planned a field trip
   - ❒ I had attended and planned a field trip
   - ❒ I had planned but not attended a field trip
   - ❒ I had neither attended nor planned a field trip

   Teacher A: *Neither attended nor planned*
   Teacher B: *Attended, but not planned*

2. How likely are you to return on a field trip to the Museum of Science next year?
   - ❒ Not at all likely
   - ❒ Somewhat likely
   - ❒ Very likely

   Teacher A: *Very likely*
   Teacher B: *Very likely*

3. What grade(s) do you teach?

   Teacher A: *6-8*
   Teacher B: *6-9*

4. How many years of classroom teaching experience do you have?

   Teacher A: *1*
   Teacher B: *3*

5. What subject(s) do you teach? (Check all that apply)

   Teacher A: *Earth Science/Astronomy, Life Science/Biology, Physical Science/Physics*
   Teacher B: *Other- did not specify*

Thank you for sharing your thoughts and ideas with us!

APPENDIX C: DEMOGRAPHICS

Table 1: Gender of public visitors, by instrument sample.

	T&T and/or post-surveys (*N*=219 visitors)	Pre-survey (*N*=198 visitors)
Child female	43	24
Child male	51	46
Adult female	79	77
Adult male	46	51

Table 2: Race/Ethnicity of public visitors, by instrument sample

	T&T observations (*N*=71)	Pre-survey (*N*=75)
White (U.S.)	52	50
Asian	4	8
Latino/Hispanic (U.S.)	4	2
White (non-U.S.)	3	3
White and Latino/Hispanic	3	1
Multiracial (unspecified)	2	2
“Other”	2	-
White and Asian	1	1
Black	1	-
Indian	1	-
Latino/Hispanic (non-U.S.)	1	-
Native American	-	1
Pacific Islander	-	1

Table 3: Sampling locations for data collection (*N*=77).

Location	# of visitors
Main entrance	54
Hub	16
Gallery	5
Unknown	2

Table 4: School group participation in each data collection method

	Middle school	High school	Overall
Students attending field trip	20	20	40
Follow-up survey	17	9	26
# tracked and timed	4	3	7
# interviewed	17	7	24

APPENDIX D: ADDITIONAL DATA FOR FINDINGS: HOW DO VISITORS PERCEIVE *HHL?*

This appendix contains rubric tables for coded open-response questions for data discussed in Section 3.2. The table title indicates the question along with the instrument it came from.

Table 1: Visitor responses to "What makes you say that *HHL* is more similar/different compared to other exhibits at the Museum?" Post-exhibition interview (*N*=71)

Definition	*# of visitors* (*n*=70)	*Example quotations*
Different		
HHL is more interactive than the rest of the Museum	27	*"There's more interactives here, interactives that involve your whole body," male, 15.*
The wristbands and/or Link Stations are unique to *HHL*	20	*"The wristband kiosk is different- I liked them. Daughter [5] was too young to really understand how to use them," female, 28.*
The topic (humans, evolution, etc.) was different than other exhibits at the Museum	18	*"It's all about different things about the human body, it's not about animals or habitats," female, 10.*
HHL was more personal, the visitor was able to make a connection to self through the topic or Link Stations	6	*"Sure there's stars, planets, and moons but this exhibit is more personal," female, 43.*
Gathering and comparing data about visitors was interesting and unique	5	*"The wristbands for one thing, the interactiveness. This is a direct interaction. Interesting that you're gathering data on yourself and your guests. Interesting learning about your demographic," female, 60.*
There were live animals (tamarin monkeys, baby chicks, and bees)	5	*"Lot of life in it, live animals. They were alive," female, 11.*

	There were a wide variety of components to interact with, including videos, labels, and interactives	4	*"There are lots of different components to it: Gallery, theater, stations, animals," female, 37.*
	The content was more extensive than other exhibits	4	*"…The exhibit doesn't assume you're an idiot. These exhibits have live spectroscopy or a database. More than that, it tries to engage in these things that have a broader impact. Health, biomechanics. Makes it more engaging," male, 34.*
	The activities (animal organs) at the Exploration Hub were unique	3	*"They have the lung, and have cool stuff, like, real things," male, 10.*
	HHL felt less interactive than the rest of the Museum.	2	*"It had components before [when it was HBC] and now in the present compared to other exhibits. There's more charts, but less exhibit interaction. More visual now. Used to have more* hands-on *before," male, 70.*
	Other comments, including no reason, about how *HHL* seemed different	3	*"To be honest, it's the most unique thing here. I came here a long time ago as a child and this looks so much better than it did before," male, 20.*
Similar			
	MOS as a whole is interactive; *HHL* is equally as interactive as the rest of the Museum	9	*"There's interactives at every station like the rest of the museum," female, 31.*
	Exhibits or components were set up in a way similar to the rest of the museum	3	*"I know that the structure of the exhibits are friendly through the whole Museum," male, 19.*
	The topic (biology) was similar to other topics in the Museum	1	*"Interaction like other exhibits do and involves biology," male, 26.*
	Vague statements, including no reason, stating that *HHL* seemed similar to other exhibits	4	*"There's different exhibits to look at, different topics like other exhibits," male, 13.*

Other			
	Other commentary, visitor did not address the question	5	*"Would prefer it without the tracking…the wristband [disliked] kids getting used to being tracked," male, 41.*
	Visitor felt like they hadn't seen enough of the Museum to make a comparison	4	*"This is one of the first exhibits we've visited, so I can't answer that," male, 40.*

Table 2: Visitor responses to *"What makes you say that HHL is more out of date/about the same/more up to date* compared to other exhibits at the museum?" Post-exhibition interview (*N*=71)

Definition		***# of visitors* (*n*=69)**	***Example quotations***
Up to date			
	The topics covered in *HHL* were current or included recent research and changing content	19	*"And the cancer, with the targeted diseases," male, 67.*
	The technology with the wristbands and Link Stations made *HHL* up to date	12	*"You can see everyone else's' data and see it compiled to see the averages," male, 14.*
	General statements about new technology	11	*"It's very technologically up to date," female, 18.*
	HHL seemed up to date when compared to other exhibits such as Natural Mysteries and A Bird's World	5	*"Some of the things out there feel kinda stale, and the exhibits in here are fresher," female, 38.*
	HHL felt up to date because the topic was relevant	6	*"Everything about it seemed relevant to life today," female, 48.*
	General comments about interactivity	5	*"It's interactive with the bracelets. I feel the level of interaction is more than in the animals' one," male, .39*
	Not sure what made it feel up to date	5	*"I don't know. Just feels like it. Maybe the colors, the videos. Everything seems to be working," female, 34.*

About the same			
	All exhibits at the Museum, including *HHL*, are up to date	9	*"Everything in this exhibit is up to date with current research and that's similar to the rest of the exhibits in the Museum," female, 21.*
	No specific reason given	6	*"I don't know- it's just the same," male, 14.*
	HHL did not seem out of date, but it did not present cutting-edge technology	4	*"Nothing really seems out of date- but there is also nothing too technologically advanced," male, 22.*
	The content, technology, or exhibit design were similar to other exhibits	4	*"It looks pretty similar to other exhibits we saw [Probe]: We were in the blue wing," female, 28.*
	HHL and the Museum haven't changed from previous visits, making *HHL* about the same	3	*"All of them have every type of technology. Computers, things in glass boxes," female, 10.*
	Other comments from visitors that responded that *HHL* was about the same	3	*"Everything was as I remembered," male, 12.*
	Other		
	Had only seen *HHL* so far, didn't have enough to compare to	2	*"We haven't gone to other parts of the Museum yet," female, 48.*
Out-of-date			
	Research moves too quickly for *HHL* to stay relevant	1	*"Given how quickly things in science are progressing. Genetics will stay the same, but things like mosquitoes is moving quickly," female, 60.*

Table 3: Student responses to "What's one thing you did at *HHL* that is *different* from what you've done at school? Why?" Follow-up student survey (*N*=26)

Definition	*# of students*	Example quotations
Learning Format		
HHL was more hands-on than the student's experience at school	9	*"I got to do hands-on things that we don't do in school," female, 17.*
The technology was more advanced than the students have access to at school	2	*"I would say everything is different at* the Hall of Human Life *because it is more high tech…" male, 13.*

Student compared their data with other people	1	*"It was cool to see how other people did, too," female, 13.*
Student participated in self-guided learning	1	*"You got to see everything and work at your own pace," female, 13.*
Content/Topic		
Students learned more about food	4	*"Talking different kinds of food and what really healthy for your body," male, 17.*
Students learned more about the human body	4	*"That sleep affect[s] our bodies," male, 17.*
Specific Exhibits		
Student discussed any live animal exhibits	4	*"See chicks hatch and different stages of life. We are not allowed to have animals in the school," female, 14.*
Student talked generally about Link Stations	1	*"We don't really get to try all these different machines with all these buttons, which was pretty cool," male, 14.*
"Can you lend an ear?"	1	*"I got to measure my ear which was fun and I don't get to do stuff like that at school, so it was different," female, 13.*
"Do you ever forget a face?"	1	*"The memorize people's faces…" male, 14.*
"Do you look scared?"	1	*"Looking at scary pictures for 60 seconds," female, 14.*
"How efficient is your walk?"	1	*"The walking rate in hall of human life," male, 13.*
"How high is your foot arch?"	1	*"One thing I did in the Hall of Human Life was take off my shoes then see how high or low I walk on my feet," female, 17.*
"What makes you hungry?"	1	*"I did this breakfast thing and what was to see how much food we eat," female, 16.*

Table 4: Student responses to "What's one thing you did at *HHL* that is *similar* from what you've done at school? Why?" Follow-up student survey (*N*=26)

Definition	# of students	Example quotations
Content/topic		
Students learned about the human body	7	*"Learned about the body and what it does," male, 13.*
Students learned about food	4	*"What's inside food that we eat. On Fridays we break down the food and see what it's made out of," female, 14.*
Students learned about human health	2	*"Learned how to prevent the flu," female, 13.*
Students learned in *HHL* and in school	2	*"Listen to people talk and learn things," male, 17.*
Activities		
Students do similar test based activities in school	4	*"Checking your memory, like remembering the faces. We take a test at school that has some memory problems in the test," female, 13.*
The "Exploration Hub" activities were similar to something students did in school	4	*"The lady that talked about taste testing," female, 14.*
Students do similar lab experiments in school	2	*"At the end we watch a dissection of an eye, this is similar because we've done many dissection in our class," female, 13.*
Other		
Nothing in *HHL* was similar to what students do in school	2	*"Nothing was really similar. I learned more at the Hall of Human Life than I have in my past 5 years of schooling," male, 13.*
Student had fun in *HHL*, like they do in school	1	*"One thing that is similar is that we all had fun and interacted," female 13.*
Student learned about other classmates	1	*"We compared what our results were and we had fun while doing it. We figured out different things about each other," female, 13.*

Student talked about an activity similar to one they did at home	1	*"Well I've never done this at school but I've done this at home it's the hands and they make it cold who's hand freeze faster," male, 14.*

Table 5: Student responses to "Do you think other students like you would enjoy visiting *HHL*? Why? Please tell us both good and bad experiences at *HHL* so we know what's working well and what we can make better." Follow-up student survey (*N*=26)

Definition	# of students (*n*=24)	Example quotations
What students liked		
Students thought that *HHL* was fun	6	*"It was fun and I loved it," male, 13.*
Students enjoyed the Link Stations and wristbands	5	*"Loved bracelets and how it tracked me," female, 13.*
Students liked everything about *HHL*	5	*"I liked everything about the Hall of Human Life," male, 17.*
Students enjoyed learning in *HHL*	2	*"It was something to learn about. You learn about yourself and the people around you," female, 13.*
Students liked learning in *HHL*	2	*"It was something to learn about. You learn about yourself and the people around you," female, 13.*
Student liked the live animals	1	*"The part that was fun was being able to see the chicks hatch," female, 13.*
What students did not like		
Some parts of *HHL* were boring	3	*"In the front, the people on some screens are boring," female, 14.*
The activities were too short	1	*"But the part that I didn't really like was how short the activities were," female, 13.*
Student thought that "What statement is this?" could be improved	1	*"The only thing is to maybe improve the three player game," male, 13.*
Student wanted more time in *HHL*	1	*"The only issue was that we didn't have a lot of time to do all that we wanted to see," female, 13.*

Not sure		
It depends on the individual and what interests them	3	*"It really depends on the person because some people may not have been as interested as me," female 13.*

APPENDIX E: ADDITIONAL DATA FOR FINDINGS: HOW ARE VISITORS USING *HHL?*

Table 1: Popularity and average dwell time for all exhibits in *HHL*, T&T observations (*N*=76)

Area	Full name	# of visitors	Average dwell time (mins:sec)
Physical Forces			
	The physical environment changes you	18	01:27.8
	How do your genes help you survive in the sun?	16	01:51.9
	Hypertension	15	00:52.8
	Are your fingers the first to freeze?	23	02:46.9
	How high is your foot arch?	34	02:57.6
	What keeps you awake?	7	03:11.9
	How does light affect our sleep?[19]	4	03:17.2
	Human torso puzzle	6	03:17.1
	Is it hot in here or is it just me?	13	01:19.4
	Transparent woman	21	01:08.3
	Walking in their footsteps (fossil model)	7	00:29.1
Food			
	The food environment changes you	30	01:07.0
	How can food turn your genes on or off?	14	01:14.8
	Type 2 Diabetes	14	01:02.1
	How efficient is your walk?	27	02:50.7
	What food grows from your decisions? (Broccoli side)	15	02:53.7
	What food grows from your decisions? (Rotisserie chicken side)	11	03:21.0
	What makes you hungry?	23	02:44.8
	Nariokotome Boy (skeleton)	16	00:47.7

[19] During data collection, "What keeps you awake?" was occasionally misattributed to this exhibit. Therefore, the data for this exhibit is potentially inaccurate and was not included in the dwell time analysis.

	What revs your metabolic rate?	5	00:37.9
Communities			
	The Social environment changes you	33	01:23.2
	How can a gene mutation be good?	23	01:12.8
	Major Depression	23	01:17.1
	Do you ever forget a face?	22	03:15.4
	How do you relate to your family?	19	01:55.9
	How does your circle of friends change your brain?	14	02:31.1
	Tamarin Monkeys	36	01:33.1
	Do you see what I see?	24	01:05.7
	Human skeleton	13	01:15.4
	What is going on inside your social brain?	25	01:00.0
Organisms			
	The Living environment changes you?	25	01:11.5
	How do your genes help you fight infection?	15	00:51.0
	Antibiotic resistant infection	15	01:09.4
	Do you look scared?	23	02:56.2
	How are you feeling today?	18	01:49.3
	Why is your body overreacting?	21	02:11.9
	Bees	40	02:10.9
	How does disease travel?	17	01:51.9
	Monitoring infectious disease	7	02:05.7
	Why might you suffer seasonally?	24	01:21.5
Time			
	The Time environment changes you	26	01:21.7
	How can your genes reveal more about you?	13	01:00.2
	Cancer	18	02:03.7
	Are you paying attention?	17	04:24.6
	Can you lend an ear?	24	02:21.9

	Is your balance as good as it gets?	22	02:30.0
	Chicks	50	01:48.9
	Are your teeth in transition?	22	00:56.6
	Fetal development	31	01:11.0
	Height chart	42	01:41.5
	How does your body grow?	11	01:59.0
	What do you stem from?	7	00:47.2
Provocative Questions			
	Form Your Opinion	15	03:21.2
	PQ panels	25	01:34.0
	What statement is this?	12	01:59.6
Additional Experiences			
	Exploration Hub	28	04:39.2
	Human Body Theater	18	04:19.7
	Living Laboratory	12	00:53.2
Other			
	Wristband Kiosk	54	00:59.6
	In-between Exhibits	65	04:35.0
	Art and science at the Koch Institute	0	00:00.0
	Postcard Kiosk	9	01:24.5

Table 2: Areas mentioned by visitors in responses to "Which part of *HHL* was most engaging or interesting?"[20] Post-exhibition interview (*N*=71)

Code	# *of visitors*	Area/Definition
Link Stations (*n*=29)		
"How high is your foot?"	8	Physical Forces
"How efficient is your walk?"	7	Food
"Do you ever forget a face?"	3	Communities
"Do you look scared?"	3	Organisms
"Are you paying attention?"	3	Time
"Is your balance as good as it gets?"	3	Time
"How does your circle of friends change your brain?"	1	Communities
"What is going on inside your social brain?"	1	Communities
"What food grows from your decisions?	1	Food
"What makes you hungry?"	1	Food
"Why is your body overreacting?"	1	Organisms
"Are your fingers the first to freeze?"	1	Physical Forces
"How does light affect our sleep?"	1	Physical Forces
Link Stations, general	6	---
Animals (*n*=25)		
Chicks	11	Time
Bees	10	Organisms
Tamarin Monkeys	3	Communities
Animals, general	4	---
Information Walls (*n*=12)		
"The food environment changes you"	3	Introduction wall, Food
DNA walls, general	3	DNA wall, Any

[20] Visitors did not

"How can food turn your genes on or off?"	2	DNA wall, Food
"Cancer"	2	Health condition wall, Time
"The time environment changes you"	2	Introduction wall, Time
"Depression"	1	Health condition wall, Communities
Additional Interactives and other exhibits (*n*=12)		
Height Chart	2	Time
Other interactives	4	Models that light up, general comments about interactives
"Why might you suffer seasonally?"	1	Organisms
"Fetal development"	3	Time
Human skeleton	1	Communities, Tamarin Monkey exhibit
Human torso puzzle	2	Multiple locations, mobile exhibit
Additional experiences (*n*=23)		
Exploration Hub	10	---
HHL Gallery	7	---
Provocative Questions	3	---
Human Body Theater	2	---
Living Laboratory	1	---

Table 3: Visitor responses to "Did you notice any particular way that the exhibit and themes were organized?" Post-exhibition interview (*N*=71)

Exhibition area	# of visitors (*n*=64)	Example quotation
Visitor identified exhibition area		
Food	11	*"The food stuff was with the food stuff," male, 28.*
Organisms	6	*"Microbes around allergies were in a similar scale,"*[21] *female, 37.*
Communities	4	*"Social-emotional [in] one area," female, 44.*
Physical forces	3	*"More walking and feet here, so this is more physical things," female, 21.*
Time	2	*"They were organized by sections…and another part with baby development, and then sectioned off depending on what they were about," female, 15.*
Visitor identified ways *HHL* was organized		
Exhibits were grouped by parts of the body	14	*"Face stuff was over there, foot and walking were here," female, 19.*
Exhibits were grouped by topic but visitor did identify the topics	8	*"Yeah, grouped according to commonalities," female, 67.*
Organized from inside to outside the human body	3	*"They had it in order, so it starts with DNA and shows you the small things and then gets bigger until it's your whole body," female, 11.*
Organized by exhibit typed (Link Stations, videos, etc.)	2	*"A lot of interactives were over there," male, 12.*
Organized by color	2	*"I noticed the different colors," male, 22.*

[21] The Organisms area includes exhibits about allergies ("Why might you suffer seasonally?") and microbial diseases such as flu ("How are you feeling today?") and malaria ("How does disease travel?").

***HHL* was not organized**		
Visitor did not notice how the exhibits were organized	29	*"No," female, 28.*
Visitor specifically stated that *HHL* was not organized	6	*"Not really. Lot of different information. No pattern." female, 38.*
Visitor was confused about the organization	1	*"No, don't think so. Wasn't impressed with that. Why is food there?" male, 70.*

MIDDLE SCHOOL FIELD TRIP, STUDENT ASSIGNMENT

Your assignment for today is to visit at least 3 different link stations from the 5 categories, in your group of 4. Each of the 5 categories have a total of 3 link stations. You should choose a station from 1 category and then move onto another link station in a different category. Repeat this until you have completed 3 link stations from 3 separate categories. You will need to use link up so that when we get back to school we can see your data. You will also be teaching the rest of the class about your category. Take a picture of your group participating in one of the link activities and e-mail it to me.

- Food
- Organisms
- Time
- Communities
- Physical Forces

Fill out the following:

What was your link station called?

What was the number to your link bracelet?

Name 4 facts from your link station.

What are two questions you still having completed your link station?

APPENDIX F: ADDITIONAL DATA FOR FINDINGS: WHAT ARE VISITORS LEARNING FROM *HHL?*

LEARNING GOALS ANALYZED FOR THIS EVALUATION

Knowledge

- Goal A: Visitors will understand that changes in themselves and in the human population can be observed, described, and measured.
- Goal B: Visitors will learn that understanding and utilizing aspects of the scientific method is critical in our understanding human variation and change.
- Goal C: Visitors will learn that human anatomy, human evolution, and our environment are all dynamically interconnected.

Engagement and interest

- Goal D: Visitors will become more interested in learning about their bodies in unique ways that will stimulate interest in their interconnectedness with the environment and the future of our species.

Skills

- Goal E. Visitors will use their own bodies and experiences to observe, describe, and measure changes in themselves and in the human population.

Behavior

- Goal F. Visitors will begin to think critically about health issues, environmental issues, and impacts on both.

MAIN MESSAGES ANALYZED FOR THIS EVALUATION

Main Message

Humans are changing in a changing environment.

Primary Messages

1. My body physically interacts with the rest of the world in surprising ways.
2. My DNA is at the center of all changes in my body.
3. My species, *Homo sapiens*, has evolved and continues to evolve.
4. I can observe, describe, communicate, and measure changes in myself and in the population.

ALL LEARNING GOALS AND MESSAGES

This is the full list of goals as of the *HHL* opening. These goals and messages are organized in the original order determined by the *HHL* development team and may not match with the organization in this report:

1. Visitors will use their own bodies and experiences to observe, describe, and measure changes in themselves and in the human population. [*Skills, Strand 3*]
2. Visitors will understand that changes in themselves and in the human population can be observed, described, and measured. [*Awareness, knowledge, or understanding, Strand 2*]
3. Visitors will learn that understanding and utilizing aspects of the scientific method is critical in our understanding human variation and human change. [*Awareness, knowledge, or understanding, Strand 2*]
4. Visitors will use exhibit-acquired scientific terminology and skills to communicate with each other. [*Skills, Strand 5*]
5. Visitors will learn about human physiology and health issues. [*Awareness, knowledge, or understanding, Strand 2*]
6. Visitors will feel that information about human physiology and health issues is knowable and relevant. [*Identity, Strand 6*]
7. Visitors will recognize the relationship between lifestyle factors and various health outcomes. [*Awareness, knowledge, or understanding, Strand 2*]
8. Visitors will learn that human anatomy, human evolution, and our environment are all dynamically interconnected. [*Awareness, knowledge, or understanding, Strand 2*]
9. Visitors will learn that humans share some control over our health, the state of the environment we live in, and the future of the species. [*Awareness, knowledge, or understanding, Strand 2*]
10. Visitors will learn about genetic mechanisms that are responsible for changes in our physiology, behavior, and health. [*Awareness, knowledge, or understanding, Strand 2*]
11. Visitors will become more interested in learning about their bodies in unique ways that will stimulate interest in their interconnectedness with the environment and the future of our species. [*Engagement and interest, Strand 1*]
12. Visitors will begin to think critically about health issues, environmental issues, and impacts on both. [*Behavior, Strand 6*]

Secondary Messages

1. My body physically interacts with the rest of the world in surprising ways.
   - A. I am a part of the environment and I am affected by it (i.e. the forces that impact me, the foods I eat, living and non-living things inside and around me, experiences with other people, and the passage of time).
   - B. As I live my life, I am creating changes in the rest of the world, which in turn affects my own biology, the biology of other people, and other living things.
   - C. Our technologies are powerful and integrated parts of the world, changing both the environment and us.
   - D. My exposure to the world is not the same as another's exposure to the world.
2. My DNA is at the center of all changes in my body.
   - A. My DNA has been in constant action since the moment I was conceived, affecting all aspects of my life until I die.
   - B. Our DNA is different between us and is different within me from moment to moment.
   - C. Similarities and differences in our bodies and behavior are related to the variability of our DNA.
   - D. Learning about how my DNA works changes my understanding of health and medicine.
3. My species, Homo sapiens, has evolved and continues to evolve.

A. I inherited my DNA from my parents, and if I have children, I will pass along some of my DNA to them.
B. I share ancestry with everyone, even with other living things on the planet.
C. The changes we make in our world today are one of the influences on human evolution.

4. I can observe, describe, communicate, and measure changes in me and in the population.
   A. My own measurements are a part of the *Hall of Human Life*.
   B. New technologies allow us to understand human change and variability.
   C. I can use my personal data to help me understand human change and variability.

ADDITIONAL STUDENT LEARNING GOAL DATA

Table 1: Students who addressed main messages across the entire interview, flash interviews (*N*=24)

Messages	# of students	Explanation	Example quotation
Main message: Human beings are changing in a changing environment.	7	Visitor talked about human change over time or based on environmental factors.	"*Age and gender affects certain things. I didn't know that before. [Things like] reaction time, family relations*," male, 13.
I can observe, describe, communicate, and measure changes in me and the human population.	16	Visitor made comparisons between themselves and the population.	"*"[I] talked about the ear station and talked about how height affects ear size," female, 13.*
My body physically interacts with the rest of the world in surprising ways.	10	Visitor talked about how her or his body interacts with the world.	*"[I was surprised that]I have somewhat good balance*," male, 14.
My DNA is at the center of all changes in my body.	0	Visitor talked about DNA or genetics and its effects on the human body.	N/A
My species, Homo sapiens, has evolved and continues to evolve.	1	Visitor talked about evolution.	*"If you look at the wall, chimpanzees used to have 'handish feet.' Like their feet looked like hands, but humans don't have feet like that anymore," female, 13.*

Table 2: Students who addressed learning goals across the entire interview, flash interviews (*N*=24)

Goals	# of students	Explanation	Example quotation
Knowledge, awareness and understanding			
Goal A. Visitors will understand that changes in themselves and in the human population can be observed, described, and measured.	17	Visitor talked about observing, describing, or measuring change in themselves and others in the exhibit.	*"How you can have an average arch or have a different kind of arch." male, high school.*
Goal B. Visitors will learn that understanding and utilizing aspects of the scientific method is critical in our understanding human variation and change.	7	Visitor talked about looking at data, such as the charts, or making theories and hypotheses.	*"I learned that most people are average in a lot of things like ear size. They eat the same foods and drink the same drink," female 13.*
Goal C. Visitors will learn that human anatomy, human evolution, and our environment are all dynamically interconnected.	4	Visitor talked about the interconnection between human anatomy, human evolution, or the environment.	*"Your age varies different things like your growth. After a certain age, you grow quick. After a certain age, you grow slow," male, 13.*
Engagement and interest			
Goal D. Visitors will become more interested in learning about their bodies in unique ways that will stimulate interest in their interconnectedness with the environment and the future of our species.	1	Visitor mentioned that as a result of their visit, they will do something outside of the Museum related to interconnectedness with the environment, or visitor talked about how choices affect future generations.	*"…how much calories you eat for breakfast. Because I wouldn't have thought that's how much you eat for breakfast for one day, how many calories [that is]," female, 13.*
Skills			
Goal E. Visitors will use their own bodies and experiences to observe, describe, and measure changes in themselves and in the human population.	12	Visitor talked about their exhibit experience and how they observed, described, or measured changes in themselves and in the human population.	*"How your eyes can tell you how you feel and stuff," female, 17.*

Behavior

Goal F. Visitors will begin to think critically about health issues, environmental issues, and impacts on both.	3	Visitor talked about health, environmental issues, or impacts on both.	*"That eating too much food is bad," female, 13.*

APPENDIX G: ADDITIONAL PUBLIC DATA

Data in this appendix are additional information from the post-exhibition survey and online follow-up survey.

POST-EXHIBITION INTERVIEW

Table 1: Visitor response to "When was the last time you visited the Museum, if ever?" Post-exhibition interview (*N*=71)

Time since previous visit	# of visitors
Within the past three months	7
3-6 months	1
6 months to a year	7
1-2 years	15
2- 5 years	10
5-10 years ago	2
More than 10 years ago	4
Never	24
Not sure	1

Table 2: Visitor responses to "Did you notice any changes in *HHL* since your last visit? If so, what?"[22] Post-exhibition interview (*N*=71)

Code		*# of* visitors (*n*=20)
Yes		
	Visitor identified a component, exhibit element, or content that was new; including elements that they did not notice during their previous visit.	4
	There was a different activity or presenter at the Exploration Hub.	4
	Visitor said there was a change in the number of animals or the location of the display.	3
	The *HHL* gallery exhibit changed.	3
	Other comments about changes in *HHL*	4
	The PQ topic changed	2
No		
	Visitor did not notice any change in *HHL* since their last visit.	11

Table 3: Visitor responses to "Why did you decide to visit *the Hall of Human Life* today?" Post-exhibition interview (*N*=71)

Definition	*# of visitors* (*n*=70)
Visitor was passing by and thought *HHL* looked interesting or cool	16
Wanted to see all the exhibits at MOS during visit or had not seen *HHL* on a previous visit	14
Visitor had a specific interest in the topic, as something they were already interested in or as it related to their profession (doctor, nurse, student)	12
Someone else, Museum staff or other group members, suggested *HHL*	11
Visitor thought that *HHL* looked interactive	9
No particular reason, visitor was walking by or stopped in by chance	9
Referred to a previous visit; always stops by *HHL* or wanted to see something they missed during their last visit	9
Was visiting traveling exhibit (Spiders or da Vinci) and *HHL* was nearby.	7
Visited to see the live animals (tamarin monkeys, baby chicks, and bees)	5

[22] This question was asked only if the visitor had visited within the last 2 years (40 groups) and had visited *HHL* on their last visit (23 of 40 groups).

Passing by and *HHL* looked fun	3
Wanted to learn something new	2

Table 4: Visitor responses to "What do you think the Museum wants people to learn from *HHL*?" Post-exhibition interview (*N*=71)

	Definition	*# of visitors* (*n*=69)
Human Life		
	General comments about the human body, how it works, or discussing the body as a whole	33
	Learning about self, either from applying what they read or through Link Stations data	16
	How humans change, from external forces or individual choices	14
	General comments about health, how to be healthy, and specific diseases	13
	What makes people similar or different. Sometimes described within the context of visitors' Link Station data	8
	How to be healthy by learning about food and making decisions about food	3
	Facts about the human mind	2
Other		
	General comments about human life, daily life, or everyday life	11
	How to understand or read data, how to think about opinions or facts	6
	Non-human animals or organisms. Specific mentions of chicks and tamarin monkeys	3
	How humans are connected to everything around them	3
	General comments about science	3
	Other statements that did not fit other codes	9
	I don't know	6

Table 5: Visitor responses to "Did you or your group learn anything new today in *HHL*?" Post-exhibition interview (*N*=71)

Definition	# of visitors (*n*=69)
Visitor learned about themselves or others through comparing data	18
About the human body and how it works	15
About food, diet, or healthy eating	10
About health, diseases, or medicine	8
How genetics work	8
About fetuses and babies	6
Visitor learned something but did not explain what they learned	4
About allergies	3
About other organisms, such as mosquitos	3
About the brain	3
Visitor did not learn anything during their visit	11
Other statements not related to *HHL* or what they learned during their visit	7

Figure 1: Exhibit areas that visitors thought related to their own life, "Did any part of *HHL* relate to your own life?" Post-exhibition interview (*n*=59)

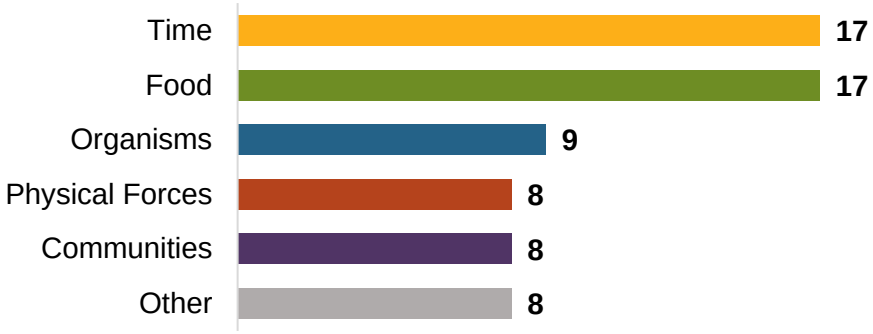


Table 6: Visitor explanations on how they related to *HHL*, in response to "Did any part of *HHL* relate to your own life? How so?" Post-exhibition interview (*N*=71)

Definition	*# of visitors (n=66)*
Through personal health conditions, which they or others close to them have.	12

Visitors made comparisons about themselves with others	12
Food and health decisions	11
Discussion of universal human experiences	8
Relevant to their occupation or field of study	7
General health decisions	3
Made connections to their life at home	3
Discussed current research	2
Learned new information	2
Visitor did not think that *HHL* related to their own life	7
No reason provided	11

Figure 2: Visitor responses to "How valuable was it/would it be to talk to an educator?" Post-exhibition interview (*N*=71)

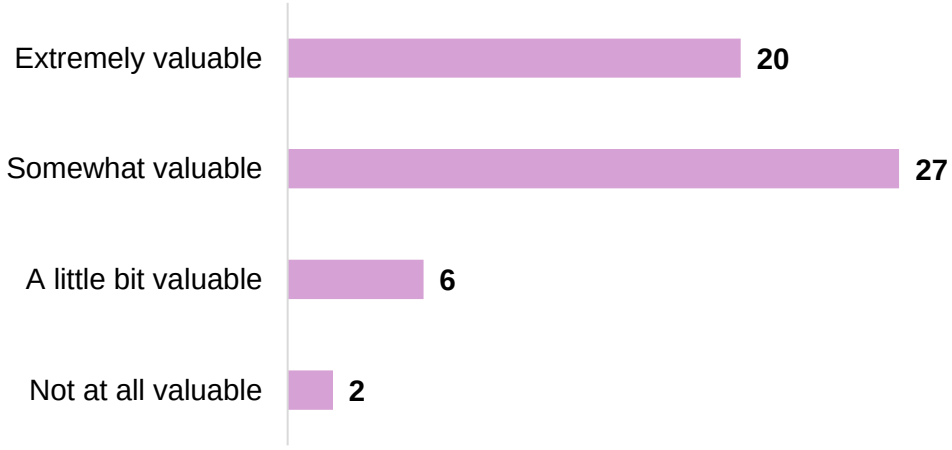


Table 7: Visitor explanations about educator value, in response to "How valuable was it/would it be to talk to an educator? Why?" Post-exhibition interview (*N*=71)

Definition	*# of visitors* (*n*=61)
What makes educators valuable	
Educators provide new information or facts, presented in a teacher-lecture format.	16

	Educators are a resource that can be tapped by asking questions. They can help if you are confused.	12
	Educators help interpret the exhibits, simplify information from labels, clarify information, and give a "human touch."	10
	Visitor complimented a specific activity or educator, but did not elaborate	8
	Visitor thought that educators would be valuable for others, but weren't "for me."	3
	Visitors were already interested in the topic presented by educators.	2
What hinders value		
	HHL has enough information to read or things to do, educators are not needed.	4
	Visitors prefer to learn at their own pace.	3
	Visitor would have liked to talk to an educator but they weren't available or there were too many other people in the exhibit.	2
	Visitor prefers a solitary museum experience.	1
	Educators are valuable only if the visitor has pre-existing interest in the topic.	1
Other		
	Visitor did not talk to an educator or did not have an opinion about educators.	10
	Visitor talked about educators in other parts of the Museum or did not respond to the question.	5

Table 8: Visitor responses to "Could you talk me through what you were thinking about or talking about when you used Link Stations?" Post-exhibition interview (*N*=71)

	Definition	**# of visitors (*n*=52)**
Positive reactions to Link Stations		
	Visitor thought that Link Stations were interesting or cool.	14
	Visitor offered general statements about enjoying Link Stations or wristbands.	10
	Visitor liked that Link Stations were fun, interactive, or hands-on.	8

Connections to Data	
Visitor discuss their data as part of a whole, comparing their results to others.	9
Visitor learned about themselves through Link Station data.	8
Visitor interested in using the *HHL* website to look at their data later.	3
Confusion about Link Stations	
Visitor confused about how the wristbands and scanners worked.	5
Visitor did not understand the activity.	4
Visitor had difficulty using the charts/graphs.	1
Other	
Visitor didn't use any Link Station.	6
"I don't know."	4
Visitor did not address the question.	3

Table 9: Visitor responses to "Could you talk me through what you were thinking about or talking about when you used Link Station charts/graphs?" Post-exhibition interview (*N*=71)

Definition	# of visitor (*n*=38)
Visitor data	
Visitor talked about comparing self to others, comparing data, or interacting with larger Museum data sets.	22
Visitors liked demographic breakdowns in charts and graphs.	4
Visitor learned about themselves, but did not reference comparison to others.	3
Visitor learned about others, but did not reference themselves.	3
Positive reaction to charts/graphs	
Visitor thought that seeing charts or graphs was interesting.	11
Visitor was surprised by their data.	2
Understanding charts/graphs	
Visitors thought the charts/graphs were easy to read or understand	3

	Visitors thought the charts/graphs were difficult to read or understand	3
Other		
	"I don't know."	2
	Responses that did not address the question.	2

None of the visitors from the T&T observations participated in Living Laboratory research. Three visitors stopped in the Living Laboratory space and looked at the pamphlets, videos, or exhibit. These visitors were asked "Could you talk me through what you were thinking about or talking about when you used the Living Laboratory?" during the post-exhibition interview. Their responses follow:

- *"Part where they said stuff about… they were talking about how they were using the samples, testing it for proteins. I didn't understand it fully," female, 10.*
- *"Didn't see the full video. It was about testing kids to see if they were able to stay for two minutes without ringing the bell. Interesting thing to do since kids aren't patient," female, 12.*
- *"Didn't see what it was. The foot information was interesting," male, 22.*

Table 10: Visitor responses to "Was there anything confusing or frustrating?" and "Anything else?"[23] Post-exhibition interview (*N*=71)

Definition	# of visitors (*n*=63)
Exhibit design	
Link Station or exhibits not working or not working as expected.	7
Frustration with crowds, lines, and exhibit layout.	5
Difficulty understanding exhibit content, specific confusion about interpreting charts and graphs.	5
Confusion about the organization about the exhibit- layout did not make sense to visitor.	2
Visitor was not engaged and did not think others would be.	1
Wristbands	
Frustration with functional difficulties using the wristband.	4
Confusion about the purpose of wristbands and how they worked.	3
Confusion about wristband kiosk locations.	3
Other	

[23] Due to overlapping visitor responses these two questions were coded together.

Visitor did not find *HHL* confusing or did not have any additional comments.	42
Visitor liked something in *HHL* or liked the exhibition as a whole.	11
Response not related to *HHL.*	7
Visitor wanted more activities in *HHL* for younger children.	1

PRE- AND POST-EXHIBITION SURVEY

Table 11: Motivations for visitation by group type (*N*=151)

Motivations for visitation	Timing and tracking and/or post-survey (*N*=76)	Pre-survey (*N*=75)	Overall (*N*=151)
To see an exhibit, program, or show other than *Hall of Human Life*	18%	16%	17%
To visit *HHL*	1%	3%	2%
Something to do in poor weather	5%	9%	7%
Had a coupon/free pass	17%	13%	15%
Something to do while visiting Boston	29%	27%	28%
To spend time together as a group/family	53%	49%	51%
For fun/entertainment for myself	28%	32%	30%
To bring out of town friends or family	7%	9%	8%
Educational experiences for group members/ children	20%	25%	23%
Educational experience for myself	16%	16%	16%
For fun/entertainment for group members/children	24%	35%	29%
Other	7%	9%	8%

Table 12: Previous experience with *HHL*, pre-survey (*N*=75)

	# of visitors (*n*=70)
Had never been to *HHL* before	49
Has been to *HHL* in the past	21

Table 13: Confidence responses for discussing the following topics, pre-survey *(N=67)*

	Pre-survey			
	Definitely could not	**Probably could not**	**Probably could**	**Definitely could**
…at least two ways that the human population can be observed, described, and measured.*[24]	4%	4%	51%	40%
…how the environment can change human anatomy.*[25]	1%	7%	43%	48%
…how the scientific method can help us understand human differences and human change.	1%	18%	36%	45%
…how the changing environment leads to changes in the human population over generations.	1%	10%	39%	49%
…how the choices humans make about our bodies lead to changes in the environment.	0%	16%	43%	40%
… how the environment leads to changes in human health and well-being.	1%	9%	37%	51%
…how evolution changes the human body	3%	10%	33%	52%
…how a person's lifestyle can change his/her health.	0%	6%	10%	84%

[24] Pre-group more confident talking about ways the human population can be observed, described, and measured: $\chi 2(1, n=127)=5.90$, Fisher's Exact 2-tailed p=.018

[25] Pre-group more confident talking about how the environment can change human anatomy: $\chi 2(1, n=127)=5.90$, Fisher's Exact 2-tailed p=.018

Table 14: Confidence responses for discussing the following topics, post-survey, (*N*=60)

	Post-survey			
	Definitely could not	**Probably could not**	**Probably could**	**Definitely could**
…at least two ways that the human population can be observed, described, and measured.	3%	22%	52%	23%
…how the environment can change human anatomy.	7%	18%	45%	30%
…how the scientific method can help us understand human differences and human change.	2%	27%	40%	32%
…how the changing environment leads to changes in the human population over generations.	5%	13%	48%	32%
…how the choices humans make about our bodies lead to changes in the environment.	5%	13%	50%	32%
… how the environment leads to changes in human health and well-being.	3%	13%	35%	47%
…how evolution changes the human body	7%	17%	37%	40%
…how a person's lifestyle can change his/her health.	5%	7%	20%	68%

APPENDIX H: ADDITIONAL STUDENT DATA

This appendixes contain quantitative counts and coded response counts for data not discussed in this report. This additional data comes from the student flash interview and the student follow-up survey.

Table 1: Student responses to "If you had to pick one part of the exhibit, which part of *HHL* was most engaging or interesting for you? Why?" flash interviews, (*N*=24)

Specific exhibit	**# of students**
"What makes you hungry?"	6
Live animals	3
"How high is your foot arch?"	4
"How efficient is your walk?"	2
"What is going on inside your social brain?"	2
Exploration Hub	2
"What influences your food decisions?"	1
"Are your fingers the first to freeze?"	1
"Is your balance as good as it gets?"	1
"Are you paying attention?"	1
"Do you ever forget a face?"	1
"How are you feeling today?"	1
"How does your body grow?"	1
"Transparent woman"	1
Other	1
Reason why	
Student learned about…	
…themselves	6
…about a specific topic	4
…others	1
Student had fun at the exhibit	7
No reason	7
Other	4

Table 2: Student responses to "Did you interact with an educator in a red lab coat today? If so, where?" flash interviews, (*N*=24)

Response	# of students (*n*=23)
Yes	10
No	13
Location of interaction	
Exploration Hub	9
Can you lend an ear?	1

Table 3: Student responses to "What were you thinking about or talking about when you interacted with the educator?" Flash interview (*N*=24)

Topic	# of students	Examples
Thinking about the Exploration Hub activity on taste.	3	*"Joined in late. They were talking about taste, bitter and sweet stuff," female, 14.*
Student was thinking about their reaction to the taste activity	7	*"I tried it. I had it strong! I had the gene," male, 13.*
Student thought about their genetics and how it related to the taste activity.	1	*"I tried it. It shows how different people have different genes. One friend could taste it and one friend didn't taste it," female, 13.*
General interest	3	*"Didn't taste it, but it was cool. The coolest part was people's reactions," female, 14.*
Other	2	*"I didn't try it. I didn't see most of it because I was sitting down," male, 13.*

Table 4: Student responses to "What were you thinking about or talking about when you were using the Link Stations?" Flash interview (*N*=24)

Topic	# of students (*n*=23)
Student learned about themselves	6
Student had general interest in the Link Stations	4
Student describes their Link Station experience	6
How the exhibits function mechanically	4
Student learned about others	3
Student compared data sets	3
Other	5
Nothing	2

Table 5: Student responses to "Have you thought about or talked about anything related to *HHL* since your field trip? If so, what was it? Who did you talk with about it?" Follow-up student survey (*N*=26)

Definition	# of students (*n*=21)
Students talked about *HHL* with…	
Teacher	5
Family	4
Classmates	3
Friend	3
Did not specify	3
Students talked about…	
How much fun they had	5
Their whole visit	5
Link Stations or Activities they did in *HHL*	4
What they learned in *HHL*	3

Wanting to visit *HHL* again	2
Wristbands and data	2

Figure 1: Student responses to "Did any part of *HHL* make you think about something in your own life?" Follow-up student survey (*N*=26)

Figure 2: Student responses to "Did you use the website mos.org/*HHL* after your field trip?" Follow-up student survey (*N*=26)

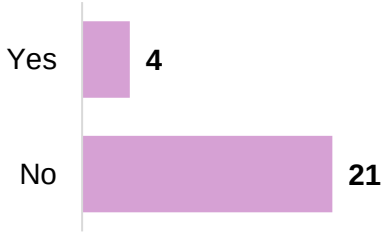


Table 6: Student responses to "Is there anything else you'd like to add or want us to know? You can write about *HHL* or any part of your visit to the MOS.*"* Follow-up student survey (*N*=26)

Definition	*# of students* (*n*=17)
Students enjoyed the Museum	5
Students made a suggestion about the Museum	3
Students enjoyed that the Museum was interactive	2
Students enjoyed the wristbands in *HHL*	2
Student had a question about an exhibit in *HHL*	1

Table 7: Student responses to, "How do you think the human body, environment, and evolution may influence each other?" Follow-up student survey (*N*=26)

Connection	# of students (*n*=21)
Anatomy impacts environment	13
Environment impacts anatomy	13
Environment impacts evolution	5
Evolution impacts anatomy	9

Table 8: Number of students who said they probably or definitely could discuss the following topics, follow-up survey, (*n*=25)

	Definitely could not	Probably could not	Probably could	Definitely Could
…at least two ways that the human population can be observed, described, and measured.	2	8	13	2
…how the environment can change human anatomy.	1	5	14	5
…how the scientific method can help us understand human differences and human change.	5	7	9	4

…how the changing environment leads to changes in the human population over generations.	3	5	10	7
…how the choices humans make about our bodies lead to changes in the environment.	3	5	9	8
… how the environment leads to changes in human health and well-being.	2	4	8	10
…how evolution changes the human body	4	5	9	7
…how a person's lifestyle can change his/her health.	1	1	11	12

ADDITIONAL WEBSITE DATA

Table 9: Responses to "Did you visit *Hall of Human Life* on your visit to the Museum?" Follow-up survey, (*N*=30)

Reason	# of visitors
Yes	29
No	1

Table 10: Responses to "Did you use the Link Stations and/or wristbands in *Hall of Human Life*?" Follow-up survey, (*N*=30)

Reason	# of visitors *(n=29)*
Yes	23
No	6

Figure 3: Visitor responses to the question, "After your visit, did you visit the website www.mos.org/hhl to look up your Link Station wristband data" (N=28)

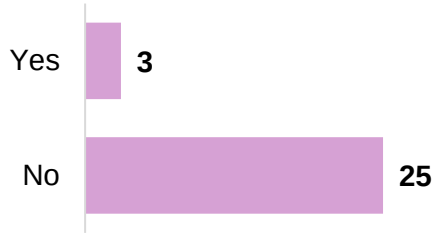


Table 11: Visitor responses to the question "What did you think about the *Hall of Human Life* Link Station website? (choose up to two words)" Follow-up survey, (*n*=28)

Word chosen to describe website if visited	# of visitors
Easy to understand	3
Fun	1
Informative	1
Over-simplified	1

Table 12: Responses to "Why did you not visit the Link Station website?" Follow-up survey, (*n*=23)

Reason	# of visitors	Example responses
Did not know about the website	6	*"Didn't know we could."*
Forgot to use the website	7	*"I forgot that I could"*
Did not have time	4	*"No time, but plan on it soon."*
Did not use a Link Station	2	*"I did not visit the website because I did not use the Link Station wristbands. …During my visit, every time I went to use a Link Station to obtain a wristband, there were too many people/kids either using or fiddling with the machines. As it is frustrating and boring to me to have to wait so long, especially when my time was limited, I finally just gave up on the whole wristband idea."*
No interest	2	*"Not interested."*
Other	2	*"I thought it [the Link Stations] was just for people who were with another person or a group, and I visited by myself."*

Figure 4: Responses to "Since your visit to the Museum, have you thought about or talked about anything you saw in *Hall of Human Life*? (*n*=28)

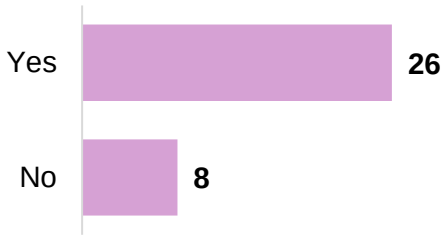


Table 13: Responses to "What did you think about or talk about?" Follow-up survey, (*n*=24)

Reason	# of visitors	Example responses
Visitor spoke or thought about exhibit content.	7	*"I have thought more about human anatomy."*
Visitor spoke or thought about their experience at a specific exhibit.	7	*"After seeing the baby chicks being hatched, it prompted me to explore vegetarianism which I've being following since I visited the museum."*

Visitor expressed general interest in the exhibition.	5	*"How much fun it was to start and finish it. It was interesting, engaging, and I learned things while having fun."*

Table 14: Visitor responses to the questions, "What did you think about your Link Station and wristband experience?" and example quotations for "Why did you choose [word] to describe your Link Station and wristband experience?" (*N*=30)

Word chosen	# of visitors (*n*=21)	Reason why
Interactive	11	*"Good to have the connection between individual/personal data and those from the other visitors. Helps contextualize the experience."* *"Because it is about the person and it's interesting to see how different everyone's outcomes are/were."*
Fun	8	*"Motivating experience to explore. The concept of individualizing the components adds to the experience by allowing children/adults to apply information to themselves."*
Informative	5	*"It helps to link you into understanding the scientific method*
Easy to understand	5	*"Could follow the directions without any problems* *It is easy for anyone to understand how to use the wristband."*
Disappointing	2	*"I'm not sure how I benefit from using it. Clearly, the museum is using it to collect data somehow. If we were locals, maybe this would be more interesting."*
Not educational	1	*"With the wristband, one can "collect" the stations. That is all my kids are interested in. I like seeing the spread of other responses, but I would prefer to see expected data from a larger sampling."*
Drab	1	*See footnote for full quotation.* [26]
Other	3	*"Hard for left handed people to scan their bracelets."*

[26] "Understanding how expensive it can be to get technology right, I'd have to say that the wristband and displays are okay - on a museum budget, maybe. That said, the red wristband does not communicate "life" or "health" to me but "first aid". It looks more like something you wear to indicate to security that you paid your fee at the gate and are allowed into a venue. Green might be a better choice or a bright blue. Overall, the Link Station experience could be friendlier. The laser scanners could be tied to a motion detector so that they're not always on. They look a bit suspicious to me. The button-interfaces look very 1980s and there's no reason why those controls couldn't be built in more into a touch-screen interface. It might be cheaper. The end-to-end experience is not communicated well at all to the visitors. Picking up a wristband, understanding what you're supposed to do with the stations, and there was no way to finish. A "receiving" station at the end (which might be there - I didn't see it) which summarizes the stations and gives a profile would be interesting. Even a pathway on the floor which directs people to groups of stations organized by area to give a sense of flow or story would help."

APPENDIX I: *HHL* EXHIBIT LIST

Exhibit Name	Exhibit type
Physical Forces	
The physical environment changes you	Introduction wall
How do your genes help you survive in the sun?	DNA wall
Hypertension	Health Condition wall
Are your fingers the first to freeze?	Link Station
How high is your foot arch?	Link Station
What keeps you awake?	Link Station
How does light affect our sleep?	Additional Interactive
Human torso puzzle[27]	Additional Interactive
Is it hot in here or is it just me?	Additional Interactive
Transparent woman	Additional Interactive
Walking in their footsteps	Additional Interactive
Food	
The food environment changes you	Introduction wall
How can food turn your genes on or off?	DNA wall
Type 2 Diabetes	Health Condition wall
How efficient is your walk?	Link Station
What food grows from your decisions?	Link Station
What makes you hungry?	Link Station
Nariokotome Boy	Additional Interactive
What revs your metabolic rate?	Additional Interactive
Communities	
The social environment changes you	Introduction wall
How can a gene mutation be good?	DNA wall
Major Depression	Health Condition wall

[27] The human torso puzzle changes locations periodically, it was in front of the Exploration Hub for the duration of this evaluation.

Do you ever forget a face?	Link Station
How do you relate to your family?	Link Station
How does your circle of friends change your brain?	Link Station
Cotton-Top Tamarins	Live Animal
Do you see what I see?	Additional Interactive
Human skeletons	Additional Interactive
What is going on inside your social brain?	Additional Interactive
Organisms	
The living environment changes you	Introduction wall
How do your genes help you fight infection?	DNA wall
Antibiotic-resistant infection	Health Condition wall
Do you look scared?	Link Station
How are you feeling today?	Link Station
Why is your body overreacting?	Link Station
Honey bees	Live Animal
How does disease travel?	Additional Interactive
Monitoring infectious diseases	Additional Interactive
Why might you suffer seasonally?	Additional Interactive
Time	
The time environment changes you	Introduction wall
How can your genes reveal more about you?	DNA wall
Cancer	Health Condition wall
Are you paying attention?	Link Station
Can you lend an ear?	Link Station
Is your balance as good as it gets?	Link Station
Chicks	Live Animal
Are your teeth in transition?	Additional Interactive
Fetal development	Additional Interactive
Height chart	Additional Interactive
How did your body grow?	Additional Interactive

What do you stem from?	Additional Interactive
Provocative Questions	
Form your opinion: discuss with a partner	
PQ panels	
Break it down	
Additional Experiences	
Human Body Theater	
Art and science at the Koch Institute	
Living Laboratory	
Exploration Hub	
Other	
Postcard Kiosk	
Wristband Kiosk	