

The Science Museum of Minnesota
***Cell Lab* Summative Evaluation**

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ACKNOWLEDGMENTS

Randi Korn & Associates, Inc., would like to thank the Science Museum of Minnesota staff for their assistance with the logistics of the evaluation. RK&A would also like to acknowledge Merhawit Kubrom and Katharyn McClenachan for their assistance collecting data.

EXECUTIVE SUMMARY

Methodology

RK&A conducted 56 timing and tracking observations of visitors, 20 exit interviews with visitors, an interview with the *Cell Lab* Program Manager, and interviews with 13 Lab Crew in the summer and fall of 2003.

Visitor Timing and Tracking Observations

- No gender bias: an equal number of males and females were observed in the *Cell Lab*.
- Appeals to a teen audience: nearly one-quarter of visitors were between 12 to 15 years of age, unlike other science exhibitions.
- Appeals to a family audience: 57 percent of visitors were visiting the *Cell Lab* as families.
- Visitors spent a median of 14 minutes at *Cell Lab* benches and 2 minutes at the cell exhibits.
- Visitors were actively engaged in the *Cell Lab*: 54 percent did activities, 54 percent talked about exhibit content, 52 percent looked at specimens, 52 percent read exhibit text, 50 percent watched other visitors do activities, and 36 percent coached/were coached by others at activities.
- Misuse/difficulty using exhibits was observed infrequently (16 percent).
- At five of the seven lab benches, visitors spent a median of 12 minutes or longer.

Visitor Exit Interviews

- *Cell Lab* interviewees tended to be repeat visitors who frequently visit the Museum (3 or more times in the past six months).
- Doing experiments at the lab benches and using microscopes appealed to many interviewees.
- Most interviewees said studying their own bodies (e.g., saliva, cheek cells) and learning something new were highlights of the exhibition.
- Many described the *Cell Lab* as more interactive and interesting than other exhibits in the Museum.
- Overall, interviewees gleaned the intended message—that science is approachable—and learned specific facts about topics discussed at lab benches.
- Most interviewees grasped the connection between the *Cell Lab*, *Tissues of Life*, and the rest of the Human Body Gallery.

Lab Crew Interviews

Current and past participants were extremely positive about their experiences in the Lab Crew. Interestingly, the program worked well for the dichotomy of students it serves—at-risk youth and high achiever teens seeking science enrichment. The personal relationships Lab Crew develop with each other and Museum staff are key to its success.

DISCUSSION

The *Cell Lab* succeeded in engaging visitors in enjoyable and educational activities. It also excelled in providing Lab Crew teens with valuable employment and life experiences.

The concept and design of the *Cell Lab*—its level of interactivity, staffing, and resource allocation—offers visitors a unique experience. In some ways, the SMM was taking a risk by offering in-depth experiences with hands-on biology wet labs. But with the Museum’s careful planning, involvement of and management by real scientists, commitment to trained youth staff, and use of evaluation, the *Cell Lab* has realized its vision. The *Cell Lab* has demonstrated that it is not only possible to provide visitors with real science experiences but it is also rewarding from both an institutional standpoint—in satisfying visitors and encouraging repeat visitation—and from a societal one—in developing teens’ potential in the Lab Crew. The SMM should be commended for developing such a unique and effective exhibition.

As the *Cell Lab* continues to provide high quality experiences for visitors and Lab Crew, SMM staff may want to consider:

- The *Cell Lab* appeals to a teen audience. Are there ways to provide career information or advice about how to craft a science major through programs or media?
- Adults without children were the least represented audience. While this is a small audience for the Museum, are there ways to make the *Cell Lab* appearance more adult-friendly? Can partnerships with continuing education institutions be forged to use the lab during slow visitation times?
- The *Cell Lab* attracts repeat visitors. The membership department may want to create an incentive related to the *Cell Lab* or at least market it as a key reason for revisiting.
- The teens in Lab Crew are essential to running the lab and providing interpretation for visitors. They help create a welcoming environment and demonstrate to adults and children the approachability of science. Their presence is vital to the *Cell Lab*’s continued success.
- Dr. Fruehling’s plans to involve Lab Crew in scientific research will provide an excellent avenue for further developing their scientific skills. It will also offer a programmatic way to present current science to visitors. Enabling her to concentrate on science projects and develop the talents of the teens should be high priority. Infrastructure such as providing her with an assistant to deal with the *Cell Lab*’s daily management should be maintained.
- One of the most unique aspects of the *Cell Lab* is that it includes a high-level, working lab and engages visitors in using real, scientific tools. Resources need to be set aside to update the *Cell Lab* as technologies and scientific knowledge change.

INTRODUCTION

This report presents the findings of a summative evaluation of the *Cell Lab*, conducted by Randi Korn & Associates, Inc. (RK&A), for the Science Museum of Minnesota (SMM), in Saint Paul, MN. The *Cell Lab* is an exhibition in the Human Body Gallery at the SMM and was funded by the National Science Foundation.

Data collection took place July through October 2003. The evaluation documents the scope of the impact and effectiveness of the *Cell Lab* and its Lab Crew (a youth training and employment program). The evaluation's specific objectives were to determine:

- How much time visitors spend in the exhibition;
- How much time visitors spend at individual exhibits;
- The exhibits at which visitors stop;
- The frequency of select behaviors;
- Visitors' responses to and understanding of the *Cell Lab* exhibition;
- Perceived connections between the *Cell Lab*, *Tissues of Life* (an adjacent and content-related exhibition), and the other exhibits in the Human Body Gallery;
- How the *Cell Lab* compared to other exhibitions at the SMM;
- Suggestions to improve the *Cell Lab* exhibition and the Lab Crew program;
- What were the *Cell Lab* Program Manager's experiences training and supervising the Lab Crew;
- What were the *Cell Lab* Program Manager's and participants' opinions about the program's most and least successful aspects;
- What were the Lab Crew participants' reasons for applying to work in the *Cell Lab*;
- Experiences Lab Crew had working in the *Cell Lab*; and
- Impact of the Lab Crew program on participants' current and future plans.

METHODOLOGY

Two data collection strategies were employed to assess visitors' experiences in the *Cell Lab*: timing and tracking observations and uncued exit interviews. Additionally, to understand the Lab Crew's experiences working in the *Cell Lab*, RK&A conducted face-to-face and telephone interviews with past and present participants.

Timing and Tracking Observations

Visitors are often observed to provide an objective and quantitative account of how they behave and react to exhibition components. Observational data indicate how much time visitors spend in an exhibition and suggest the range of visitor behaviors.

All visitors nine years of age and older were eligible to be unobtrusively observed in the exhibition. RK&A selected visitors using a continuous random sampling method. In accordance with this method, the observer was stationed at the entrance of the exhibition, and the first eligible visitor to enter was observed. The observer followed the selected visitor through the

exhibition, recording the exhibits used, select behaviors, and total time spent in the exhibition (see Appendix A for the observation form). Upon the completion of a visit, the observer returned to the entrance to await the next eligible visitor to enter the exhibition.

Exit Interviews

Open-ended interviews encourage and motivate interviewees to describe their experiences, express their opinions and feelings, and share with the interviewer the meaning they constructed from an experience. Open-ended interviews produce data rich in information because interviewees talk about their experiences from a personal perspective.

Upon exiting the exhibition, visitors nine years of age and older were eligible to be selected (following a continuous random sampling method, as described above) to answer several questions about their experiences (see Appendix B for the exit interview guide). The interview guide was intentionally open-ended to allow interviewees the freedom to discuss what they felt was meaningful. Interviews were tape-recorded with participants' permission and transcribed to facilitate analysis.

Lab Crew Program Interviews

RK&A conducted Open-ended interviews with the *Cell Lab* Program Manager and current and past Lab Crew members to understand their experiences working in the *Cell Lab*. The *Cell Lab* Program Manager was interviewed at the SMM, and SMM staff provided RK&A with the names and telephone numbers of current and past Lab Crew members. RK&A interviewed one-half of the Lab Crew interviewees face-to-face at the SMM, and one-half over the telephone.

Again, the interview guides were open-ended to encourage the *Cell Lab* Program Manager and Lab Crew interviewees to talk about their personal experiences (see Appendix C and D for the Lab Crew Program interview guides). Interviews were tape-recorded with participants' permission and transcribed to facilitate analysis.

DATA ANALYSIS

Quantitative Analysis

The quantitative observational data were entered into a computer to be analyzed statistically using SPSS/PC+, a statistical package for personal computers. Frequency distributions were calculated for all categorical variables (e.g., gender, age group). Summary statistics, including the mean (average), median (data point at which half the responses fall above and half fall below), and standard deviation (spread of scores: “±” in tables), were calculated for the time data.¹

¹ For the most part, medians rather than means are reported in this document because, typically, the number of components used and the time spent by visitors were distributed unevenly across the range. For example, whereas most visitors spent a relatively brief amount of time with exhibition components, a few visitors spent an unusually long time. When a distribution of scores is extremely asymmetrical (i.e., “lopsided”), the *mean* is strongly affected

Qualitative Analysis

Visitors and Lab Crews' responses to interview questions were analyzed qualitatively, meaning that the evaluator studied the data for meaningful patterns. As patterns and trends emerged, similar responses or behaviors were grouped together. Each group was then assigned a name or category to convey the meaning the data embody and quotations illustrate interviewees' thoughts and ideas as fully as possible.

METHOD OF REPORTING

This report presents both quantitative and qualitative data. Tables and graphs are used to display the quantitative information. Percentages within tables may not always equal 100 owing to rounding. The findings within each topic are presented in descending order, starting with the most frequently occurring.

The qualitative interview data are presented in narrative. Interviewees' verbatim quotations (edited for clarity) are included for the exit and telephone interviews. Within quotations, an asterisk (*) signifies the start of a different speaker's comments. The interviewer's remarks appear in parentheses. Trends and themes in the stationed observation and interview data are also presented from most to least frequently occurring.

Findings in each report are presented in three main sections:

- I. Visitor Timing and Tracking Observations
- II. Visitor Exit Interviews
- III. Lab Crew Interviews

by the extreme scores and, consequently, falls further away from the distribution's central area. In such cases, the *median* is the preferred measurement because it is not sensitive to the values of scores above and below it—only to the number of such scores.

I. PRINCIPAL FINDINGS: VISITOR TIMING AND TRACKING OBSERVATIONS

The observer timed and tracked visitors in *Tissues of Life* and the *Cell Lab*² for 10 days in July 2003, observing 100 drop-in visitors, ages nine years and older.³ Of 100 visitors observed, 52 percent visited both *Tissues of Life* and the *Cell Lab*, 44 percent visited only *Tissues of Life*, and 4 percent visited only the *Cell Lab* (see Table 1).

Table 1
Exhibitions Visited
(n = 100)

Exhibition	Total %
Both <i>Tissues of Life</i> and <i>Cell Lab</i>	52.0
<i>Tissues of Life</i> only	44.0
<i>Cell Lab</i> only	4.0

This report presents data for the 56 visitors who visited the *Cell Lab*. A separate report for National Institutes of Health was prepared for *Tissues of Life*.

² The *Cell Lab* includes all the cell biology exhibits and benches in the Human Body Gallery.

³ The observations of the two exhibitions were combined for two main reasons: (1) to account for the close proximity of *Tissues of Life* and the *Cell Lab* and (2) to accurately reflect visitors' experiences—in which they tend to ignore the boundaries between related exhibitions.

DATA COLLECTION CONDITIONS

The majority of observations were conducted on weekday afternoons when few visitors were present (see Table 2).

Table 2
Data Collection Conditions
(n = 56)

Condition	<i>Cell Lab</i> %
Day	
Weekday	55.4
Weekend day	44.6
Time of Day	
PM	76.8
AM	23.2
Crowd Level	
Few	60.7
Moderate	39.3
Crowded	0.0

As shown in Table 3, more than two-thirds of visitors entered near the Body Slices/Introduction to Tissues (70 percent). Less than one-third of visitors entered near the Body Hotel/Perception Theater (30 percent).

Table 3
Visitor Start Location
(n = 56)

Location	<i>Cell Lab</i> %
Near Body Slices/Introduction to Tissues	69.6
Near Body Hotel/Perception Theater	30.4

Upon exiting the *Cell Lab*, nearly three-quarters of visitors went to *Tissues of Life* (73 percent) (see Table 4). About 20 percent left the Human Body Gallery.

Table 4
Where Visitors Went After Leaving *Cell Lab*
(*n* = 56)

Location	<i>Cell Lab</i> %
<i>Tissues of Life</i>	73.2
Leaves Human Body Gallery	19.6
Other part of Human Body Gallery	7.1
Perception Theater	0.0

VISITOR DEMOGRAPHICS

As indicated in Table 5, one-half of visitors were female and one-half were male (50 percent each). More than one-third of visitors were between 25 and 44 years of age (36 percent).

Table 5
Visitor Demographics
(n = 56)

Characteristic	<i>Cell Lab</i> %
Gender	
Female	50.0
Male	50.0
Age Group	
9 to 11	14.3
12 to 15	23.2
16 to 24	3.6
25 to 44	35.7
45 to 64	10.7
65 years or older	12.5

The majority of visitors were visiting the exhibition in groups of both adults and children (57 percent) (see Table 6).

Table 6
Group Composition of Visitors
(n = 56)

Group Composition	<i>Cell Lab</i> %
Multigenerational group	57.1
Adult only groups	19.6
Alone	7.1
Children only groups	16.1

OVERALL VISITATION PATTERNS

Total Time Spent in the Cell Lab

Total Time Spent at Lab Benches

As shown in Table 7, visitors spent a median of 14 minutes at lab benches.

Table 7
Total Time Spent at Lab Benches
(n = 16)

Median	Minimum	Maximum	Mean	±
14 minutes, 9 seconds	54 seconds	42 minutes, 57 seconds	16 minutes, 11 seconds	9 minutes, 23 seconds

Total Time Spent at Cells Exhibits

As shown in Table 8, visitors spent a median of about 2 minutes at cell exhibits.

Table 8
Total Time Spent at Cells Exhibits
(n = 50)

Median	Minimum	Maximum	Mean	±
1 minute, 30 seconds	12 seconds	8 minutes, 17 seconds	2 minutes, 1 seconds	1 minute, 51 seconds

Total Number of Exhibits Stopped At

The *Cell Lab* included seven lab benches and five cells exhibits at which visitors could stop. **For this evaluation, a “stop” was defined as a visitor standing for three seconds or longer in front of a component. If a visitor returned to a component at which s/he had previously stopped, this return was not counted as an additional stop, but the amount of time spent was included in the total time spent at the component.**

Total Stops at Lab Benches

As presented in Table 9, visitors stopped at between 1 and 3 lab benches. They stopped at a median of 1 lab bench.

Table 9
Total Stops at Lab Benches
(n = 16)

Median	Minimum	Maximum	Mean	±
1.0	1.0	3.0	1.2	0.5

Total Stops at Cells Exhibits

As presented in Table 10, visitors stopped at between 1 and 6 cells exhibits. They stopped at a median of 1 cells exhibit.

Table 10
Total Stops at Cells Exhibits
(n = 50)

Median	Minimum	Maximum	Mean	±
1.0	1.0	6.0	2.0	1.2

OVERALL BEHAVIOR PATTERNS

The most commonly observed behaviors were doing activities and talking about exhibit content (each 54 percent) (see Table 11). Looking at specimens, reading exhibit text, and watching others do activities were also frequently observed (52 percent, 52 percent, and 50 percent, respectively).

Misuse or difficulty using exhibit activities was the least frequently observed behavior (18 percent).

Table 11
Behaviors Observed in the *Cell Lab*
(*n* = 56)

Behavior	<i>Cell Lab</i> %
Do activity	53.6
Talk about content	53.6
Look at specimens	51.8
Read	51.8
Watch	50.0
Coached/Be coached	35.7
Staff interaction	25.0
Misuse/difficulty using	16.1

VISITATION OF INDIVIDUAL EXHIBITS

Time Spent at Each Exhibit

As shown in Table 12, visitors spent the most time at the Cheek Cell bench (median time of 16 minutes, 47 seconds). Visitors spent a median time of more than 12 minutes at the DNA Extraction, Enzymes in Saliva, and Anti-microbial Agents benches.

Visitors spent the least time at Information about Cells multimedia (median time of 27 seconds) and Digestion in Cells microscope specimen (median time of 22 seconds).

Table 12
Median Time Visitors Spent at Each *Cell Lab* Exhibit
(n = 56)

Exhibit Name	Number of Visitors who Stopped	Median Time (Seconds)
Cheek Cell bench	4	1007.5
DNA Extraction bench	6	849.5
Enzymes in Saliva bench	4	807.0
Anti-microbial Agents bench	3	792.0
Giant Chromosomes bench	2	637.0
Protozoa microscope specimen	13	63.0
Model of a Cell physical interactive	25	58.0
Good Cell, Bad Cell microscope specimen	14	35.0
How to Use a Microscope bench	16	34.5
Information about Cells multimedia	14	27.0
Digestion in Cells microscope specimen	16	22.0
Mystery Microbes bench	0	0.0

Stops Made at Each Exhibit

Visitors could stop at 12 exhibits.⁴ As shown in Table 13, the most visitors stopped at the Model of a Cell, followed by Digestion in Cells and How to Use a Microscope (45 percent, 29 percent, and 29 percent, respectively).

The fewest visitors stopped at the Giant Chromosomes bench (4 percent) and no visitors stopped at the Mystery Microbes bench.

Table 13
Percentage of Visitors that Stopped at Each *Cell Lab* Exhibit
(*n* = 56)

Exhibit Name	% Stopped
Model of a Cell physical interactive	44.6
Digestion in Cells microscope specimen	28.6
How to Use a Microscope bench	28.6
Good Cell, Bad Cell microscope specimen	25.0
Information about Cells multimedia	25.0
Protozoa microscope specimen	23.2
DNA Extraction bench	10.7
Cheek Cell bench	7.1
Enzymes in Saliva bench	7.1
Anti-microbial Agents bench	5.4
Giant Chromosomes bench	3.6
Mystery Microbes bench	0.0

⁴ For this evaluation, a “stop” was defined as a visitor standing for three seconds or longer in front of an exhibit.

Behaviors at Each Exhibit

Behaviors at Interactive and Multimedia

The observer noted seven behaviors at interactive and multimedia exhibits: doing the activity, watching others do the activity, coaching or being coached at the activity, reading, talking about exhibit content, interacting with staff, and misusing or having difficulty using the activity (see Table 14).

More than one-half of visitors who stopped at the Model of a Cell did the activity and watched others do the activity (numbers highlighted in table). More than one-half of visitors who stopped at Information about Cells did the activity—that is, used the computer.

Table 14
Behaviors Observed at Each Interactive and Multimedia Exhibit

Exhibit	Number of Visitors who Stopped	Number of Visitors who Displayed Each Behavior						
		Do	Watch	Coach	Read	Talk	Staff	Misuse
Model of a Cell physical interactive	25	13	15	8	8	13	0	1
Information about Cells multimedia	14	10	6	1	4	1	0	5

Bench Exhibits

The observer noted eight behaviors at benches: doing the activity, watching others do the activity, coaching or being coached at the activity, reading, talking about exhibit content, interacting with staff, misusing or having difficulty using the activity, and completing the activity (see Table 15).

How to Use a Microscope was located outside the *Cell Lab* and visitors used it in a different way than they used the benches inside the *Cell Lab*. Few visitors who stopped at How to Use a Microscope used the lab companion and followed along with the proscribed activity—rather, more than one-half (11 visitors) simply looked at specimens (see Table 15 footnote). One-half (8 visitors) also discussed exhibit content (see highlighted numbers in Table 15).

Few visitors stopped at the benches inside the *Cell Lab*. However, those who did displayed many behaviors. All or nearly all of the visitors who stopped at DNA Extraction, Enzymes in Saliva, Check Cell, Anti-microbial Agents, and Giant Chromosomes did the activity, watched others do the activity, coached or were coached, read lab companion text, talked about bench content, and completed the activity (see highlighted numbers in Table 15).

No visitors stopped at Mystery Microbes during the observations, so no behaviors were recorded for this bench.

Table 15
Behaviors Observed at Each Bench Exhibit

Exhibit	Number of Visitors that Stopped	Number of Visitors that Displayed Each Behavior							
		Do	Watch	Coach	Read	Talk	Staff	Misuse	Complete
How to Use a Microscope bench*	16	2	7	3	5	8	0	1	2
DNA Extraction bench	6	4	3	5	4	4	5	0	4
Enzymes in Saliva bench	4	4	2	3	2	4	4	0	2
Cheek Cell bench	4	3	3	4	3	4	4	0	4
Anti-microbial Agents bench	3	2	2	2	2	2	2	0	2
Giant Chromosomes bench	2	2	2	2	2	2	2	0	2
Mystery Microbes bench	0	0	0	0	0	0	0	0	0

*How to Use a Microscope bench was outside the *Cell Lab*. Visitors tended to use it as a microscope station, and 11 of the 16 visitors just looked at specimens.

Specimen Exhibits

The observer noted five behaviors at exhibits with specimens: looking at specimens, looking at cards, reading, talking about content, and misusing or having difficulty using the activity (see Table 16).

More than one-half of visitors who stopped at Protozoa microscope looked at the specimens and talked about content (see highlighted numbers in Table 16). Almost all visitors who stopped at Digestion in Cells and Good Cell, Bad Cell looked at specimens.

Table 16
Behaviors Observed at Each Specimen Exhibit

Exhibit	Number of Visitors who Stopped	Number of Visitors Displaying Each Behavior				
		Look	Use Card	Read	Talk	Misuse
Protozoa microscope specimen	13	13	3	6	8	0
Digestion in Cells microscope specimen	16	16	2	3	4	0
Good Cell, Bad Cell microscope specimen	14	13	N/A	6	6	2

II. PRINCIPAL FINDINGS: VISITOR EXIT INTERVIEWS

RK&A conducted open-ended interviews with visitors as they exited the *Cell Lab* exhibition at the SMM. RK&A designed the interview guide to explore:

- Visitors' responses to and understanding of the *Cell Lab* exhibition;
- Connections between the *Cell Lab*, *Tissues of Life* (an adjacent and content-related exhibition), and the other exhibits in the Human Body Gallery;
- Comparison of the *Cell Lab* to other exhibitions at the SMM; and
- Suggestions for improving the *Cell Lab* exhibition.

Interviews were conducted in July and August 2003. Drop-in museum visitors, ages nine years and older, were intercepted as they exited the Human Body Gallery and asked to participate in an interview. Of 51 visitor groups intercepted, 11 declined to participate in the study. Thus, the refusal rate was 21 percent—a typical rate for museum evaluations.

A total of 40 visitor groups were interviewed—14 had only visited the *Cell Lab*, 6 had visited both *Tissues of Life* and the *Cell Lab*, and 20 had only visited *Tissues of Life*.^{5,6}

This report presents data for the 20 visitor groups who visited the *Cell Lab*, but also provides data for *Tissues of Life* as context and draws comparisons between the two exhibitions where appropriate.⁷

INTERVIEWEE DEMOGRAPHICS

Demographics

RK&A interviewed a total of 20 visitor groups, comprised of 48 individuals (24 adults and 24 children). Fifty-three percent of interviewees were female and 47 percent were male. The median age of the adults was 40 years, and the median age of the children was 10 years.

Prior Visits to SMM

Eighty-two percent of interviewees were repeat visitors to the SMM, and 18 percent were first-time visitors. Of the repeat visitors, 7 had visited frequently in the last six months (3 or more times) and 2 had visited infrequently (2 or fewer times).

⁵ The interviews about the two exhibitions were combined for three main reasons: (1) to account for the close proximity of *Tissues of Life* and the *Cell Lab*, (2) to accurately reflect visitors' experiences—in which they tend to ignore the boundaries between related exhibitions, and (3) to examine whether visitors drew connections between cells and tissues.

⁶ The data collector initially randomly intercepted visitors as they exited the Human Body Gallery; however, when few visitors who used the *Cell Lab* were intercepted and agreed to participate, the data collector began intercepting visitors as they exited the *Cell Lab*.

⁷ RK&A prepared a separate report for the National Institutes of Health for *Tissues of Life*.

VISITATION TO THE *CELL LAB* AND *TISSUES OF LIFE*

For context, interviewees were asked whether they visited *Tissues of Life*, the *Cell Lab*, or both. The evaluator pointed to the exhibitions, rather than referencing them by name.

As stated earlier, 14 of the 20 visitor groups interviewed about the *Cell Lab* had not visited *Tissues of Life*. Six had visited both the *Cell Lab* and *Tissues of Life*.

Interviewees who had not visited *Tissues of Life* did so for a few reasons. Most said they had no time to visit it and were planning to do so later that day. A few said they had come to the Museum to use the *Cell Lab* or to attend some demonstrations, noting that they did not plan to use *Tissues of Life* on this visit.

VISITORS' EXPERIENCES IN THE *CELL LAB*

To understand how interviewees used and responded to the *Cell Lab*, the interviewer asked them to identify exhibits that were the most and least fun to use. They were also asked which exhibits presented the most and least interesting information.

Most and Least Fun Exhibits

Many interviewees praised the activities' general characteristics. For example, they appreciated the easy-to-understand instructions as well as the opportunity to do experiments for themselves, "mix potions," and use microscopes (see the first two quotations below). Others liked the authenticity of the *Cell Lab* benches, which made them feel like real scientists in their goggles and lab coats (see the third quotation).

*We got to mix all [this] stuff together. (What's fun about that?) *Mixing stuff is fun.
**It was spelled out in an easy way, so it was easy for the kids to do on their own. *You didn't have to read, it told you what to do. **The computer program was really helpful [for] knowing exactly what to do. [Female, 10 years; Female, 21 years]

On several of them you got to use microscopes and that's fun for the kids because seven-year-olds normally don't get to use microscopes. [Female, 39 years]

(What was the most fun part of these [*Cell Lab*] exhibits?) Wearing the goggles and white coat. *They told us we were scientists, so we had to wear them. (Was that fun or not fun?) It was fun, like pretending to be a scientist. [Male, 10 years; Female, 10 years]

In terms of specific exhibits, interviewees said a variety of cells exhibits and lab benches were fun to use. A few each enjoyed the Cheek Cell bench and Enzymes in Saliva because they were studying their own cells and saliva. A few others found working with fruit flies at the Giant Chromosomes bench intriguing. Two interviewees were impressed with seeing alive, moving paramecia in Digestion in Cells. One liked the "oversized puzzle" at the Model of a Cell.

Most and Least Interesting Exhibits

In terms of the *Cell Lab* exhibits with the most interesting information, many interviewees were intrigued by the lab benches. A few were amazed to see their own cells at the Cheek Cells bench, while a few others were surprised that saliva has a digestive function and that people's saliva differs (see the two quotations below). A few more interviewees were surprised to learn that flies have chromosomes as humans do and to see the fly chromosomes. Similarly, the fact that wheat has DNA that can be extracted was new information for one interviewee. Another interviewee appreciated learning “don't buy anti-bacterial soaps, they don't work” at the Anti-microbial Agents bench.

(Why was the most interesting exhibit?) *Learning about cells. (What was interesting about that?) *You learn about cells in school . . . but you don't get to see one of your own. **I think for her to see a cell that she pulled out of her cheek was neat—rather than just a picture of one in a book like at school. [Female, 11 years; Female, 43 years]

It's interesting to find out . . . something we take for granted every day, like saliva, and [then to] see what it actually does in our body for digestion. *The enzymes, the amylase starts to work in your mouth and that digestion begins in your mouth. Where I think most people think it doesn't start until it reaches your stomach. [Female, 40 years; Male, 40 years]

COMPARISON TO OTHER SMM EXHIBITIONS

The evaluator asked interviewees to compare the *Cell Lab* with other exhibitions in the Museum in terms of how engaging it was and how interesting they found its information.

Many interviewees said the *Cell Lab* benches were more interactive and more interesting than other SMM exhibits (see the first two quotations below). In fact, two interviewees said the lab benches were their favorite exhibit (see the third quotation). In contrast, several said it was the same high quality as the rest of the Museum (see the fourth quotation).

I think this [lab bench is] a little more hands-on than other exhibits. . . . This really stands out . . . as a hands-on exhibit. The other ones—a lot of them [are] just mostly pictures and actual exhibits of something. They [give] general information. . . . Where this one is more hands-on and actually lets you experience what's being taught. [Female, 40 years]

It was interesting to be able to test some ideas for yourself. Like the anti-bacterial soap and saliva—it didn't tell you what the answer would be, you had to test it for yourself. Then at the end it [the lab companion] provided some information that . . . helped you understand [what] you just did. That [is what] makes these [lab benches] so good—the [combination] of experience and information. [Male, 43]

*I don't know if I could really speak for the kids, but they always want to come back to the cell ones [*Cell Lab* benches]. **It's my favorite. (Why is that?) It's fun to mess around with all this stuff. Do little experiments for yourself rather than watch someone else do it. *We visit here [the *Cell Lab*] all the time and even though the experiment's the same, the kids get just as excited. . . . It's like her own little private laboratory—there are people here to help us and it's not too crowded. . . . I think, for her, it's just the chance to do something you can't anywhere else. [Male, 40 years; Female 11 years]

Everything here [at the Museum] is good. So this is just another fun thing to do. I wouldn't expect anything less from the Museum. [Male, 25]

THE *CELL LAB*'S MAIN MESSAGE

The evaluator asked interviewees to describe what they thought the *Cell Lab* intended to convey to visitors. The evaluator, to make sure she did not bias visitors, pointed to the *Cell Lab* but did not call it by name when asking the question.

Interviewees identified a range of main messages for the *Cell Lab*. Some thought it showed children how scientists do their work and made science approachable for children (see the first quotation below). Some others gleaned facts from the lab benches, such as how an enzyme in saliva breaks down starch, that all living things have DNA, and what cheek cells look like. A few said the overall message was to explain how cells function (see the second quotation).

I think they're trying to show you that science can be fun. You can learn things if you follow directions. . . . I think they're [trying] to explain science to kids. My child's pretty young, so he hasn't really gotten into science yet. But and I think they're trying to show kids, science can be fun and interactive. . . . And to explain how you can do science. The display [lab companion] has instructions of here's what you do, instead of just reading and glancing through it. It actually proves the point to the child. (The point?) That science is fun but also about being methodical and measuring. It shows you how to do science. [Female, 34 years]

(What do you think this area [the *Cell Lab*] is trying to get across to visitors?) To explain what the cells do and that each cell is important to the human body. (How would you describe a cell?) Each cell is different, they each have a purpose, so like if one dies, one always replaces it. . . . So a cheek cell is different from another cell. . . . But all cells have DNA in them, so they're important to the body. [Female, 13 years]

CONNECTION BETWEEN THE *CELL LAB* AND *TISSUES OF LIFE*

The evaluator asked interviewees whether there was a connection between the *Cell Lab* and the *Tissues of Life* exhibitions and what their relationship was. Again, to make sure the evaluator did not bias visitors, she pointed to the *Cell Lab* exhibition but did not call it by name. Because

some interviewees had not visited *Tissues of Life*, the evaluator pointed to the exhibition and explained that it discusses human tissues and how the body fends off disease and heals itself.

Many interviewees said both the *Cell Lab* and *Tissues of Life* intended to show visitors how the human body functions (see the quotation below). A few visitors who said the two exhibitions focused on “different parts of the body” were unable to define tissues or cells. Others were unsure how the two exhibitions were related.

They’re both about the human body in general. How your immune system works over there [Tissue Invaders] and how your saliva works in there [Enzymes in Digestion bench]. [Female, 29 years]

CONNECTION BETWEEN *TISSUES OF LIFE* AND THE HUMAN BODY GALLERY

The evaluator asked interviewees what connection, if any, there was among the *Cell Lab*, *Tissues of Life*, and other exhibits in the Human Body Gallery. The evaluator pointed to the *Cell Lab* and *Tissues of Life* but referred to the Human Body Gallery by name.

Most interviewees grasped that the *Cell Lab*, the *Tissues of Life*, and the other exhibits in the Human Body Gallery explained the human body “at different scales” from “inside-out” (see the first two quotations below). One interviewee who has a science background explicitly described the relationship as “DNA is inside cells, cells make up tissues, tissues make up organs, and organs make up systems.”

*DNA and all this stuff is the foundation of the outside of the body. **It’s connected. You’re dealing with cells and DNA. *It’s all part of the part of the body—inside and outside. (Can you say more about that?) The lab stuff is sort of the internal workings—what’s happening inside your body while the other stuff is about what your skin looks like [magnified] and how different people look. [Female, 14; Female 38 years]

Everything over here [*Tissues of Life*] is about the body, the tissues. You have the hand washing, you see what kind of germs grow on you. Then over here [cells exhibits] you have the Model of a Cell, how the cells live—just everything talks about the body at a smaller level. [Male, 40 years]

In contrast, a few were unsure of the relationship between the exhibitions. One interviewee said the *Cell Lab* was “more advanced and for big kids” and the rest of the Museum was for younger children.

III. PRINCIPAL FINDINGS: LAB CREW PROGRAM INTERVIEWS

RK&A conducted open-ended interviews with the *Cell Lab* Program Manager and current and past Lab Crew members to understand their experiences working in the *Cell Lab*. RK&A designed the interview guide to explore:

- The *Cell Lab* Program Manager’s experiences training and supervising the Lab Crew;
- The *Cell Lab* Program Manager’s and participants’ opinions about the program’s most and least successful aspects;
- Lab Crew participants’ reasons for applying to work in the *Cell Lab*;
- Experiences Lab Crew had working in the *Cell Lab*;
- Impact of the Lab Crew program on participants’ current and future plans; and
- Suggestions for improving the Lab Crew program.

Interviews were conducted in July, September, and October 2003. RK&A interviewed Sara Fruehling, the SMM’s *Cell Lab* Program Manager and Lab Crew supervisor. For participants, SMM staff provided RK&A with the names and telephone numbers of current and past Lab Crew members. The evaluator conducted interviews with 13 Lab Crew members, one-half of them face-to-face at the SMM and one-half over the telephone.

CELL LAB PROGRAM MANAGER

Sara Fruehling has been the *Cell Lab* Program Manager since December 2001. Dr. Fruehling has a Ph.D. in Microbiology/Immunology. She manages the daily operations of the *Cell Lab* as well as trains and manages volunteers and the youth employed in the Lab Crew. In addition, in 2002 she began a research project, the Tissues Bioreactor Project, with a subset of Lab Crew participants.⁸

As *Cell Lab* Program Manager, Dr. Fruehling described her work with teens in the Lab Crew as “rewarding.” She has enjoyed getting to know and working with Lab Crew participants as well as seeing them grow and mature. While acknowledging that teen employees pose unique challenges, such as working around student schedules and dealing with occasional personality conflicts, she is a strong proponent of the Lab Crew program. She says the Lab Crew is essential to the *Cell Lab*’s success—both in maintaining the functioning of the lab and in providing interpretation for visitors. In addition, she feels the Lab Crew provides a positive public face for the SMM, noting that visitors often compliment the interactions they have with the Lab Crew. She highly recommends the Lab Crew program to other museums considering opening a hands-on biology exhibition like the *Cell Lab*.

Dr. Fruehling strives to develop the work ethic, as well as the interpersonal and science skills of Lab Crew participants. Supporting the growth of each individual is important to her, because Lab Crew is the first job for most participants. Additionally, participants are often recruited

⁸ The Tissues Bioreactor Project is part of the *Tissues of Life* project. A separate report for National Institutes of Health was prepared for *Tissues of Life*.

from low-income communities and need the counsel of a caring adult who can help them with school and personal issues as well as advise them about college and future employment. She has developed close relationships with Lab Crew participants to learn what skills they have and which ones they could develop. Furthermore, she tries to incorporate participants' existing interests—such as in technology—into their *Cell Lab* jobs.

One aspect of Dr. Fruehling's job that has frustrated her is her lack of time to develop science-based projects. While she conducts extensive training to teach the Lab Crew the science related to each lab bench, she would like to develop additional research projects to involve Lab Crew in doing real science. To address this issue, Dr. Fruehling hired an assistant (a graduate of the Lab Crew program) to handle scheduling and lab operations. The assistant is enjoying her expanded responsibilities, and Dr. Fruehling has been able to devote time to the Tissues Bioreactor Project. The Tissues Bioreactor Project is particularly appealing to Dr. Fruehling because it combines her expertise in scientific research and devotion to mentoring Lab Crew participants.

LAB CREW PARTICIPANTS

Background Information about Interviewees

Of 13 Lab Crew members interviewed, 10 were female and 3 were male—their median age was 18 years.

Ten of the interviewees are past Lab Crew members and three are current members. Five of the past members worked in the *Cell Lab* for one year, while four worked there for two years. Most worked in the *Cell Lab* between 2000 and 2002.

Four past Lab Crew members are in college. Three continue to work at the Museum in different jobs: one works with the Museum's overnight camp program, one with visitor services, and the third assists the *Cell Lab* Program Manager with daily operations (she also attends college). Three past members are employed elsewhere or are planning to return to college.

Three of the current Lab Crew are in high school and will be continuing with the program in the fall 2003 semester. One recently graduated from high school and will conclude her participation at the end of the 2003 summer.

Reasons for Applying to Work in the Lab Crew

The evaluator asked interviewees to describe their reasons for applying to work in the Lab Crew.

Interviewees gave a variety of reasons for pursuing working in the Lab Crew. Several wanted to work in the Lab Crew because it is youth-oriented, and the Museum is a welcoming place for young people to work (see the first quotation below). A few said the Lab Crew job matched their existing interest in science and in pursuing a scientific career. A few others said they needed a paying job and wanted to work in a place where they would also learn (see the second quotation). A few more connected personally to the Museum: two had friends who worked at

the Museum and one's parent worked there. They perceived that having this kind of personal recommendation was the only way they could get their first job without having any prior experience (see the third quotation).

The main reason [for applying to work in the Lab Crew] was just to get a job for the summer. (Why apply for a job at the Science Museum versus a record store, or a restaurant or clothing store?) The Science Museum is very flexible and [staff there] are [concerned with] your wants. They want you to feel comfortable and especially around school time they're very flexible. It's all focused on youth—what we need and you get to work with a lot of cool young people. (You mean your fellow Lab Crew or your supervisors?) Both—it's all young people and they really care about us. [Female, 18 years]

I wanted to do something different. I had been working in [the] food [industry], and I didn't like that. My family had visited the Science Museum and that's when I had decided to apply. (Was there anything in particular about the Science Museum position that appealed to you?) I liked that we could learn as we worked. There was opportunity to do research and work in a lab. And I liked that idea. [Female, 19 years]

One of my friends worked here. He got the job before I did and told me about it. He said it's really cool. (Why work for the Lab Crew instead of another place where your friends might also work like a restaurant or a sporting goods store?) Because it was easier. I got in with a friend, and it's hard to find a job. Not everybody hires somebody who doesn't [have any] experience. . . . I was young, and I didn't know how to get a job, so it was kind of a first step that my friend gave me. [Male, 20 years]

Experiences Working in the Lab Crew

For context, interviewees were asked to describe the jobs they perform as part of the Lab Crew and to identify their favorite and least favorite aspects of their jobs.

Job Responsibilities

As part of Lab Crew, all interviewees helped to maintain the *Cell Lab*—the lab benches that visitors use as well as the lab's backroom. This entailed making solutions, cleaning labware, maintaining live cultures of bacteria and protozoa, sterilizing goggles, and keeping the benches clean and fully stocked with supplies. All also actively worked with the public, inviting them into and introducing them to the *Cell Lab*, helping them with lab benches, and answering questions. Some also participated in outreach programs in which Lab Crew visited community centers or schools and facilitated *Cell Lab* activities. Three interviewees who are current participants in Lab Crew are also working on a research project, the Tissues Bioreactor Project, to grow mammalian tissue in culture. One interviewee holds a new position, Senior Lab Crew, and is assisting the *Cell Lab* Program Manager. For example, she ensures that supplies are ordered, works with volunteers and Lab Crew to create work schedules, as well as other duties related to the *Cell Lab*'s daily functioning.

Favorite Aspects

Many interviewees identified several aspects of their Lab Crew job that they enjoyed. Most said their favorite aspect of the Lab Crew was working with visitors, especially children. They said they were proud to help visitors with the lab benches and share their knowledge. Some also appreciated learning and doing experiments while getting paid. A few discussed the camaraderie of working with other teens, saying they had developed close friendships during their time in the Lab Crew. A few others also found satisfaction in doing lab preparation work. Two quotations below exemplify interviewees' responses.

(What was your favorite part about working in the Lab Crew?) Coming in and doing the experiments. Cleaning up or making the protozoa. Getting stuff ready, and then helping out the kids when they came in. When they didn't know [something] and you taught them [about it], you could tell they learned—just the look on their face was pretty cool. [Male, 20 years]

(What would you say are your favorite parts about working in the Lab Crew?) I've realized that all of us have become really good friends over the years. At first we didn't even know each other and we're all pretty different. So it's just really cool, because we're like family. . . . I like the constant learning and teaching visitors. That makes you feel [like] you're important. And you also realize what you've learned when you try and teach them, because then you have to recall what you've learned. [Female, 18 years]

Least Favorite Aspects

None of the interviewees seriously criticized their Lab Crew jobs. However, interviewees identified two aspects most often as the least favorite aspects of their jobs: washing labware and rude, unruly visitors. Upon further probing, it became clear that washing labware was an issue when some Lab Crew said they felt like others were not doing their fair share. In terms of problematic visitors, interviewees accepted having to deal with difficult visitors as an aspect of working with the public. As one interviewee stated, "You've got to take the good with the bad. Some visitors are great; others are not." When asked whether they felt prepared to deal with such situations, all said they were because of their training, guidance from the Cell Lab supervisor, and growing confidence after working extensively with the public (see the quotation below).

(What would say was your least favorite part about being in the Lab Crew?) Probably just trying to remember to respect visitors even if you don't get respected back. . . . A lot of times a visitor will have a bad day or something, and they'll try and take it out on you. But you still have to be professional. (So how prepared were you to deal with something like that?) We learned how to deal with people like that and after a while you feel like, 'Hey I know how to handle this.' [Female, 18 years]

Other comments were idiosyncratic. One interviewee disliked having to attend "long meetings." Another said there was tension between some Lab Crew members but that the personal issues were resolved with the assistance of the *Cell Lab* Program Manager. A third said making agar

plates was difficult because of the mathematical calculations involved. She also expressed a little frustration that when she and some of the other Lab Crew could not correctly make agar plates, their supervisor took that duty away from them instead of teaching them how to do it.

Experiences in the Lab Crew Program

The evaluator asked interviewees to describe their experiences working in the Lab Crew and to provide suggestions for improving the program.

How Interviewees Described their Lab Crew Experiences

All but one interviewee enthusiastically praised their Lab Crew experiences. Many said it was the “best job they ever had,” regretting having to leave the position upon graduating from high school. In particular, some appreciated the low-stress work environment and enjoyable interactions with their coworkers and supervisor, as well as the opportunity to continually learn (see the first and second quotations below). Several discussed how participating in the Lab Crew was a positive experience for them, stating that the *Cell Lab* Program Manager had helped them with difficult personal issues (see the third quotation). A few noted that working with visitors was a rewarding aspect of being in the Lab Crew (see the fourth quotation).

(Overall, how would describe your experiences working for the Lab Crew?) It was . . . a really good experience. . . . I met some really cool people, who I wouldn’t have met [otherwise] who were fun to work with. . . . I hated to leave [*Lab Crew*]. It was really just a great experience. I learned a lot. (What about it do you think worked really well for you?) The people I worked with. . . . If you can’t get along with the people you’re working with or they’re just not fun or nice to work with your job is pretty awful. . . . So, the people I worked with were great. . . . (So by ‘people’ you mean your fellow Lab Crew or the staff at the Museum?) Both. [Male, 20 years]

It’s been a positive experience. . . . I’ve gained communication skills because we’re always one on one with visitors and [using our] lab skills, making sure you use the microscope properly [and] handle the bacteria [following] safety procedures. It’s just been a thrilling ride so far. And it’s not work, work, work, work. It’s not stressful. . . . It’s pretty a nice atmosphere. [Female, 17 years]

(How would you describe your experiences in the Lab Crew?) Really, really good. I think it was good for me personally. . . . It was nice to have somebody like [the *Cell Lab* Program Manager], because she was more than a boss; she was also a friend. She really cared about her employees and you could talk to her about anything. She really explained . . . what we were supposed to do, and if we had any problems personally, we could talk to her about it. . . . She really helped me with some stuff I was going through even though it didn’t have anything to do with [my work at] the *Cell Lab*. [Female, 18 years]

(How would you describe your experiences in the Lab Crew?) It was great. I wouldn’t change it for any job in the world. . . . (Was there anything, in particular, about the work

that you did in the Cell Lab that really worked well for you?) I would say working with the kids is a wonderful thing, because I love kids. They're always eager to learn and they give you energy, so that's the most appealing thing to me—in the job. [Female, 18 years]

One interviewee said she learned a lot working in the Lab Crew but thought the program should have been more research-based (see the quotation below).

We just learned how to set up the experiments like fill the bottles, but we didn't really learn the scientific concepts behind them. I know a lot of the kids that are working there weren't really interested in science, but . . . for the people there that were really gung-ho about science [we would have liked to have learned] more about the science behind the experiments—the why or how, who came up with them, and why is it important. I think that it would have been a more valuable experience if I had known the science behind the experiments beforehand and had been . . . an active member in creating [the] experiments that we do. (That's one thing that they're trying out now, having Lab Crew members doing research with some of the scientists at the University of Minnesota. So, they're growing tissue cultures, for example.) That's neat. (If something like that had been available during your time in the Lab Crew, do you think you would have participated? How would that have impacted your experience?) I would have definitely participated in that. . . . It would have helped me because this past summer, I did some scientific research. . . . If I had had background experience [in research] when I was in high school, it would have gone a lot easier. [Female, 19 years]

Suggestions for Improving the Lab Crew Program

Interviewees offered a few suggestions for improving the Lab Crew program. Several discussed scheduling issues, and a few would have appreciated being able to work more hours. A few others noted that on weekends there were too many workers—both volunteers and Lab Crew—in the *Cell Lab*.

While most interviewees praised the training and supervision they received, a few thought more one-on-one training would have been beneficial (see the first quotation below), and a few others said the Lab Crew could use some additional supervision (see the second quotation). In fact, one interviewee noted that the supervisor should be stricter with Lab Crew members who do not perform their job duties (see the third quotation).

My training was one-on-one with [the *Cell Lab* Program Manager] and that worked really well, but [my last year] it was more like all eight Lab Crew altogether. . . . [Training should be] one-on-one or in like groups of two, where people are asking questions, [so] you can learn from each other. [With] a big group, somebody's always wandering off or just sitting there bored. They don't understand it [but they are] too afraid to ask the question. . . . Plus after the training there was still a lot of one-on-one time, so you could learn how to teach visitors and work with the public—deal with tough customers. A lot of those skills have to be developed on a personal level, so you don't really want to share that in front of the group. So, I think training, one-on-one or with a small group of people—not all eight Lab Crew—would make a difference. [Male, 20 years]

Some people think that it's just a simple little job and not much to do. . . . So, a little bit of supervision might help, like [the *Cell Lab* Program Manager] might drop in once in a while maybe to surprise you. Everybody's different—sometimes they slack off, but sometimes they actually come in [and] do their own work. (So Lab Crew kind of regulate themselves or?) One a busy day every single Lab Crew will actually be busy doing something, but one a slow day one or two people [would] be out there helping the visitors, some people might be doing some stuff in the back room, [and] then maybe one or two might just be slacking off. . . . So some people end up doing more work than others. [I don't] think they'd slack off if they knew someone was supervising them. [Male, 19 years]

It's really hard to get fired at the *Cell Lab*, and maybe that's not such a good thing. I tried my best to do all my responsibilities and do my best at handling visitors and so on, but I know some of the Lab Crew . . . kind of slacked off. One person actually told me she was working and two Lab Crew were . . . back in the lab part and they were playing cards. She just couldn't believe that. Maybe if [they] got a warning . . . [or] some kind of penalty, and then finally [if there] was a risk of getting fired . . . that might motivate some of the other people to do their best. [Female, 17 years]

As mentioned earlier, two interviewees thought the Lab Crew program could teach participants more lab techniques—in particular, how to correctly plate agar or, in general, basic lab research skills.

Impact of the Lab Crew Program

The evaluator asked interviewees to recall the science topics they learned about and taught to visitors as part of the Lab Crew. They were also asked to describe how what they were learning in the *Cell Lab* complimented their schooling and what were their future plans. In addition, they also discussed how their work in the Lab Crew changed them personally.

Science Teaching and Learning

Interviewees recalled learning a variety of facts about the lab benches. At the Cheek Cells bench, many talked about explaining to visitors what a cell is, while at the DNA Extraction bench, many discussed learning that all living things have DNA. Several fielded questions about fruit flies—how they live, the stages of development—and about the enzymes in saliva. A few talked about confirming visitors' findings from the Antimicrobial Agents bench—that the antibacterial gel is not particularly effective at killing microbes. Two quotations below exemplify interviewees' responses.

Some people ask, 'What's DNA?' We try to explain the concept, but it's kind of difficult to get across because it's not visible to the human eye so people have trouble [with it]. (How would you explain DNA to a ten-year-old?) I'd say inside each one of our cells, we have DNA. DNA . . . determines hair color, eye color—they'll understand [that] by

physical experience—basically DNA makes you look how you look. It represents you. [Female, 17 years]

Visitors would ask about the enzymes in saliva—how we know that it’s breaking down starch. (So how do you know?) You put iodine and it changes color. . . . And they ask about the cheek cells. They can’t believe that there are cells inside your mouth. (How would you explain what a cell is?) Your whole body is made up of cells. [Cells] make up all the tissues in your body. [Female, 18 years]

Connections Between School and the Cell Lab

Interviewees’ science experiences in high school varied and, as such, so did their connections between school and the *Cell Lab*. Some interviewees said their work in the *Cell Lab* complimented their school work. These interviewees were focusing on science in their high schools and/or taking advanced-placement biology. They did, however, emphasize that the tools and experiments they used in the *Cell Lab* were more sophisticated than those at school (see the first quotation below). Some other interviewees said the *Cell Lab* presented higher level content than what they were doing in school, in part, because they were taking general science courses or none at all (see the second quotation). In fact, one interviewee admitted to disliking science prior to working in the *Cell Lab*. She and a few others said they appreciated having the *Cell Lab* Program Manager help them with their science schoolwork, by pointing them to resources, explaining difficult concepts, and answering questions in a supportive environment (see the third quotation).

(Thinking back on your experiences, in what ways, if any, did the work that you did while you were in the Lab Crew connect with what you were doing or learning in school?) A great deal of stuff that I was learning in the *Cell Lab* had to do with school, so it did help with what [I was] doing at school. So that’s a benefit from working there, too. . . . You learn about DNA and stuff in your biology classes, so . . . you get . . . it from working at the *Cell Lab* and in school. . . . Being around it all the time [in the *Cell Lab*] you grasp the concepts a little bit better [than] when [you] did it in the classroom. (How would you compare the experiments that you were doing in the Lab Crew to any experiments you did in your regular school?) I never did [any experiments] in school, not like at the Science Museum. (So you didn’t do any hands-on stuff at school?) Not really. We looked at slides, but [in the *Cell Lab*] you make your own cheek cell slide. So it was just totally different at the *Cell Lab*. . . . Schools don’t have the [resources] of the *Cell Lab*. [Male, 18 years]

[The *Cell Lab*] was more advanced than what we were doing in school. I didn’t take chemistry or anything. Even like the DNA extraction, . . . the giant chromosomes, we never did anything like that—not even cheek cells. . . . (And how did your science knowledge before being in Lab Crew compared to your knowledge afterward?) Poor when I started. I learned a lot just from sitting down and looking at the [lab companion] computer over and over. . . . I didn’t know too much [before] the *Cell Lab*. [Male, 20 years]

Last year, I had [to give] a speech about future technology. I actually chose to do mine on stem cells because that was somewhat work-related. I knew that I could come in to [the *Cell Lab* Program Manager] and actually talk to her about [it] and if I needed any information, I could come here. So that was really nice. I ended up doing the best I've ever done on any speech with that one. The teacher was way impressed and it was really cool. . . . (Why do you think your stem cell talk was so successful?) Maybe because I was interested in it. . . . When I was applying for the job, I hated biology [but] I lied and said I liked it because I wanted the job so bad. Then I ended up learning it and I actually realize that I did like biology. It was just the teacher that I didn't like. (What about her approach did you not like?) She didn't make it fun. . . . I didn't even comprehend what a cell was at the time, just because she didn't explain it good enough. . . . I didn't know what was going on and then I came here and then it kind of all clicked. (Why do you think that is?) We went more in depth with it, and [the *Cell Lab* Program Manager's] pretty open to talk about anything. You can ask her any question and you don't feel stupid. [Female, 18 years]

Connections to Current and Future Plans

When asked what connections, if any, the Lab Crew has with their current and future plans, interviewees' responses fell into three main categories. Some credited the Lab Crew for their current employment (see the first quotation below). Some others said the information and lab skills they learned in the *Cell Lab* are helping them in college (see the second quotation). The remaining interviewees said they hope to pursue teaching or social work because of their positive experiences in the Lab Crew working with children (see the third quotation).

I wouldn't have been able to get a job [without the Lab Crew experience]. I learned how to act [professionally], like dress the right way and [how to] talk to future employers. [Male, 20 years]

A lot of what I'm doing in college I already learned in the *Cell Lab*, so that's helping me a lot. And the skills that I use in different jobs [I gained in the *Cell Lab*, too]. . . . I'm working as a lab technician at school, and I got the job because I had experience. [Being in the Lab Crew] helped a lot, [for knowing] the machinery, how to plate agar in Petri dishes, and things like that. [Female, 19 years]

I'm not really going into anything scientific, [but] I think I'd like to go into teaching. . . . I'm mentoring high school students right now. So I guess the teaching part [of the Lab Crew] is what impacted me the most. I really liked working with kids, so teaching is something I'm interested in. [Male, 20 years]

Personal Impact

All interviewees said working in the Lab Crew changed them. Several said the job helped them gain confidence in public speaking (see the first quotation below). Others said it made them more responsible and professional, enabling them to find employment after graduating from high school (see the second quotation). A few said their work in the *Cell Lab* reinforced their love of

science and opened new areas of interest, such as microbiology (see the third quotation). A few others said their caring coworkers and supervisors helped them through personal difficulties (see the fourth quotation).

I'm able to talk to people without being nervous as much as in the past. Before, my hands would shake, I'd sweat. . . . But now, it's a pretty standard routine, I go up to a visitor [and] ask them questions. I feel more comfortable with visitors now. [Female, 17 years]

I've matured and grown up a lot from working there. It made me a totally different person from who I was then to who I am now. My work ethic is just really good. I walk into a job and I get the job done. It [the Lab Crew] teaches you [about] work . . . and life too, how to handle things. And [the *Cell Lab* Program Manager] helps you out in life, too. They ask you what's wrong and if you needed help. . . . They actually cared. . . . When I was younger, I was pretty wild. I got kicked out of my house when I was 16. And then I got this job. . . . I was working, going to school, and . . . learning. That's what you're supposed to be doing, not running around acting crazy. Now I have a full-time job as a technician at this company. . . . I go to work every day and show up on time. I know how to have a job—nobody in my family showed me how to do that. [Male, 20 years]

I've always loved science, but it's helped me to like science even more [now] that I understand the different types of science. . . . Working in the cell lab made me realize that maybe I'll do microbiology instead of zoology. . . . It's just broadened my view [of science.] [Female, 21 years]

I was going through a lot of stuff. I don't know if I'd have made it without the [*Cell Lab* Program Manager]. She just listened and helped me through it. [Female, 19 years]

APPENDICES

Removed for proprietary reasons