Cell Lab: *An Opportunity to Interact with Scientific Instruments*

For most people, the tools and practices of science are a mystery. In their daily lives, they do not have opportunities to see laboratory equipment and materials such as bacteria cultures, centrifuges, or even microscopes, let alone actually use them as part of a scientific investigation. However, at the Science Museum of Minnesota's (SMM's) *Cell Lab*, museum visitors engage in wet-lab biology activities using real scientific tools and techniques.

Cell Lab consists of a series of eight wet-lab biology activity benches. Each activity is equipped with an online Lab Companion, which introduces the investigation; gives instructions on how to use the instruments, tools, and materials; and leads participants step by step through the procedure. Often the Lab Companion provides supplemental information to enhance the experience. To provide additional assistance, museum volunteers and Lab Crew

members—high school juniors and seniors who work in the *Cell Lab*—are available to answer questions.

Cell Lab investigations vary from station to station. At one bench, visitors use toothpicks to scrape cells from the inside of their cheeks, fix the cells to a slide, stain the cells, and look at the cells under a microscope. The Lab Companion allows further investigation about the structure of cheek cells and any variations they may have noticed.

At another station, called "Testing Antimicrobials," visitors make a hypothesis about which type of antibacterial cleaner—hand soap, bleach, or sanitizers—most effectively kill a common bacterium, *Bacillus megaterium*. Participants test their hypotheses by using a fluorescent assay to expose bacteria to each agent. If bacteria are still present, they will glow green. If the agent killed the bacteria, the sample does not glow. This activity allows participants to test their hypotheses and see for themselves the impact of cleaning products on bacteria.

To make the experience as safe and authentic as possible, everyone entering *Cell Lab* must put on a lab coat, goggles, and gloves. This laboratory uniform protects the participants, keeps biological sample bacterial contamination to a minimum, and puts the museum visitor into the proper frame of mind. "The lab coat, goggles, and gloves are really a lab uniform, which becomes part of the experience. Our visitors really enjoy dressing as scientists do," says Laurie Fink, director of human biology at the museum.

With the help of a Cell Lab *teen volunteer, young scientists work on two different activities.*

Visitors' Responses to Cell Lab

Cell Lab has been open for almost 10 years and was the first wet-lab experience created for the public. It also has proven to be a popular attraction at the museum. During the past 10 years, evaluations have provided the museum with information about who visits *Cell Lab*, what activities they engage in at the different benches, and what their overall impressions of the experience have been. According to a summative evaluation conducted by Randi Korn & Associates, most of the visitors have been small groups of adults and children (often a caregiver and a child), and they spend an

average of 15 minutes at each bench. They really enjoy working on the different investigations, with the Cheek Cell bench often selected as one of their favorites. Below are some visitor reactions:

"We got to mix all [this] stuff together." (Interviewer: "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."

"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).

The first quote above illustrates a common response of visitors; one of their goals for an informal experience is active engagement or doing fun things. The second quote is a reminder that visitors may want to explore complex issues, but prefer to do so through experiences that are easily accessible. Parents are often particularly concerned that their children are able to participate easily. The third quote from an adult describes the full spectrum of the experience and again illustrates that learners can be aware of the content and even the underlying design principles of the experience.

Interviews with visitors also reveal that they mostly performed the investigation outlined in the Lab Companion and then talked about what happened. The setup of the benches has been thoughtfully designed to allow for dialogue. "The museum designs these spaces to support social interaction. The benches are arranged so that small groups can do the activities together," explains Kirsten Ellenbogen, director of evaluation and research on learning at the museum. "People can look at each other's experiments or specimens and talk about what they see."

These strategies appear to be working. They have been consistently successful in providing visitors with a rewarding experience. Perhaps a father, visiting with his 11-year-old daughter, best sums up the impact of a visit to *Cell Lab*: "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 because it's fun to mess around with all this stuff. Do little experiments for yourself rather than watch someone else to do it. We visit 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 do anywhere else."[12]