A Study of Volunteer Impact on Learning Interactions at “Discovery Centers”

Introduction:

In recent years there has been a shift in public perception of museums, they have gone from places of silence and decorum to places of public learning and activity. Attendance is on the rise, and visitors are looking to museums for new experiences and opportunities to learn. (Falk & Dierking 1992) Accordingly, science and technology museums now offer a wide variety of activities to engage visitors and promote learning. Often these museums use “discovery centers” as areas for hands-on activities and interactions around scientific or technological concepts.

Due to financial considerations, many museums have turned to volunteers to staff their exhibit halls and “discovery centers”. Volunteers are asked to greet visitors, engage in discussions surrounding science and technology, perform demonstrations, and actively support visitor learning. Is this really what happens? Are volunteers adequately trained to staff these centers? Science and technology are complex topics that often require years of study for true understanding. How prepared are volunteers to share their knowledge and understanding of technology with visitors and what factors impact the level of interaction and learning that occurs? These questions guide my study of volunteers and their role in the learning activities at discovery centers.

The following study uses qualitative methods to explore discovery center interactions between visitors and volunteers. Through the use of observations and interviews, information was gathered for review and analysis. The goal of this study is to discover
patterns of interaction and factors pertaining to volunteers that impact interaction at the “discovery centers.”

**Area of Study:**

To best understand how volunteers impact learning at discovery centers, this study examines the interactions that take place at four such centers in the Invention, Industry and Innovation Museum* located in Santa Chiara, CA*. Volunteers at the I³ are responsible for greeting visitors, sharing knowledge and information and actively engaging visitors in learning experiences. According to an internal evaluation, visitors to the I³ enjoyed the staffed interactive exhibits, like the “discovery centers”, best of all exhibits. However, these visitors also expressed the need for more help interpreting gallery content and “playing” at the centers. From the data collected through the evaluation, an area for recommended improvement is training for volunteers to better interpret and share gallery content. (Wageman 2000)

The identified need for training leads to the question: What kinds of training will help volunteers interpret and share gallery content? In order to inform the design of training for volunteers, this study focuses on the factors that impact the quality and types of interactions that take place. Does the knowledge level of the volunteer in the area of interest play a role in the interaction? What skills do volunteers use when interacting with visitors? How does volunteer attitude toward their position impact their interactions with visitors? The findings I present through this paper are a preliminary step toward answering these questions.
**Literature Review:**

To begin the investigation I conducted a literature review in order to understand what kinds of interactions and activities lead to learning and cognition in museums. Through research I found many articles that focused on learning within the museum environment. Most of the articles recommend human interaction and hands-on activity as a way to engage visitors and promote learning.

Museums have the potential to engage the majority of learners through appealing to different learning styles and intelligences. At a discovery center, mastery style learners can absorb information concretely and see it applied in a practice, understanding style learners are introduced to abstractions and can reason and test in an experimental way, and in the social setting of a museum the interpersonal style learner can focus on concrete information that they then discuss with others. (Silver, Strong, & Perini 1997) Through multiple ways of presenting and allowing visitors to experience information, museums can build understanding of complex scientific concepts. “The point is to realize that any topic of importance, from any discipline, can be taught in more than one way. There are things people need to know and educators have to be extraordinarily imaginative and persistent in helping students understand things better.” (Gardner 1997) Volunteers, acting as “educators” at the discovery centers, have the potential to foster learning through appealing to different learning styles and intelligences and applying imagination in helping visitors understand technology.
Another factor in helping visitors understand scientific concepts, is the process by which museum staff interprets content for visitors. “Interpretive communications is not simply presenting information, but a specific communication strategy that is used to translate that information for people, from the technical language of the expert, to the everyday language of the visitor.” (Veverka 1994) Volunteers can serve as “experts” who scaffold understanding for the novice visitor by presenting information at their level and in a variety of ways. Modeling information is far more effective than signs in building visitor understanding. (Falk & Dierkling 1992)

One of the common flawed assumptions that museums make is that visitors will stop, look and absorb all the information presented through text and visual processing. Instead, visitors are more likely to make sense of what they experience in a concrete way. No matter how adept one is at absorbing abstractions, nothing reinforces experience like involvement of the senses. This kind of hands-on, personal experience will make the museum experience and the content much more memorable and enhance the learning interaction. (Falk & Dierkling 1992) In order for visitors to have a complete and educational museum experience it is recommended that they have “a high level of participation, role-playing, hands-on and minds-on activities, where each gallery experience becomes immersive.” (Booz-Allen & Hamilton, 1999) Volunteers play a vital role in engaging visitors in hands-on activities and immersing them in the museum experience.
Based on this literature review key components to look for in volunteer interaction with visitors are hands-on engagement, translation of complex information, modeling, conversation, and the presentation of information through a variety of styles and activities.

**Site Background:**

As mentioned earlier, the research site for this case study is the Industry, Invention and Innovation Museum (I³) in Santa Chiara, CA. The I³ museum has recruited and trained over 600 volunteers to assist in greeting, engaging and educating the public about the museum and technology. This site provides a rich resource and the need for this study.

The majority of volunteers are residents of the prosperous, high-tech community that surrounds the museum. The I³ is an interactive technology museum dedicated to “Inspiring the Innovator in Everyone”. Their published mission is to “provide an educational resource to engage people of all ages and backgrounds in exploring and experiencing technologies affecting their lives, and to inspire the young to become innovators in the technologies of the future.”

The I³ is self-described as a private, non-profit educational organization and they view their volunteers as essential to reaching their educational goals. For volunteers, there are six different job descriptions: exhibit explainers, information and membership assistants, exhibit engineering, special events, bilingual guides, and office assistants. Volunteers are allowed to self-select their area of interest within the galleries including the discovery
centers. Within the museum the discovery centers are areas designated for hands-on activity, where visitors get to touch, play and experiment with objects, models and simulations. This site provides a unique and interesting environment for study of learning interactions between visitors and volunteers.

**Design and Methods:**

**Data Collection:**
The process of data collection employed in this study included observations and interviews. Carried out on a micro-level, this study was designed to build understanding of the learning interactions taking place between volunteers and visitors at the I³ museum discovery centers. I chose to focus on the volunteers (as they are the constant in the equation) and what factors led them to engage visitors in learning activities. All methods employed in data collection sought to include a suspension of opinion and were carried out from a non-judgmental orientation. This stance allowed for the careful data collection and the process of interpretation to arise from the information, not guide the collection of information.

- **Observations:**
Observations were both standard and participant. Initially several observations were conducted without volunteer knowledge. However, as I became known within the galleries, I began introducing myself to volunteers and asking permission to observe the interactions at the counters. Often, this introduction led to brief conversations, giving me general information about the volunteer and their work at the discovery center. Once
volunteers became familiar with my presence I started helping them work with visitors, often participating with them in the interactions. This participatory observation allowed me to experience their job from an emic perspective.

Kinesics was an important part of the observation process. By noting the body language of volunteers during interactions with visitors, I gained valuable insights into their comfort level and desire for interaction, adding another layer to my observations.

- **Interviews:**

Interviewing was crucial to the data collection process for this study. Interviews were conducted with 12 members of the volunteer staff, 7 during the week and five on the weekend. Initially interviews were of an informal nature trying to gather information concerning volunteering, backgrounds, interests, and reasons for working at the I³. These unstructured interviews allowed me to gather perceptions of an insider’s perspective. The topics were guided more by the volunteers’ responses than a set series of questions. As patterns developed in response to certain questions, interviews became more structured. By repeating questions between interviewees it allowed me to make comparisons and look for patterns. Interviews began with specific questions of an informational nature in order to make the subject feel comfortable and prime the conversation. Grand tour questions were used to gain information about the discovery centers and often led to more specific questions. For example, I asked volunteers to give me a tour of the items in the center. What and how they chose to describe the items gave insight into their knowledge and attitudes about the exhibit. Questions, including both
open-ended and closed-ended, pertaining to visitor interactions and learning, were then used to gain information of a specific nature.

**Analysis:**

The first step in the analysis of data began with processing the information collected in a meaningful way. I used the literature review as a lens through which to focus my thoughts about the interactions taking place. I reviewed and selected pieces of the data that directly related to my topic of interest and the questions that I had formed.

Next, I looked at the data from multiple interviews and observations in order to recognize patterns in the behavior and comments of the volunteers. While I started looking for patterns early in the process, I was careful to remain objective and tried to verify/refute my conclusions through additional data collection. I also used triangulation to confirm and revise interpretations. When a volunteer discussed interacting with visitors, and mentioned how they like to engage visitors in conversation, I then looked for this interaction during observation in order to confirm their statements. This process of analyzing and triangulating data began after several observations and continued throughout the case study, changing and honing my interpretations along the way.

**Site Description:**

*I leave the sunshine behind and push through the doors of the Innovation, Invention and Industry Museum (or I³ as it is called). It is early afternoon on a Sunday and visitors are slowly filing in. Up the escalator to the second floor, the flow of traffic guides me into*
the Innovation Gallery. “Greetings from…Pushing the Limits” says the sign welcoming me to the space. It encourages me to “help invent the future.” Intrigued, I enter the gallery. Purple painted pipes, colorful wires, gadgets, and signage consume my field of vision. A constant din coming from the activity in the surrounding galleries fills my ears. The gallery is windowless with hanging lights to illuminate the space and reveal signs posted above. These signs prod the reader to: try, guess, test, change, innovate, imagine and observe. Funny, I think to myself, that is exactly what I am here to do.

• The Museum

Founded in 1990, the museum recently reopened in a new building with over 132,000 square feet of space and they now host over 700,000 visitors a year. The building is two stories tall and takes up almost an entire city block. Painted bright mango and purple, the exterior provides a visual break from the businesslike appearance of downtown Santa Chiara. The I³ houses four permanent exhibit galleries, an IMAX theater, the Nelson Center for Learning, educational media and science/technology labs, a gallery for traveling exhibits called “Breaking Ground”, a museum store and café. The interior is open, with high ceilings and exposed “workings”. The museum designers felt that the technology that runs the museum should be visible to the public. The atmosphere is bright, busy and encourages visitors to explore and experiment.

• Discovery Centers:

“People are really hesitant. They have been taught to keep their hands at their sides, because a museum is a place where they had stuff and you weren’t supposed to touch it.”
It is only in the last 15-20 years that it has become the hands on- lets touch it. The question I really like is “May we take a picture?” OF COURSE! We’d be broken hearted if you didn’t!” Robert leans forward, opens his hands wide and smiles as he demonstrates his response to the question. “These are the responses you have to give people because they are trained to be reserved in a museum. Which makes this a great museum, it means relaxed.”

There are four discovery centers within the museum, one within each gallery. The content of each discovery center corresponds to the gallery within which it resides: Communications, Innovation, Exploration or Life Tech. Each discovery center is designed for interaction.

- Communications Discovery Center:

“It is fun working at the (communications) discovery center*... just meeting the people that come to it. A lot of people will stop by here and ask, “What do you have? What can you show me?” “Well, you name it... everything from the videophone to the old rotary phone, from the early home computers like the Atari to the latest PC. In fact... I like to tell them “You can see us on the internet right now on the computer screen.” Then they look around for the camera - they don’t understand that it isn’t just a monitor with a camera hook-up, they are actually on the Internet!”

The Communications discovery center sits at the entrance to the gallery and is filled with communications devices. Currently there are video phones, cell phones, a range of computers from the earliest Atari to the latest PC, and display pieces used for
comparisons between old and new technologies.

- Exploration Discovery Center:

“Here take this, bend it any way you like!”, Alice says to the son while handing him a tightly coiled piece of nickel titanium. The boy pulls and twists the metal out of shape. The metal is now virtually unrecognizable as the original shape. Alice smiles, “Now... try putting it into the hot water.” As his father looks on, the boy dips the metal into the water. Within seconds the metal is back to its original shape. “Wow, COOL!” says the boy as he looks at the metal in disbelief. “Can I try it again?”

Next door to the Communications gallery is the Exploration gallery. The discovery center in this gallery focuses on technologies that have helped the world explore uncharted territories. On the counter are materials used to build airplanes and space shuttles, including a heat tile, nickel titanium and different forms of plastic. When a volunteer is manning the center, you can bend “memory” titanium out of shape and watch it form right back to where it began when heated to the correct temperature.

- Innovation Discovery Center:

A teenage girl is the next visitor. She has long brown hair and is dressed in a jacket, blue shirt, jeans and sneakers. Her first word upon spotting the diode machine is “Awesome!” Joe asks her “Do you know what is happening?” She replies, “No, well...the thing is moving really fast.” “Exactly! – It is like a movie, it moves fast and your eye retains the image.”.

Upstairs at the top of the escalator, at the back of the Innovation gallery is the Innovation
center focusing on the silicon chip. It contains a buckyball, silicon ingots, quartz crystals, a “Peltier Effect” device, light emitting diode, wafers, and a microscope trained on the surface of 486 microprocessor chips. The counter is covered in items to pick up and explore.

- Life Tech Discovery Center:

“See here, these alcohol glasses, I think they are the best teaching tool we have here.” He says, “Here, try it!”, as he hands me the glasses. “There you go, stand on the line. Put the glasses on. Now, heal to toe, heal to toe, arms out! Arms out! There you go.” He talks me through the process of walking down a straight line taped to the floor. He explains to me that the alcohol glasses, through distortion of the plastic, simulate vision after 2 glasses of alcohol and that it is very difficult to walk the line with the glasses on.

“Would you want to drive with those goggles on?” I respond, “No way!”

Across the “bridge” (a hanging walkway) from the other galleries is the Life Tech gallery. Down the hall and into the gallery the Life Tech discovery center sits in the middle of the gallery. On the counter sit many objects all related to medical technology and human processes. X-rays, plastic reproductions of bones with joint replacements, alcohol goggles, bullet-proof vest, gel bicycle seat, and pacemakers are some of the objects on display.

Volunteers:

Volunteers run the gamut in age, gender and ethnicity. However, the majority of them fall into one of two categories: either young adults or retirees. They are residents of the
Santa Chiara area and have watched the I³ grow from “the garage” to its current exhibit space. The weekend volunteers are often high-school students completing community service requirements for graduation or students interested in technology. While the majority of the weekday volunteers are retired adults, who formerly had high-tech careers.

**Findings:**

In order to inform myself on the topic of the learning interactions between volunteers and visitors at discovery centers, I collected data by observing and interviewing volunteers. During data collection I kept my focus on factors that impact the ability of the volunteer to engage visitors in hands-on activities, share knowledge of technology and carry on discussions that personalize the museum experience. Three areas of interest developed from the research conducted: motivation, knowledge of technology, and the social/teaching skills of the volunteers.

**Motivation:**

_The discovery center has suddenly become quiet and Robert*, a retired production manager from the semi-conductor industry, leans back in his chair, clasps his hands behind his head with elbows out and responds to my question, “I started volunteering at the I³ after I retired, well my wife and I volunteered for the traveling Smithsonian exhibit when it came through town. I thought it was fun…it was enjoyable. So, when the I³ opened and they advertised for volunteers I decided to apply. See, One of the things that_
happens when you retire is that you lose a lot of the interface with people that you may have had in your business world. When you retire, then your business friends...well you just don’t see them like you used to. I thought it would be a good idea. Get me out of the house. I like people and I like to talk to them, so I am here.”

One of the main areas of interest that developed during the case study is how the motivation of the volunteer impacts the quality of the learning interactions. How do the reasons the volunteers decided to work at the museum (and what they wanted to get out of the experience) influence their interactions with visitors? In order to address these questions I asked volunteers about the reasons they chose to volunteer at the I³. The “discovery center” volunteers offered varied responses to the question of why they volunteer. Three main motivations were consistently mentioned: desire to interact with people, desire to help people learn, and interest in playing with the technology.

Robert, quoted above, mentioned his interest in interacting with people as the motivating factor in his decision to volunteer as did all of the 7 retirees I spoke with, each with a slightly different spin on the idea. For example, another type of personal interaction is mentioned by Ed*, a retired electrical engineer, as the reason for volunteering at the I³. Ed enjoys helping people learn. When discussing what he enjoys about volunteering, Ed describes the feeling of success when he teaches a new technology concept to a child. “I love to see the look on a child’s face when they get “it”. Nothing beats that look. It really gives me a thrill to show something to someone, to help them use the technology,
explain it to them, and have them do it, and then they get it. That’s why I do it. For that look.”

The reasons and motivations retirees mention for their decision to volunteer contrast sharply with those listed by the young adults. Young adults, (4 out of 5 interviewed), mentioned interest in the technology and playing with the exhibits as their motivation for volunteering. Only one of the young adults mentioned interacting with people as their reason for working at the I³.

Lucy*, a college freshman, when asked what she enjoys most about volunteering responded, “I like playing with all the gadgets, it is fun. There is so much to do here, I am always learning something.” She states that she has volunteered at the museum for three years, and decided to volunteer because of her memories of visiting the I³ when she was “little”. “I started going to the I³ when it was still in the garage, as a little kid. I guess I have good memories of the museum and I still like to come here to play.” John*, a high-school student, repeated her interest in playing with the technology, but added the additional reason of “Community service”. He explained to me that the San Jose school district has a graduation requirement of community service. He “looked at different places, and the I³ seemed fun so I decided to volunteer here. It is pretty cool, I get into the museum for free and I get to play with stuff. It is a lot better than other places for community service.”

Knowledge of Technology:
Jim*, a retired telecommunications engineer, stands holding a fragment of a fiber optic cable in his hand. He is in the process of giving me a “grand tour” of the discovery center in the communications gallery and is explaining how he uses the demonstration piece to talk to visitors, “You start off like you start a lot of conversations. With “How are you today? Are you having a good time at the museum? Do you want to see what we have here? Have you seen our video phone? That kind of thing see. Depending on the person, some people ask questions, like what kinds of lines do you need? Is there anything special? What we like to show people is this fiber-optic cable. The latest thing we do with this is show them how it acts like a magnifier, a fiber-optic magnifier. Because then you can really see the individual strands. See - you have to show them. You can tell them this is a whole group of fibers and they sort of say, “yeah”. And of course they don’t believe you because it looks like a solid piece of plastic or glass. But when you put it under there and show them what the top looks like, and you let them hold it and look, and its all these little hexagons then they say, oh! (laughs) People need to be shown, if you just tell ‘em something sometimes, that’s not quite good enough. So after showing them the fiber-optic cable then I ask them to take this cup here and talk to me.” Jim takes down a set of two plastic cups connected by fishing line that is hanging on the wall. “Here talk to me. This is just like your phone lines, just like the fiber-optic cables you just saw. Can you hear it? Now, lets make a network.” Jim takes a second set of cups down from the wall and wraps the second fishing line around the first. He solicits help from two visitors who take the cups in hand. “Pull them tight he tells us, now lets talk. You start.” I speak into the cup and all three participants hear me. We created a network!
A second area of interest that developed during the case study is the difference in knowledge levels of the volunteers concerning technology. How does volunteer experience with and knowledge about technology influence interactions with visitors? How does their understanding of the technology help them interpret complex concepts in a way that visitors can understand? In order to gather data on this issue, I performed interviews and observations. The following observations illustrate the patterns I saw in knowledge level of the volunteers.

While observing a volunteer named Joe at the Innovation discovery center, I transcribed the following learning interaction: An older gentleman (60-70 years of age), with a full head of white hair, Joe stood behind the center dressed in business-casual attire of a purple polo shirt, slacks and the black I³ Museum apron. A pre-teen boy dressed in a t-shirt and jeans, walks up the counter, picks up a silicon ingot and asks Joe, “What is this?” Joe replies, “It is a silicon ingot” and follows up with, “Do you know what silicon is?” The boy replies, “It is used to make computer chips.” “That’s right”, Joe responds, “Do you know where it comes from?” The boy shakes his head, and Joe picks up a piece of quartz and hands it to the boy as he describes the process of turning quartz into silicon. “It starts out as quartz, they remove the oxygen to get pure silicon. Silicon and oxygen is quartz. So if they take out the oxygen they get pure silicon – it is a pure form of sand.” While Joe is talking a family comes up from behind and listens to the explanation. The family consists of a mother, son about 11 and a father. The son is dressed in a NY Yankees cap, sweatshirt, jeans and tennis shoes, just like his parents. The child asks Joe,
“So it’s both of these combined?” “Yes, pure silicon and oxygen.” He picks up the ingot of silicon, and asks Joe, “Isn’t it obsidian?” Joe says, “It’s silicon, it looks like obsidian because it is dark and shiny. So, that is a good guess.” The boy moves to the microscope and looks at the silicon chip under the glass. “Wow, that is neat.” “It is like a grid in a city with the connectors as streets”, says Joe. The boy then asks about how they make the chips. Joe explains the process of creating a chip including the use of a clean room. They discuss the clean room for a few minutes and then Joe directs the boy to the exhibit of an actual clean room around the corner. The boy looks at the chip again before heading to the clean room, exclaiming, “wow, these chips are so small…..”

This interaction contrasts with a similar situation where a young visitor again asks about the silicon ingot. This time John*, a high-school student, is staffing the center: A blonde boy, around the age of 9, dressed in shorts, t-shirt and immaculate sneakers approaches the counter. He picks up a silicon ingot tosses it around in his hands and asks John in a bold voice, “What is this?” John softly replies, “Oh, it is uh, made from sand, silicon like.” John then turns to the computer at his right and stares at the screen. The screen is blank except for the general desktop icons. No program is running. The boy does not ask any more questions. He sets the object down turns and jogs off to another exhibit area. John continues to stare at the empty computer screen for several minutes before he turns out toward the gallery and pans the scene.

I witnessed another interaction at a discovery center where the level of engagement was impacted by the knowledge level of the volunteer. This interaction was again, typical of...
those occurring between young adult volunteers and visitors: Lucy sits behind the discovery center, swiveling back and forth in the chair, her arms crossed in front of her. A woman, about 40 years old, approaches the counter. Lucy remains seated, but smiles at the woman. The woman, dressed in a green jacket, a polo shirt and khakis peruses the counter touching the different items. She stops at the device that demonstrates the “Peltier Effect”. She looks at Lucy and asks, “Can I try it?” Lucy responds, “Go ahead.” The woman plays with the device a bit as Lucy watches her. The woman then asks Lucy, “What is going on here?” “It is something about polarizing warm and cold, I think”, says Lucy in response. The woman plays with the device a few seconds more, then sets it down and leaves the counter. Lucy turns and picks up a three-ring binder sitting behind the counter, she leafs through the pages and pulls out the explanation of the “Peliter Effect” and sets it next to the device on the counter.

The types of interaction described above became a pattern in my observations. Young adults engaged visitors for less time and were less likely to expand upon answers than retirees. Young adults were far more likely to answer, “I don’t know” to visitor questions. Interactions with retirees and visitors were consistently longer and more involved than the interactions between the young adults and visitors. Nine out of 10 of my observations confirmed that retirees made more links between technologies and followed-up questions with complete answers. They were also more likely to talk to the visitors first, ask them questions, and reach out and put something into a visitor’s hand. Four out of five retirees physically gave something to the visitor to touch or “play” with while only 1 out of 5 young adults used this technique of interaction.
Social Skills:

A woman, approximately 40 and dressed in jeans, a jean shirt, and loafers with her long hair tied back into a ponytail approaches the discovery center. As she nears the counter John*, a high-school student volunteer, stands up and says in a strong voice “Hello, Welcome to the Discovery Center.” As he speaks he opens his arms wide, one to either side, in a gesture of welcome. The woman does not respond to his welcome. She turns around and quickly walks away from the counter, arms folded and frowning. Looking a bit rejected, John again turns back to the computer. This time he opens a screen saver of a red panda and looks at it until the next visitor arrives.

One of the patterns uncovered through my research at the discovery centers was a difference between younger and older volunteers when soliciting interactions with visitors. Retirees, 5 out of 7, mentioned gauging visitor desire for engagement when they consider how to interact with people. Robert mentions to me in an interview that he adjusts his behavior and interactions depending on the age or culture of the person. He learned to do this in the semi-conductor business where he received training in multi-cultural backgrounds in order to interface on the job. He uses these skills at the museum and gives me the example of making a cultural connection with a Japanese visitor. “I will show them how to do something interesting in small phones - try to make a cultural connection by showing them the NNT. They will say, “Oh Nippon!” and smile and nod. It is by listening to them and trying to engage that I draw them out.”
This idea of measuring social engagement was repeated in other interviews. For example, Jim told me that “There are some people that come to this museum that really don’t want to talk to anybody and you kinda have to respect that. And they’ll come along the counter and they’ll look at this and you say “hi” and they’ll say “hi” and you can kind of tell. So you gauge people, you kind of have to, cause one of the most fun things about this place is all the different kind of people you run into cause they’re all over the lot. Here I see people of vastly different ages, vastly different comprehension of technical stuff, and so its not like you can treat everyone the same. You really have to try to figure out where the person is.” When asked where he picked up this skill Jim responds, “I mean, once you have lived 60 years or so you pick up some of that. (laughs)”

A second social difference between volunteers involves the depth of conversation and engagement. George, a retired geneticist and former president of a small company, uses multiple modalities to present information to a group of youngsters and adapts the information to the level of the visitor in the following interaction: George tells me that he is in his 70’s, although he looks much younger. He is wearing a blue wool sweater over a dress shirt, gray dress pants, glasses and the black apron emblazoned with the Tech logo. His hair is white and thinning and he is in good physical shape. George moves to the end of the counter to talk to a new group that has arrived. The group consists of two girls, a boy and a parent chaperone. As the chaperone translates into the display into Spanish, George notices that one child is picking up pacemakers and looking at them. George says to the group, “How does your heart sound?” He answers his own question by starting to clap in rhythm. The kids begin clapping with him. He then asks them, “How does your
heart sound when you run?” George and the kids begin clapping faster. “When you are sleeping?” They group claps slower. George continues, “Some peoples’ hearts don’t work that way.” He shows the group a pacemaker. “So a doctor puts this into a persons body to remind the heart of the correct rhythm.” George then shows them how the size of the pacemaker has changed since 1960 to what they use today. He takes out a diagram that shows where the pacemaker is placed within the body. He says, “They make the cut right here and slip it in, then connect it to your heart with a wire.” He demonstrates on his own body, near the collarbone, where the cut would be. The mother says to her child, “That’s why uncle Bobby has the cut right here.” The group moves from the counter to the bobsled ride next door.

Robert uses verbal questioning techniques to engage visitors in learning activities. He says, “I always ask them “I hope you are going to tell me how it works!” - to get them thinking. Most kids kind of go, “I haven’t a clue.” Every once in a while someone gets it. I had a 13 year-old girl explain the whole thing to me. I was like “WHOA!” He smiles and shakes his head. “When you run into that you have to be impressed. Those are the kinds of things I get a kick out of.” He then repeats the dialog he uses with young people, ““I hope you are going to explain this.” “I haven’t a clue” “Are you interested in knowing?” I always ask that because it’s easy to run off and be the expert, but it is better to have them teach me.” I ask him where he got his philosophy for interacting with people, and he tells me he uses ideas from teaching. His wife was an elementary school teacher and she always told him that students learn more by not telling them. She would
say, “Don’t tell the kids that, make them tell you!” Robert says that interaction is “fun that way. We are teachers down here. We really are.”

The young adult volunteers tended to keep interactions simple and brief, as Patrick, a high-school student told me, “I just sorta tell them what stuff is if they ask and help them use it. We just show them how to use stuff, we really don’t teach them anything.”

**Interpretation:**

The findings I have reported indicate that motivation, social skills and knowledge of technology are all factors that impact a volunteer’s ability to engage visitors in hands-on activities, share knowledge of technology and carry on discussions that personalize the museum experience. Volunteers clearly showed different levels of ability and interest in these areas, primarily based on age and experience. The retired volunteers brought a wealth of knowledge and life experiences with them to discovery centers along with an interest in talking to people, and it shows in the learning interactions.

- **Knowledge of Technology:**

  Volunteers clearly showed different levels of understanding concerning the technology at the discovery centers. This difference was demonstrated not only in how they talked about, or listed facts concerning the technology, but also by how adept they were at interpreting the information for visitors, and applying the ideas to examples that visitors can understand. Retired volunteers’ backgrounds in fields of science, engineering, and technology give them a familiarity with the content that allows them to tailor discussions
to the level of the visitor. They use their experience working with technology to inform their actions. Robert understood how to teach me about fiber-optic cable networks, because he understands the material so well. Clearly his knowledge of networking aided his ability to scaffold visitors understanding of what a telephone line is and how the connections work. Through a simple device, he was able to show me a complex process.

Interactions around the technology were much more difficult for the younger volunteers. While the young adults showed enthusiasm for the museum they often lacked specific knowledge of the technology. “I don’t know” or “Um…I’m not sure” was often overheard during my observations. It is difficult to predict and prepare for the wide variety of questions that visitors will ask without having a strong background in science and technology.

• **Life Experiences (Social Skills):**

Retirees seem particularly adept at engaging in social interactions around the discovery centers. They demonstrate the ability to gauge visitor interest in interaction and adapt accordingly. They do not carry the self-consciousness or shyness that was shown by the young adults. As Robert told me they don’t often have a problem with shyness, “…. It doesn’t bother me - nothing has ever bothered me. My sales experience has not made me shy and I have never been one to be shy.” They are very willing to reach out and draw a visitor into an interaction as George demonstrates: “Do you see these two papers?” She replies, “Yes.” “Lets do an experiment! Put one of each paper into a petrie dish.” The girl complies. “O.k. now, take this dropper. Practice squeezing into the jar.” The girl
squeezes drops of water back into the container. “O.k. now drop water onto each piece of paper, one first and then the other, see how many each piece can absorb. Count how many drops.” George actively works to bring the visitor into the demonstration instead of performing for them. This behavior shows both social and teaching skills, by putting the interaction into the experience of the learner and personalizing the museum experience.

**Motivation:**

The motivation for volunteering strongly maps to the quality of social interactions. The retirees told me again and again that their time in the gallery is their time to interact with people, while the young adults viewed it as their time to interact with technology. This difference is demonstrated in the willingness to reach out to people by the retirees and the reticence shown by the young adults.

The young adults seemed very hesitant to actively engage visitors in demonstrations or activities. Four out of five of the young volunteers I observed remained seated during most interactions and rarely initiated contact with visitors. They waited for the visitor to ask them a question, as Lucy told me, “I just sit here and wait for someone to ask me a question, and then I try to answer it.”

**Conclusion:**

The differences between volunteers in the areas of motivation, social skills and knowledge of technology strongly impact the quality of learning interactions at the
discovery centers. The older volunteers bring a wealth of experience and knowledge to their positions. This greatly enhances their ability to interact with visitors. Younger volunteers often lack the life-experience needed to build quality learning interactions with visitors. This study suggests that further research into the factors that inhibit younger volunteers from engaging in strong learning interactions with visitors may be beneficial to the design of training. Additionally, closer analysis of the interactions and interviews with visitors may help clarify the true disconnects and aid in understanding the process of learning at the discovery centers.

*Names have been changed.

**References**


