



# The Studio

## Summative Evaluation Report

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## EXECUTIVE SUMMARY

With support from the Institute for Museum and Library Services (IMLS), Pacific Science Center (PSC) created **The Studio**—also referred to as Research Focus Gallery in earlier grant documents—a portal to current medical research within the Science Center’s new human health exhibit, *Professor Wellbody’s Health and Wellness Academy* (Wellbody Academy). The Studio is a 500 ft<sup>2</sup> hybrid exhibit/program space that combines artifacts, hands-on exhibits, media, and a programming area where local researchers communicate their work to visitors. Using a magnetic peg-system that enables text and image panels to be repositioned and changed with ease, The Studio was designed to be flexible. This modularity enables the project team to install a new current research exhibit every six months.

The aim of the IMLS Studio project was to design and implement a cost-efficient, change-ready exhibit model that could serve as a means for museum visitors to learn about current science research. Being situated within a larger similarly themed permanent gallery, this exhibit offered an opportunity to investigate the nature of how visitors negotiate between the topics of current and established science and the spaces each of those occupy within their museum visit. The addition of science programming extended the opportunities for visitors to engage with authentic science experiences.

From the onset, The Studio presented the PSC project team with challenges. Delayed timing of the Wellbody Academy and the need to design, develop, and sustain The Studio and an additional change-ready exhibit, Portal to Current Research, required team agility and tenacity. Yet despite these issues, The Studio team successfully created an aesthetically compelling, content-rich exhibit space that showcased current health science research to museum visitors. During the grant period, three different exhibits were designed and installed; each was on display for a six-month period. These exhibits were on the topics of global health, genetics, and neuroscience. This summative evaluation study shows that this changing exhibit/program hybrid space was effectively embedded within the larger permanent gallery and that it can serve as a flexible, cost-efficient model for other institutions.

Data was collected for this summative evaluation study throughout the grant period, from October 2012 through December 2013; findings from the formative evaluation study were incorporated where appropriate. Below are highlights from each audience:

### PSC Visitors

Data was collected from two types of visitors: 1) *casual visitors* to the Science Center who were either intercepted near The Studio and asked to participate in facilitated exit surveys, or video recorded as they approached, entered, and/or explored The Studio; 2) *cohort visitors* who applied and were selected to participate in a long-term study requiring them to visit The Studio approximately every six months as exhibit themes changed. These participants were observed during their visit, interviewed on site, and completed a follow-up online survey some weeks after their visit.

- An estimated 75% of PSC visitors were exposed to The Studio during their visit, with over half (53%) being in mixed groups of adults and children.

- 40% of visitors stopped to explore the exhibit (by walking up to and watching, reading, or engaging with at least one exhibit element). Notably, over half of the visitors observed (54%) walked through the space without stopping.
- On average, visitors stayed in The Studio for 4 minutes and 7 seconds, which was comparable, if not better than similarly sized temporary exhibits in PSC (installed in the Portal to Current Research).
- Within Theme 3, the most popular elements were the mouse brain kiosk, the Mindball® game, and Discovery Carts. Additionally, Scientist Spotlight programs were highly valued by visitors and most reported learning something new from their interactions with scientists and in the exhibit (4.56 out of 5).
- 73% of responses from cohort group post-visit surveys revealed that their Studio was still memorable, with most remarking on specific elements they particularly enjoyed.
  - 87% of respondents said that non-computerized, hands-on activities contributed to their group’s exhibit enjoyment (rated either “Extremely” or “Pretty Important”) and 84% indicated facts and content were important.
  - Two-thirds of cohort visitors reported that they, or someone in their group, had talked about the exhibit or content presented in the Studio to others. References to the *Next Generation Genetics* exhibit were more content-specific than those from the *Minds and Machines* exhibit, which were focused primarily on their Mindball experience.
  - 41% of cohort visitors indicated they had followed up on something they learned from their Studio visit. Again, the genetics exhibit appeared to elicit more specific action (e.g. researching topic on the internet, reading a book, being more aware of the topic in traditional or social media) than the exhibit on neuroscience.
- Although casual visitors interviewed ascribed a high value to The Studio (4.45 out of 5), their understanding of the nature and fit of the exhibit were less certain.
  - About 44% reported seeing content related to *health and wellness* research while 28% indicated they saw something relating to *current* research, and 24% recalled information about *local* research. Only 10% of casual visitors were aware that exhibits in The Studio changed on a regular basis.
  - Respondents rated The Studio’s ‘fit’ within the larger context of the Wellbody Academy a 3.51 out of 5; 60% indicated that the exhibit fit “Completely” while 32% responded more conservatively with “Mostly.” These results should be interpreted cautiously as the concept of ‘fit’ may be difficult for people to grasp and that visitors may interpret fit in different ways – content, layout, look-and-feel, etc.

Thus, while visitors were mostly positive about their experience in The Studio, they were still somewhat challenged by the exhibit. The physical layout did not encourage deep exploration and visitors subsequently

focused on only one or two parts of the exhibit—often interactive or visually interesting elements. The most appealing exhibit content tended to have personal relevance or meaning to their everyday lives. Juxtaposed to the kinetic and high-energy environment of the Wellbody Academy, the ‘seriousness’ of The Studio was often a difficult transition for visitors; and groups, particularly with young children, were not often compelled to dwell in the exhibit. While visitors indicated that they enjoyed The Studio and believed their experience added value to their overall PSC visit, they were less aware that it showcased current, local research and that the exhibit changed frequently.

Given these challenges, it is recommended that the project team develop visual “hooks” that grab the attention of passers-by and draw them into the exhibit. By creating opportunities for visual stimulation and active engagement that feature personally relevant content, The Studio can encourage curiosity and exploration. Additionally, the project team should consider incorporating small elements (e.g. visual, tactile, activity-based) that appeal to younger audiences to acknowledge and welcome family groups into the exhibit area. Programs—Discovery Carts and Scientist Spotlights—have been shown to add dimension and richness to visitor experiences and should therefore be developed so they more closely connect with and complement Studio exhibits. As a means to extend their exposure to the topics and encourage further study, The Studio should offer visitors in-exhibit resources such as a listing of websites and/or leaflets; and an online catalog of content and media archived from all Studio themes.

### **Participating Scientists**

Because this project not only focuses on The Studio as an exhibit, but also The Studio’s programming, it was important to understand the experiences of the scientists who were specifically trained to deliver face-to-face interactions with public audiences. Forty-three scientists and researchers representing 10 different organizations in the Puget Sound area completed PSC’s Science Communication Short Course training workshop and about half completed a follow-up online survey after participating in at least one public program. Overall, scientists’ experiences and attitudes were very similar to results from other Portal-related programs (e.g. Research Weekends), which positively reflect on the quality and consistency of PSC’s Science Communication Fellows program.

- The majority of respondents (77%) were employed in research positions; 5% were medical doctors. The most popular reasons cited for participating in the program were “to inspire others about science or to promote science” (29%) and “contribute to the public understanding of research” (26%).
- Almost all respondents (96%) believed that their skills in communicating science and their current research had improved with the majority (68%) reporting that their interactions with visitors caused them to think about their work in new ways.
- 82% of scientists indicated that their hands-on activities related directly to their current research. Respondents estimated that about half of visitors to their station asked questions about the topic or concepts presented and over three-quarters were interested in trying their hands-on activity. Additionally, scientists reported that about one-third of visitors engaged in observations about the activity or experiment presented.

- 41% of scientists expressed an interest in spending more time engaging with the general public than they currently do. Respondents were also in strong agreement (4.86 out of 5) that their participation in the program was a worthwhile effort and something they would recommend to a colleague.

Data suggests that for the majority of scientists (86%), The Studio exhibit space had at least “a little impact” on their presentations. Those who reported some influence explained that the accompanying Studio exhibit enabled them to refer visitors to objects, images or text panels that illustrated points they were presenting, or they felt that visitors in the exhibit space were primed to discuss the topic. Over half of the scientists (55%) believed that visitors they spoke with were able to make sort of connection between their presentation/activity and The Studio exhibit. As a result, almost half (46%) indicated they would prefer to be located within The Studio in future public programs. Given these findings, a more strident effort should be made to design a scientist recruiting strategy that maximizes the opportunities to support the potential for a hybrid exhibit/program model; and scientists should be trained more explicitly to help visitors make connections between their activities/presentations and The Studio exhibit.

In addition to the programmatic issues, the physical and logistic challenges of locating scientist stations within or adjacent to The Studio present an additional problem. Because there is nothing that can be done with the exhibit layout, it is recommended that the project team continue to experiment with station locations and perhaps designing a specific place in the exhibit for scientists and their activities.

### **Museum Professionals**

To address the full impact of this project, it was important to understand this initiative from the project team’s point of view. This investigation would contribute to better understand whether The Studio is a model that informal science institutions can replicate or adapt. To this end, data was collected from two types of museum professionals: 1) PSC staff who were responsible for the development and implementation of The Studio project; and 2) ISEs from 15 other museums across the United States who attended a Portal to the Public dissemination workshop hosted at PSC.

Although the scope of the project was ambitious, the project team successfully delivered a hybrid exhibit/program model that was proven achievable and sustainable. ISEs from museums across the U.S. acknowledged the value and viability of the hybrid exhibit/program model. Specifically, they noted that the model would contribute to the field’s current science initiatives and provided museums, like theirs, with an innovative approach to exhibit development.

In addition to contributing to the professional development of the project team, The Studio also served as an opportunity for PSC to build productive and collaborative relationships with local scientists, researchers, and science organizations. Through this initiative, PSC engaged and re-engaged with the science community, cultivated new relationships, deepened existing ones, and identified new opportunities for future partnerships. Sustainability is an important outcome for The Studio, and as part of an effort to improve and refine their project approach the team developed several recommendations, some of which have already been adopted.

- **Project management:** Establish a project advocate to better manage deliverables and ensure a clear decision-maker for the initiative. Centralize project information flow and minimize redundancy of one-on-one meetings and miscommunications as a way to engage everyone in discussion and contribute to problem solving. Increase collaboration with Exhibits in order to better integrate them into The Studio theme development process.
- **Content from science community:** Rely on science community experts to review content, suggest local resources, and provide artifacts and media. The team should also leverage these relationships to source materials and develop in-house solutions with the goal of doing less but at a higher quality. In the same vein, the project team should tighten themes and present focused content that is meaningful and relevant to visitors, and devise a strategy to assess content presentation options.
- **Integration of program and exhibit:** To ensure that the match between scientists and exhibit content is strong, The Studio team should first select the exhibit theme, then recruit and train Fellows who fall within that field of science. This new process will ensure a greater number of content experts per exhibit theme and it will ensure greater connectivity between exhibit content and interactive scientist-led experiences.
- **Exhibit development cycle:** The team should move the development cycle to nine (9) months to one year to allow for more planning and prototyping time as well as opportunities for richer content development, stronger ideas and solutions, and a higher-quality visitor experience.

In August 2011 Pacific Science Center received funding from National Institutes of Health (NIH) for a five-year project entitled, **Out of the Lab and Into the Spotlight (OLIS)**, the goal of which is to bring vital health science research and career information to the Pacific Northwest. The Studio—the exhibit and its programs—will continue to play a central role in this project, and it will be joined by robust programs: Life Sciences Research Weekend (LSRW), an annual, four-day research festival, Discovery Carts, and Science Cafés.

OLIS will build on Pacific Science Center’s strengths by integrating The Studio with a unique combination of tested, successful science engagement approaches already in place at PSC and by drawing on our established relationships with local research organizations. By presenting the groundbreaking research and innovations taking place in our own backyard, the proposed project will have particular relevance for the community.

Thus, the findings and recommendations identified through this IMLS-funded summative evaluation process will support further project innovation. As The Studio evolves through this new funding source, there are continued opportunities to improve the strategies and practices of the exhibit/program hybrid model and further understand its possible impacts on museum visitors.





# TABLE OF CONTENTS

EXECUTIVE SUMMARY .....	3
OVERVIEW .....	13
<i>Project Impacts</i> .....	13
<i>Studio Exhibit &amp; Program</i> .....	14
<i>Studio Themes</i> .....	15
<i>Project Audiences</i> .....	16
EVALUATION OBJECTIVES .....	17
METHODOLOGY .....	18
<i>Pacific Science Center Visitors</i> .....	18
<i>Participating Scientists</i> .....	20
<i>Museum Professionals</i> .....	20
<i>Limitations of Study</i> .....	22
PACIFIC SCIENCE CENTER VISITORS .....	23
<i>Exposure to Research on Current Health</i> .....	23
<i>Exhibit Attendance</i> .....	23
<i>Stay Times</i> .....	25
<i>Exposure to Health Science Careers</i> .....	27
<i>The Studio Engagement</i> .....	28
<i>Who and Where</i> .....	28
<i>Attraction and Holding Power</i> .....	29
<i>The Studio's Programs/Exhibit Effectiveness</i> .....	32
<i>Scientist Spotlights</i> .....	32
<i>Cohort post-visit surveys</i> .....	35
<i>Understanding the Concept, Fit, and Value of The Studio</i> .....	42
<i>Concept Comprehension</i> .....	42
<i>Studio Fit with the Wellbody Exhibit</i> .....	42
<i>Valuing The Studio</i> .....	44
PARTICIPATING SCIENTISTS .....	46
<i>Scientist Background</i> .....	46
<i>Science Communication &amp; Outreach</i> .....	47
<i>Station Presentation/Activity</i> .....	48
<i>Impact of the Physical Exhibit</i> .....	49
<i>Impact of Scientist Participation</i> .....	52

MUSEUM PROFESSIONALS .....	55
<i>Project Approach</i> .....	55
<i>Project Challenges</i> .....	55
<i>Successful Strategies &amp; Practices</i> .....	57
<i>Program Impact &amp; Value</i> .....	58
<i>Personal &amp; Institutional Impact</i> .....	58
<i>Impact on Science Community</i> .....	59
<i>Impact on the Field</i> .....	60
<i>Adopting New Strategies to Sustain The Studio</i> .....	62
<i>Lessons &amp; Advice</i> .....	63
CONCLUSIONS & RECOMMENDATIONS .....	64
<i>Pacific Science Center Visitors</i> .....	64
<i>Participating Scientists</i> .....	68
<i>Museum Professionals</i> .....	69
<i>Areas of Further Study</i> .....	70

# LIST OF TABLES & FIGURES

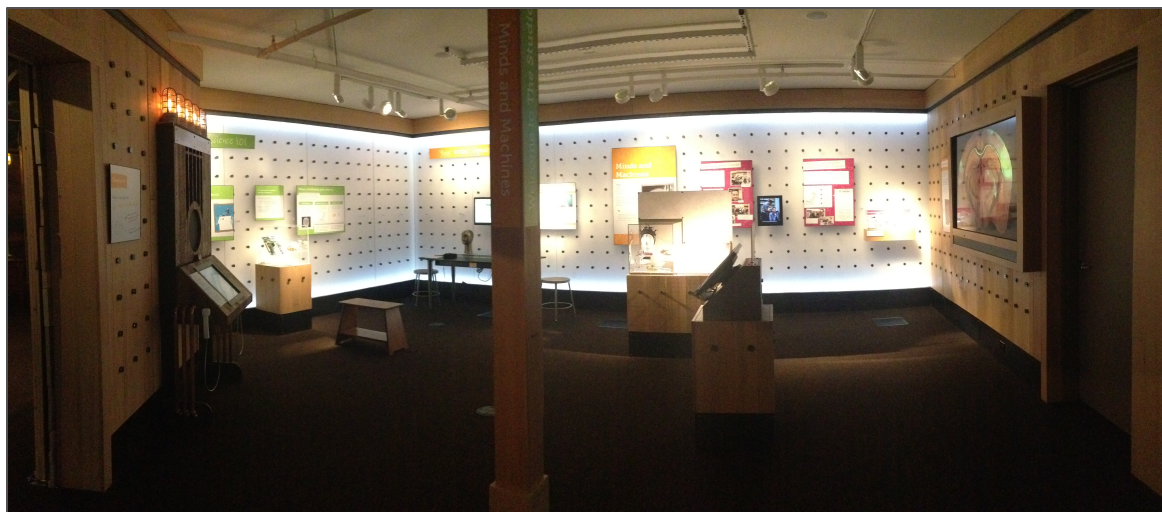
Table 1: <i>Project outcomes and possible indicators</i> .....	17
Table 2: <i>Description of sample by audience and method</i> .....	21
Table 3: <i>Thanksgiving week recording statistics</i> .....	24
Table 4: <i>How visitors behaved in The Studio</i> .....	24
Table 5: <i>Visitor behavior when a Discovery Cart is present</i> .....	25
Table 6: <i>Career Machine careers and card questions</i> .....	27
Table 7: <i>Where Studio “Explorers” entered from and how they moved around the room</i> .....	29
Table 8: <i>Where Studio “Explorers” stopped first and where they spent the most time</i> .....	30
Table 9: <i>Scientist Spotlight ratings</i> .....	34
Table 10: <i>Value-add and interest in Scientist Spotlight</i> .....	34
Table 11: <i>Memorable-ness of The Studio</i> .....	35
Table 12: <i>Importance of exhibit elements to cohort enjoyment of The Studio</i> .....	36
Table 13: <i>Cohort discussion about The Studio</i> .....	38
Table 14: <i>Further cohort engagement with Studio topics</i> .....	39
Table 15: <i>Understanding of big picture Studio concepts</i> .....	42
Table 16: <i>Fellowship and survey participants</i> .....	46
Table 17: <i>Current position</i> .....	46
Table 18: <i>Engagement with Pacific Science Center over past 2 years</i> .....	47
Table 19: <i>Reasons for participating in public outreach</i> .....	47
Table 20: <i>Observed visitor behaviors</i> .....	48
Table 21: <i>Main benefit of Scientist Spotlight</i> .....	53
Table 22: <i>Impact of Spotlight experience on scientists</i> .....	54
Figure 1: <i>Studio maximum, minimum, and average stay times</i> .....	26
Figure 2: <i>Visitor knowledge of Studio topics</i> .....	33
Figure 3: <i>How well cohort members think The Studio fits in with Wellbody Academy</i> .....	43
Figure 4: <i>How effective do you feel your presentation or activity was?</i> .....	49
Figure 5: <i>To what extent did the exhibit positively contribute to your presentation or activity?</i> .....	50
Figure 6: <i>To what extent do you feel visitors connected your research activity with the exhibit?</i> .....	51
Figure 7: <i>Since participating in this program, to what extent do you feel your skills in communicating science and current research have changed?</i> .....	53



## OVERVIEW

Museums have the potential to connect science more directly to local and regional communities, giving the scientific enterprise a greater sense of place, proximity, relevance to the community and regional pride. For museums that aspire to establish themselves as the interfaces between current science and the public in the 21<sup>st</sup> century, these connections can come in the form of a simple, flexible, and replicable model for showcasing current research. These scalable spaces provide an efficient way for their communities to explore the research conducted in their regions and in their neighborhoods.

With support from the Institute for Museum and Library Services (IMLS), Pacific Science Center (PSC) created The Studio—also referred to as Research Focus Gallery in earlier grant documents—a portal to current medical research within the Science Center’s new human health exhibit, *Professor Wellbody’s Health and Wellness Academy* (Wellbody). The Studio is a hybrid exhibit/program space, which combines artifacts, hands-on exhibits, media, and a programming area where local researchers communicate their work to visitors. Based on the best practices of integrating current research into museums but designed to be cost-efficient and scalable, The Studio serves as a model for any museum looking to incorporate current science research from their community. The Studio project also tests the concept of integrating a small, current research space into a large, permanent exhibit. The embedded nature of The Studio represents an opportunity to learn how visitors negotiate between the topics of current and established science and the spaces each of those occupy within their museum visit.



### ***Project Impacts***

This project centers on achieving both micro- and macro-level goals. Within the context of The Studio exhibit, the project goals were to:

- Create a sustainable and engaging current science experience for visitors within a larger health themed exhibit.
- Create opportunities for the public to interact with active research scientists.
- Communicate on-going findings of regional health-related research.

- Create a flexible, scalable platform for regional researchers seeking to share their work with the public.

And while The Studio (and the Wellbody Academy) is focused on health and medical science, the project has the potential to impact the field in broader ways. Specifically, it aims to increase the capacity of museums to address their community's need for current science research, by:

- Serving as a platform for current science research within the scope of a larger, permanent exhibit.
- Developing a cost-effective, flexible model for integrating current science research into a larger exhibit.
- Securing partnerships with research organizations to provide mechanisms for them to easily and effectively disseminate their research to the public.

### **Studio Exhibit & Program**

The Studio is a 500 ft<sup>2</sup> exhibit space that incorporates two (2) large LCD video screens, object cases, and an assortment of digital media and tactile interactive displays. Content is presented along the exhibit walls using a magnetic peg-system that enables text and image panels to be repositioned and changed with ease. The modularity of this exhibit design supports the fact that The Studio will install a new current research theme every six months.



The Studio's integration within the Wellbody Academy is reinforced by the presence of the Career Machine, an interactive touch-screen station that is physically similar to the half dozen "Network Stations" in other rooms of the health and wellness exhibit. All Networks Stations, including the Career Machine, feature the option to create a log-in under which visitors can store quiz scores and in the case of The Studio version, careers that interest them.

In addition to the exhibit space itself, face-to-face programs in The Studio offer an opportunity for museum visitors to interact with scientists and science interpreters and engage in hands-on learning about the showcased theme or topic. In preparation for their program, scientists take part in professional development workshops (*Short Course in Science Communication*) designed to enhance their comfort and skill in engaging with public audiences. As part of their training, scientists create materials-based activities and participate in a public program situated near or within The Studio exhibit. They are featured in monthly Scientist Spotlights that occur on the first Saturday of each month. To complement these scientist-led programs, PSC's science interpretation staff developed 1-2 hands-on cart activities per theme that they facilitate with visitors in or

near The Studio exhibit. These Discovery Carts are presented in The Studio on a flexible schedule anywhere from one to three times a day.

### **Studio Themes**

The flexibility of The Studio space allows for exhibits to be installed approximately every six months. Themes are chosen to have broad appeal for audiences yet convey compelling current science that is supported by and advanced through the local Seattle science community. Each theme includes visual and multimedia elements related to local science organizations or research labs. Scientist Spotlight and Discovery Cart programs are developed to support each exhibit theme.

The three themes included in this summative evaluation study were:

- Theme 1: **Global Health** – This exhibit examined how scientists’ research in the Pacific Northwest is positively impacting the health of people around the world, particularly through research advancements in tuberculosis, malaria, and delivering safe drinking water.
- Theme 2: **Next Generation Genetics** – Using advances in technology, this exhibit demonstrated how scientists are making discoveries about how and when genes contribute to health and disease.
- Theme 3: **Minds and Machines** – Spurred by new understanding of how the brain works, this exhibit showed how local science labs are learning how to use brain signals to compensate for injury or lost function.

The development of these Studio themes involved a close partnership between PSC and the science community. First, the project team defined broad areas of science research and invited scientists and researchers who were conducting work within this general field to participate in science communication training. Concurrently, the team engaged people in the science community to serve as content advisors for the proposed topic; this often included 1-2 recently trained scientists. This group provided insight into the theme and helped focus the topic, connecting it more directly to current research happening at their labs and in their field. In addition, some content advisors were featured in videos produced for The Studio.

The Studio opened in June 2012 in a temporary location due to a one-year delay in the Wellbody Academy timeline. This strategy was employed to mitigate further delays in fulfilling this IMLS grant requirements. The first theme, *Global Health*, was installed in the temporary exhibit space and was open until February 2013. During this time, the project team concurrently planned and installed The Studio’s permanent location. Both the Wellbody Academy and the (permanent) Studio exhibit opened to the public in October 2012, with The Studio featuring *Next Generation Genetics*. This second exhibit ran until June 2013 when it was replaced by the third exhibit, *Minds and Machines* that ran from June to December 2013.

## ***Project Audiences***

This summative evaluation study includes three audiences: 1) visitors to Pacific Science Center, 2) participating scientists, and 3) museum professionals. The following describes their involvement in this project.

- 1. Museum Visitors:** Public audiences had opportunities to not only experience one or more Studio exhibits during this grant period, but also engage local scientists (and science interpreters) in face-to-face interactions, giving them a greater appreciation and understanding of science and the scientific research happening in their community. Data was collected from two types of visitor:
  - *Casual visitors* who are visiting the Science Center; and
  - *Cohort* of 42 groups and individuals who applied for and agreed to participate in a long-term study requiring them to visit The Studio exhibit every six months to explore each topic (starting with Theme 2). The cohort members were able to deliver in-depth feedback on exhibit elements and often offered insights into casual visitor reactions that the evaluation team would not have been able to intuit otherwise.
  
- 2. Participating Scientists:** Prior to their outreach program, local researchers took part in professional development workshops designed to enhance their science communication skills and comfort in interacting with public audiences. Their training culminated in the development of a materials-based interactive based on their own research that they facilitated at public programs situated near or within The Studio exhibit (i.e. monthly Scientist Spotlights that occur on the first Saturday of each month). Graduates of the training program became PSC Science Communication Fellows, a group that spans many scientific fields and disciplines.
  
- 3. Museum Professionals:** To understand the practicalities of The Studio project as well as the appeal and viability of The Studio concept, two types of informal science educators participated in this study.
  - *PSC Studio Team:* This is a group of 3-4 members who were responsible for the design, fabrication and installation of The Studio, as well as the iterative conceptualization and installation of each Studio exhibit. The Studio project exposed this team to scenarios and challenges in delivering a new model for current science exhibitions and programming; and leveraged their expertise in adapting practices and capacity to bring current science research to PSC in an innovative manner.
  - *Other ISE Museum Professionals.* As part of their involvement with the IMLS-funded Portal to the Public National Network (PoPNet) project, ISEs from 15 science museums across the country were asked to provide feedback on The Studio exhibit. These ISEs participated in PoPNet dissemination workshops hosted by Pacific Science Center and thus were able to see The Studio in person. Their feedback was used to complement the internal perspectives of the PSC Studio team.



## EVALUATION OBJECTIVES

While formative evaluation was designed to inform the iterative development of The Studio, this summative evaluation study examines the effectiveness of the exhibit as a whole and evaluates the extent to which the project has achieved its intended audience outcomes as follows:

1. Visitors are exposed to current research on health and wellness-related topics as well as career choices within this field.
2. Visitors understand the concept of The Studio; how it is integrated into the overall Wellness exhibit; and believe it adds value and context to their overall Wellness experience.
3. Visitors feel The Studio is an engaging and effective component of PSC's Wellness initiative.
4. Researchers/scientists increase their confidence and competence in communicating with the public.
5. Researchers/scientists demonstrate ongoing interest in public outreach.
6. PSC develops capacity and expertise in designing an innovative and sustainable model for current science exhibits/programs.
7. PSC grows and maintains strong partnerships with regional research organizations.

Further, potential indicators were developed to match outcomes and more clearly define measure of success.

**Table 1:** *Project outcomes and possible indicators*

Evaluation Outcomes	Possible Indicators
Visitors are exposed to current research on health and wellness-related topics; as well as career choices within the field.	<ul style="list-style-type: none"> <li>• General attendance rates</li> <li>• Exhibit capture rate</li> <li>• Data from career kiosk</li> </ul>
The Studio project is engaging and effective.	<ul style="list-style-type: none"> <li>• Dwell time for individual elements</li> <li>• General visitor behavior</li> <li>• Visitors demonstrate content knowledge/recall</li> <li>• Visitors self-report increased awareness of:               <ul style="list-style-type: none"> <li>○ Specific content items</li> <li>○ Health careers</li> </ul> </li> </ul>
Visitors understand The Studio concept.	Visitors understand that: <ul style="list-style-type: none"> <li>• The Studio is a changing exhibit space</li> <li>• The exhibit showcases current research</li> <li>• The exhibit showcases health and wellness research</li> <li>• The Studio is an integrated component of the Wellness exhibit.</li> </ul>
Visitors feel The Studio exhibit and/or programs add value to their PSC visit.	<ul style="list-style-type: none"> <li>• Visitors indicate that the exhibit/programs added value to their visit</li> <li>• Visitors indicate that they intend to return for future Studio visits</li> <li>• Visitor return to The Studio for more visits</li> </ul>

Evaluation Outcomes	Possible Indicators
Researchers increase skills in communicating with the public.	<ul style="list-style-type: none"> <li>• Researchers report increased skills (confidence, competence) as a result of participating in workshops</li> <li>• Researchers report increased skills (confidence, competence) as a result of participating in public programs</li> </ul>
Researchers demonstrate ongoing interest in public outreach.	<ul style="list-style-type: none"> <li>• Researchers report positive attitude about outreach</li> <li>• Researchers report intent to participate in (any) public outreach program beyond initial PSC commitment</li> <li>• Researchers participate in (any) public outreach program beyond initial PSC commitment</li> </ul>
PSC grows and maintains strong partnerships with regional research organizations	<ul style="list-style-type: none"> <li>• Organizations/individuals work with PSC over the course of the grant</li> </ul>
PSC develops innovative model for current science exhibit/programs that is appealing to the ISE field	<ul style="list-style-type: none"> <li>• PSC builds staff capacity</li> <li>• PSC builds departmental and programmatic synergies and streamlined processes</li> <li>• Other museums express interest in model</li> </ul>

## METHODOLOGY

Data was collected for this summative evaluation study using a combination of qualitative and quantitative methods and instruments, and are described by audience groups as follows:

### *Pacific Science Center Visitors*

Although data was collected from PSC visitors in Themes 1 and 2, these results were primarily formative in nature and served to inform early exhibit development as well as evaluation instruments and protocol. This strategy reflected the fact that The Studio was still evolving, and evaluation practice along with it. For this summative evaluation study, data was collected using a greater variety of methods and in general, findings are reflective of Studio's Theme 3.

Data was collected from two types of visitor: 1) **casual visitors** to the Science Center who were intercepted near The Studio on the exhibit floor when data collection was convenient or necessary (in the case of monthly Scientist Spotlight programming); and 2) a **cohort** of 42 groups and individuals who were specifically recruited to participate in a long-term study requiring them to visit The Studio exhibit every six months to explore each topic (starting with Theme 2).

1. **Casual Visitors:** Three studies were conducted to gauge the casual visitor experience – an experience that an average guest to the Science Center might have on any given day.
  - **Facilitated Exit Surveys** were conducted with adults (18 and over) who had spent at least one minute in The Studio exhibit. The facilitated questionnaire aimed to gauge visitors' comprehension of The

Studio *concept*, its fit within the larger Wellbody Academy, and their perceived value of the space. Evaluation Assistant Volunteers collected a total of 50 surveys in November 2013.<sup>1</sup>

- A second **exit survey** was prepared for those adults who spent time speaking with a scientist or researcher during monthly Scientist Spotlight programs held within the exhibit. This instrument was designed to capture attendees' attitudes toward the program and its impact. Members of the Evaluation team collected a total of 59 surveys between August 2012 and December 2013.<sup>2</sup>
- A **video-recording study** was designed to replicate the traditional timing and tracking methodology in order to eliminate the need to have a data collector intrude on guests in such a small space. It also allowed the evaluation team to schedule observations during conveniently busy times and removed the need to obtain and train additional data collectors.

Two cameras were installed in The Studio to provide complementary views; one to record visitors' ingress and egress through the two doorways and the other to record what visitors were doing in the space if they decided to engage with it rather than pass through. Recording took place during Thanksgiving week of 2013. The Science Center was open for five days and the cameras were programmed to capture video data for two and half hours each day resulting in 12.5 hours of footage per camera. The schedule alternated between mornings and afternoons, although no statistically significant differences were found based on time of day. The recording window allowed for analysis of about one-third of the week's operating hours. Nvivo 10 software was used to play back the video at high speed. Video data was analyzed in two ways:

- *General Capture Rate*: When analyzing the entryway video, a tally was kept of every individual that entered the space of their own volition (babes in arms or strollers were not counted). Additionally, everyone was tagged by their level of interaction with the exhibit: *Walk-through* (proceeded directly from Building 3 to the Wellbody Academy or vice versa without interacting with the space at all); *Pause* (did not interact with anything in the exhibit but stopped on their way through to look around); or *Explore* (came in contact with or looked closely at least one element of the exhibit whether physical or programmatic).
- *Timing and Tracking*: Exhibit video tracking analysis was implemented as if the evaluator were physically on the floor with one caveat: only visitors in the *Explore* category (described above) were examined. The first "Explorer" to cross a threshold into the exhibit area was tracked until they left the exhibit. The video was then paused and several attributes were categorized. Upon restarting the video the next person to enter the space was tracked. Visitors who simply walked from one doorway to the other and did not enter the interactive area were not eligible to be tracked.

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<sup>1</sup> Casual visitor feedback was also collected during Theme 1 when The Studio was located in a temporary space as described previously. That data was formative in nature and is not included in this report.

<sup>2</sup> Scientist Spotlight surveys collected during Theme 1 **are** included in this report. The data was reflective of the program and the instrument remained unchanged once The Studio opened in its permanent location.

These efforts provided: estimated attendance of the space, general traffic patterns and dwell time, as well as insight into the most attention-grabbing exhibit elements and knowledge of which interactives visitors spent the most time with. During 12.5 recorded hours, 2,168 visitors entered The Studio. Of those, a total of 118 were timed and tracked as they explored the space.<sup>3</sup>

2. *Studio Visitor Project Cohort:* During the early stages of formative evaluation, the exhibit design team asked for more detailed insights than casual visitors were able to provide. A long-term study was planned to allow the same group of visitors to provide feedback both thoroughly and repeatedly, allowing for intensive comparisons across themes. Applicants were solicited through PSC's e-newsletter and social media outlets. Out of the 300 applicants, 50 were invited to participate and 42 joined the study. The majority of groups were families although there were a handful of pairs and individuals. Cohort members agreed to be observed as they explored The Studio exhibit and participated in interviews with an evaluator immediately after seeing the exhibit. One week after their visit, they were e-mailed a survey addressing awareness of exhibit topics and impacts, if any, on their daily lives. In exchange for their commitment, they received a one-year family membership or membership renewal to Pacific Science Center. The groups participated in 78 observed visits/interviews and completed 63 post-visit surveys between April and November 2013.

### ***Participating Scientists***

Each Studio theme had a group of 12-15 scientists who were trained as part of the Science Communication Short Course. Each cohort of scientists was asked to complete an online survey after their public program experience. While scientists may have returned to participate in more than one public program during the grant period, they were asked to complete the survey only once. The questionnaire included open-ended, multiple choice, and Likert-type (rating) questions about their public outreach experience, the degree to which their activity/presentation related to The Studio space, as well as classifying information about their work. The survey was hosted by SurveyMonkey® and allowed scientists to respond anonymously, at their convenience. Data was collected from a total of 22 scientists from August 2012 to October 2013; all representing one of the three themes included in this study.

### ***Museum Professionals***

Data was collected from two types of museum professionals: 1) **staff** based at Pacific Science Center who were responsible for the development and implementation of The Studio project; and 2) **ISEs** from 15 other museums across the United States who attended a Portal to the Public dissemination workshop at Pacific Science Center. These two groups contributed different perspectives on the issues of project development and model viability and appeal.

- *PSC Studio Team:* The goal for this audience was to define the practicalities of designing, implementing, and sustaining The Studio, and as such, qualitative methods were used to allow for dialogue and broad

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<sup>3</sup> Some paper-pencil timing and tracking was conducted as the technical aspects of the video study were being worked out. The 18 instruments that were collected served as pilot studies and reference for the final video protocol and are not included in this report.

exploration of discussion topics. A combination of semi-structured face-to-face and telephone interviews were conducted in December 2013. These interviews focused on understanding key practices and challenges of their endeavor, the impact of their experience, and the long-term feasibility of The Studio model. Interviews were 30-40 minutes in length. The researcher took notes during the interview and interviews were audio recorded if conducted in person. A total of four (4) interviews were conducted.

- *Other ISE Museum Professionals:* The availability of this external group was fortuitous and provided an effective way for researchers to solicit feedback among the field about the interest in The Studio concept. These ISEs participated in three-day dissemination workshop as part of the Portal to the Public National Network project at Pacific Science Center. As part of their post-workshop debrief, attendees were asked to complete an online survey. Included in this questionnaire were a series of questions specifically aimed at understanding their interest showcasing current science at their institution, the appeal of a change-ready exhibit, and areas of enthusiasm and hesitation about The Studio model. The survey was hosted online by SurveyMonkey and allowed ISEs to respond anonymously, at their convenience. A total of 35 responses were collected from ISEs between June 2012 and July 2013.

**Table 2: Description of sample by audience and method**

Audience	Method/Instrument	Sample	Period
PSC Casual Visitors	Facilitated Exit Surveys (Exhibit only)	50	Nov 2013
	Facilitated Exit Surveys (Scientist Spotlight only)	59	Aug 2012 – Dec 2013
	Video Tracking	118	Nov 2013
Cohort Members	Paired Observation/Exit Interviews	78	Apr – Aug 2013
	Post-visit Survey	63	Apr – Nov 2013
Participating Scientists	Online Survey	22	Aug 2012 – Oct 2013
Museum Professionals	1:1 Interviews	4	Dec 2013
	Online Survey	35	Jun 2012 – Jul 2013

All qualitative data were analyzed within the context of the study’s overarching evaluation questions and a coding strategy was created inductively from themes in the data. Quantitative data were analyzed for frequency distribution, central tendencies, and statistical comparisons between samples made when appropriate. Additionally, formative feedback from dissemination workshops was incorporated into the summative study where appropriate. Data from each audience group were analyzed independently and then aggregated to formulate overall project conclusions where appropriate.

## ***Limitations of Study***

As with any evaluation study, the methods and sampling procedure have the potential to impact the findings, as does the circumstances of the audiences being studied. The following are suggested limitations of the study, based on the evaluators' best knowledge:

- *Exhibits were difficult to compare.* The dynamics and changing nature of The Studio made it difficult to compare across themes. Each exhibit was very different in terms of content (topics, approach, and reading level), textual and media elements, physical layout of the exhibit, and visitors' prior knowledge of the subject matter. Visitors were engaging with each exhibit so differently that only general patterns could be compared. As such, this summative study focused primarily on Theme 3—which is viewed as the culmination of formative learning from Themes 1 and 2.
- *Casual visitor data were not matched.* Casual visitor interviews were conducted during the last few weeks of the Theme 3 exhibit and with the purpose of understanding visitors' perceptions of the underlying nature of the exhibit. Timing and tracking data was collected using video observation of Theme 3 and was analyzed post-visit. These studies were independent of each other and the study subjects for each method was different. As such, there was no opportunity to match observations with interviews and speak with visitors to dive deeper into understanding their particular actions and behaviors in the exhibit.
- *Limited observational data on individual exhibit elements.* The physical layout of The Studio made it difficult to time and track specific elements and areas within the exhibit. For example, a single visitor could be looking to any number of exhibit areas while standing in the middle of the exhibit floor. This made it difficult for evaluators to identify specific elements that most resonated with visitors. Behavior and movement could only be recorded if the visitor was specifically attending to it (i.e. walked up to it, played with it).
- *Health career data limited to one source.* Investigation into exposure of visitors to health science careers was limited to the Career Kiosk. This was identified during project planning as the primary data indicator. While Scientist Spotlight programming and in-exhibit scientist videos may have touched upon career information, their focus tended to be more about exposing visitors to local research or explaining aspects of their own research. During Spotlights, some conversation did center on the scientist-presenter's job and how they got interested in the field of study. That said, visitors rarely mentioned careers/career paths in Spotlight interviews. In the same vein, not all visitors who entered The Studio played/watched the videos that showcased a scientist's background or career path. Because of this inconsistency, it was decided that the Career Kiosk provided the most direct indicator of visitors' exploration of careers.

## PACIFIC SCIENCE CENTER VISITORS

Data was collected from two types of visitor: 1) *casual visitors* to the Science Center who were intercepted near The Studio on the exhibit floor randomly and when data collection was convenient or necessary (in the case of monthly Scientist Spotlight programming); and 2) a *cohort* of 42 groups and individuals who applied for and agreed to participate in a long-term study requiring them to visit The Studio every six months to explore each topic (starting with Theme 2). The cohort delivered in-depth feedback on exhibit elements and often offered insights into casual visitor reactions that the evaluation team would not have been able to intuit otherwise. This audience was used to assess the degree to which the following objectives were met:

1. Visitors are exposed to current research on health and wellness-related topics as well as career choices within this field.
2. The Studio is an engaging and effective component of PSC's Wellness initiative.
3. Visitors understand the concept of The Studio; how it is integrated into the overall Wellness exhibit; and believe it adds value and context to their overall Wellness experience.

### ***Exposure to Research on Current Health***

To address the first visitor objective, several methods were used to address the various ways that visitors might have been exposed to health research and careers: exhibit attendance, stay times, and use of a health career kiosk.

#### ***Exhibit Attendance***

Exhibit attendance was challenging to estimate due to the layout of the space; it is located at the intersection of two Science Center buildings and features two large doorways directly across from each other, which were often utilized as a passageway to the Wellbody Academy rather than as ingress to explore the small space. Still, the video-recording study proved an effective way to get an accurate count of bodies through the space if for only a portion of each day.



Pacific Science Center attendance for the five days of Thanksgiving week was 8,776 with a much larger volume of visitors on Friday and Saturday.<sup>4</sup> During recording, 2,168 guests passed through The Studio space. Because recording occurred for one-third of the week’s operating hours, it can be extrapolated that 6,504 visitors may have passed through The Studio in total. This estimate represents about three-quarters (74%) of all Science Center attendees. Estimations and recording windows are broken out by day in the table below.

**Table 3: Thanksgiving week recording statistics**

	TOTAL	Mon	Wed	Fri	Sat	Sun
Actual PSC attendance	8,776	1,119	1,476	2,145	2,495	1,541
Recording window*	[12.5 hours per camera]	11am-1:30pm	1:30-4pm	1:30-4pm	11am-1:30pm	1:30-4pm
% of operating hours recorded	32.9%	35.7%	35.7%	31.2%	31.2%	31.2%
Bodies recorded going through Studio	2,168	317	377	506	597	371
Est. Studio attendance†	6,504	951	1131	1518	1791	1113
Est. % of PSC visitors to visit The Studio	74.1%	85.0%	76.6%	70.8%	71.8%	72.2%

\* PSC was open from 10am-5pm Monday and Wednesday and 10am-6pm Friday-Sunday for a total of 38 hours.

† All estimates were derived by multiplying *Bodies through Studio* by 3 (the **average % of operating hours**).

As attendance was tallied, individuals were categorized in one of three ways depending on the amount of engagement they seemed to have with The Studio: 1) walked through without slowing down or stopping; 2) walked in, paused and looked around and continued through; or 3) entered exhibit area and explored. This was a subjective sorting and to ensure consistency, the process was conducted by the same evaluator throughout video analysis.

The most prevalent group were the walk-throughs, visitors who never stopped or slowed down on their way from Building 3 to the Wellbody Academy exhibit (or vice versa). On average, 54% of guests behaved this way in The Studio. Individuals who explored the exhibit (by walking up to and engaging, reading, or watching at least one exhibit element) made up 40% of the recorded population. Finally, there was a small percentage (5%) that either entered the exhibit space fully or paused on their route through the space to look around. While there was no visible evidence that they interacted with the exhibit elements, they did pay more attention to their surroundings than those who purposefully walked through.

**Table 4: How visitors behaved in The Studio**

	AVERAGE	Mon	Wed	Fri	Sat	Sun
Walk-through	54.3%	47.3%	55.7%	56.9%	58.8%	53.0%
Explored	40.3%	51.4%*	39.8%	37.5%	32.0%	40.9%
Paused	5.3%	1.3%	4.5%	5.5%	9.2%	6.1%
% of Explorers that watched Scientist Videos	7.1%	4.9%	10.0%	6.8%	6.1%	7.8%

\* There was a slightly higher percentage that explored the space than on Monday and this increase is attributed to the school groups, both students and chaperones, who may have repeatedly entered the exhibit to play or observe.

<sup>4</sup> Attendance figures exclude IMAX-only ticket sales.



In addition to tracking the entire exhibit area, the doorway-facing camera was also able to capture visitor interactions with either a television screen of five scientist interviews, or when present, a Discovery Cart featuring hands-on exploration related to the exhibit. Because the Carts had such an impact on whether visitors walked through or explored the space, the statistics for those interactions have been included separately in the table below.

PSC science interpreters facilitate hands-on experiences with visitors and are trained to invite everyone, young or old, to try their activity—in this case touching a real sheep brain. The cart was present for three 30-minute periods and during those times the percentage of visitors who explored the space was over 68%, a 28% increase from when the cart was not present. And while not everyone that was an Explorer stopped at the Discovery Cart, 73% of them did.

**Table 5: Visitor behavior when a Discovery Cart is present**

	AVERAGE	Mon	Wed	Fri	Sat	Sun
Walk-through	29.0%	no cart present	no cart present	no cart present	40.8%	17.2%
Explored	68.5%				54.2%	82.8%
Paused	2.5%				5.0%	0.0%
% of Explorers that visited a Discovery Cart	72.8%				70.5%	75.0%

### **Stay Times**

In addition to providing precise visitation counts, the video study also allowed for timing and tracking. Each 2.5-hour exhibit-facing video segment was played back at high speed and on average, 24 visitors were tracked each day. A total of 118 visitors were tracked throughout Thanksgiving week.

Observed visitors spent a minimum of 23 seconds and the maximum time of 19 minutes and 44 seconds exploring the space. The average stay time across all five days was 4 minutes and 7 seconds (coincidentally, this was also the average time for Wednesday).

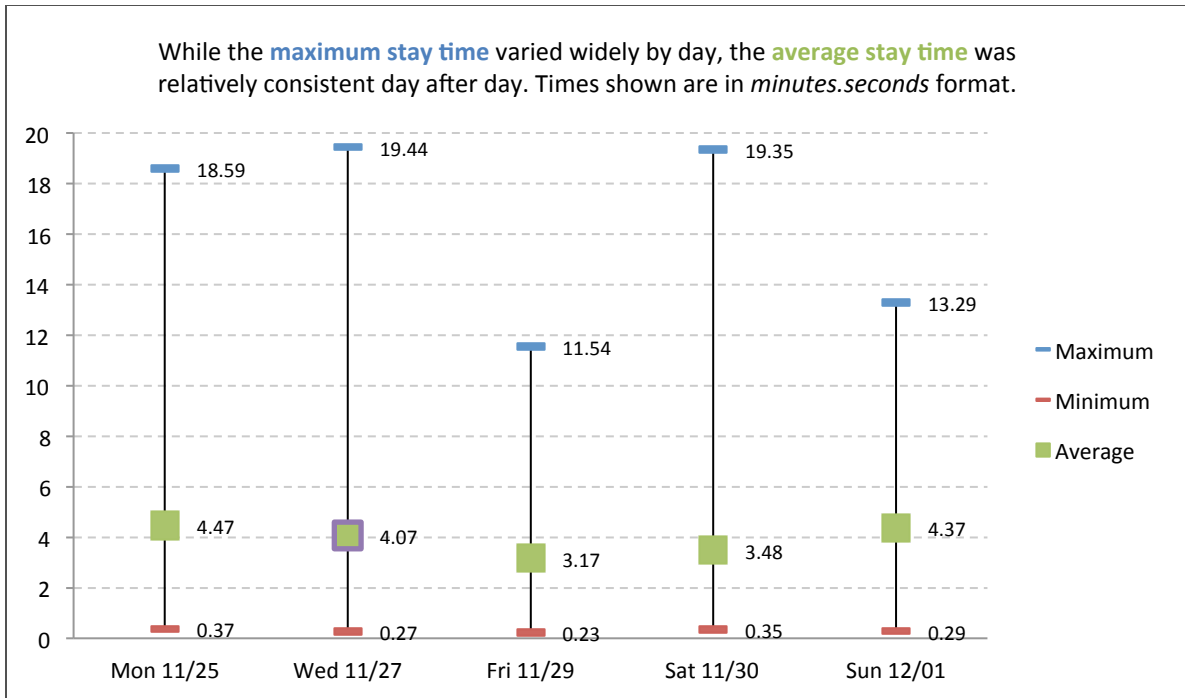


Figure 1: Studio maximum, minimum, and average stay times

While stay times of over ten minutes were not common amongst those individuals who were timed and tracked, there were likely many visitors who spent that long in The Studio. The reason for extended stay times can be attributed to the presence of an EEG biofeedback game called Mindball (see photo below). This game was extremely popular and based on video data it was occupied 85-92% of the time. Visitors



frequently spent as much or more time watching others and waiting for a turn as they did playing the game.

Museums sometimes refer to an index called the *sweep rate* as a measure of how long visitors are lingering in an exhibit.<sup>5</sup> A *lower* resulting index indicates a longer average stay time considering the size of the space. When the square footage of The Studio, 500, is divided by the average time spent, 4.11 minutes, a sweep rate of 121 results. Although timing data was not available for previous Studio exhibits, similar small exhibits in the Portal to Current Research space at Pacific Science Center have resulted in sweep rates of 133 (*Exploring our Solar System with local NASA Scientists*), 210 (*Investigating Arctic Ice Melt*), and 276 (*Life in Extreme Environments*).

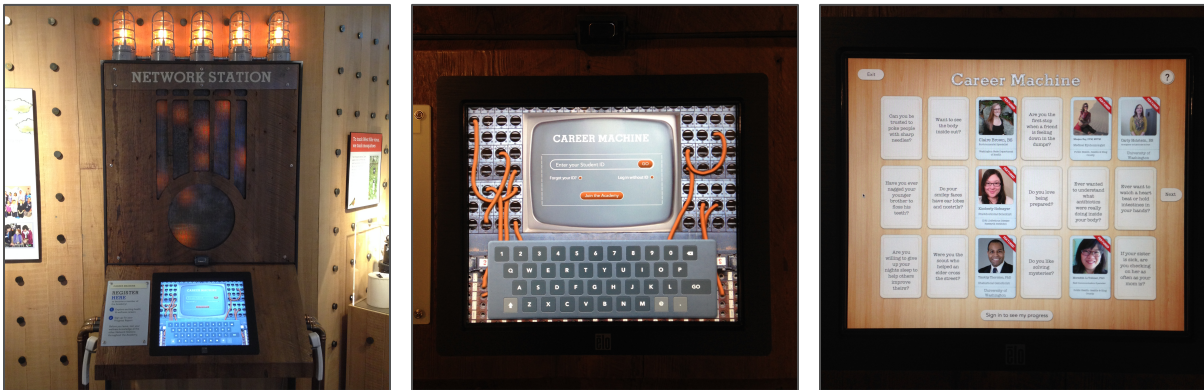
While it would be ideal to compare the index of The Studio to other frequently visited areas of the

<sup>5</sup> The sweep rate metric was popularized by a prominent museum evaluation consultant, Beverly Serrell, and discussed in her book *Paying Attention: Visitors and Museum Exhibitions* (1998).

Science Center, given the available data, it is clear that *Minds and Machines* has a comparable, if not stronger holding power than similarly sized temporary exhibits.

### *Exposure to Health Science Careers*

Aside from the exhibit and program content that highlights the work of local scientists and researchers,<sup>6</sup> The Studio also contains a permanent interactive kiosk called the Career Machine that displays profiles of 36 different careers in health and wellness fields. Each page features six local scientist photos and twelve teaser questions such as, “Do your smiley faces have earlobes and nostrils?”



Back-end data was made available for which careers were tapped and by who (if the user signed in using their Wellbody Academy ID). The three-month period from August-October 2013 was chosen for analysis because scientists from Themes 2 and 3 were featured and there was also high attendance at the Science Center in general.<sup>7</sup>

Over the course of three months, or 84 operating days, 4,905 careers were viewed—an average of 58 per day. The most tapped careers were, unsurprisingly, those on the first page. The top ten careers viewed made up 47% of the total taps.

**Table 6: Career Machine careers and card questions**

Career	Card Content	Taps	% of all taps
Epidemiologist	<i>Do you like solving mysteries?</i>	460	9.4%
Surgical technologist	<i>Do you love being prepared?</i>	280	5.7%
Counseling psychologist	<i>Are you the first stop when a friend is feeling down in the dumps?</i>	237	4.8%
Medical sonographer	<i>Want to see the body inside out?</i>	225	4.6%
Biomedical engineer	<i>Do you think the Transformers are cool?</i>	196	4.0%

<sup>6</sup> As discussed in the Limitations of Study section, the exhibit content and Scientist Spotlight program were viewed as providing only peripheral exposure to career choices. Thus, while they exposed visitors to people in science and local research, they did not consistently expose visitors to choice.

<sup>7</sup> Wellbody Academy was still under construction when Theme 1 debuted and since the Career Machine is a Wellbody element, researchers from the Global Health exhibit are not present in the kiosk.

Career	Card Content	Taps	% of all taps
Registered nurse	<i>If your sister is sick, are you checking on her as often as your mom is?</i>	194	4.0%
Medical illustrator	<i>Do your smiley faces have earlobes and nostrils?</i>	188	3.8%
Surgeon	<i>Ever want to watch a heart beat or hold intestines in your hands?</i>	187	3.85
Acupuncturist	<i>Can you be trusted to poke people with sharp needles?</i>	182	3.7%
Sleep technologist	<i>Are you willing to give up your night's sleep to help others improve theirs?</i>	163	3.3%

Interestingly, Studio-specific careers were tapped less often.

- Theme 3 (i.e. neuroscience) careers, on the first page of cards, were in the middle third of the rankings; the most popular of that set were: research scientist, philosopher/ethicist, and lawyer.
- Theme 2 (i.e. genetics) related jobs, on the second page, were in the bottom third; the most popular of those were: forensic scientist, clinical geneticist, and family genomicist.

It is possible that the portraits of researchers (with their career clearly listed on the card) are not as compelling as the question-only cards. Curiosity about what the “answers” on the question cards may be driving a large portion of taps regardless of whether the content is relevant the user or not. Thus it could be posited that visitors are using the Career Machine as more of an interactive game than as a means to learn about health-related science careers.

### ***The Studio Engagement***

The degree to which visitors were engaged with The Studio was largely assessed by further analysis of recordings from the video study; specifically, the movements of visitors who interacted with at least one element of the space were observed. Prior to the install of the camera system during Theme 3, data on visitor movement through the space was only collected for members of the cohort study, an audience primed to engage with everything in the space so findings from Theme 2 are not included in this discussion.<sup>8</sup>

#### ***Who and Where***

Two cameras were installed in The Studio exhibit; one to record visitors’ ingress and egress through the two doorways and the other to record what visitors were doing in the space if they decided to engage with it. Visit timing and tracking was conducted on the exhibit facing feed and only visitors who interacted with at least one element of the space, “Explorers,” were observed. On average, about 40% of bodies that walked through The Studio fell into this group (approximately 874 individuals). Of those, 118 visitors were tracked and their stays were timed.

<sup>8</sup> Theme 1 was installed in a temporary space so tracking methodology was not employed at all. Instead, visitors were asked to reflectively indicate the ‘areas’ visited in the exhibit (i.e. Safe Water, Tuberculosis, Malaria).

It should be noted that while singular persons were tracked for this methodology, they were often part of pairs, or family/school groups. Just over half of those bodies tracked (53%) appeared to be part of a mixed ages group – one with both adults and children aged 17 and under. This is the most common type of group, in general, at the Science Center. Adults-only groups were tracked about one-quarter of the time (28%) followed by individuals (15% - age not specified) and school groups (4%).

**Table 7: Where Studio “Explorers” entered from and how they moved around the room**

	(%)	TOTAL	Mon.	Wed.	Fri.	Sat.	Sun.
<i>Visitors tracked</i>		<b>118</b>	<b>22</b>	<b>24</b>	<b>24</b>	<b>27</b>	<b>21</b>
<i>Ingress from:</i>							
Building 3	58%	<b>69</b>	15	18	10	15	11
Wellbody Academy	42%	<b>49</b>	7	6	14	12	10
<i>Direction:</i>							
Focused	58%	<b>68</b>	12	15	13	16	12
Counter-clockwise	16%	<b>19</b>	3	5	7	4	0
Bounced	14%	<b>16</b>	7	1	1	4	3
Clockwise	13%	<b>15</b>	0	3	3	3	6

Ingress to the exhibit was somewhat balanced with slightly more individuals (58%) entering from the Building 3 side. This may reflect the popularity of that entrance to the Science Center itself; it is near to both public transportation as well as a public parking garage.

Another type of “Explorer” movement that was tracked was the general path that the person took through the space. While attempts were originally made to sort visitors into either clockwise or counter-clockwise groups – based on preliminary findings from the cohort observations – it became clear that a looser description of direction would be required with the oddly shaped Studio. The majority of Explorers (58%) visited just one or two exhibit elements (interactives, text panels, Mindball, Career Machine, etc.) and were thus coded as “Focused” visitors. The three remaining types of movement, Counter-clockwise, Clockwise and Bounced around, occurred with similar frequency (16%, 14%, and 13% respectively).

### ***Attraction and Holding Power***

In addition to providing data on who explored the space and how they moved through it, the video study allowed for examination of the attraction and holding power of the various physical elements of the exhibit. When examining the table below, a few things are striking about the elements that topped both the “First stop” and “Most time spent at...” lists.

**Table 8: Where Studio “Explorers” stopped first and where they spent the most time**

	(%)	TOTAL	Mon.	Wed.	Fri.	Sat.	Sun.
Visitors tracked		n=118	n=22	n=24	n=24	n=27	n=21
<b>First stop</b>							
Mouse brain	25% (17%) <sup>†</sup>	30	9	5	8	4	4
Mindball - watch	16%	19	3	4	5	4	3
Mindball - play	15%	18	7	4	3	3	1
Career Machine	12%	14	0	2	3	3	6
Discovery Cart	9% (23%) <sup>†</sup>	11	n/a	n/a	n/a	8	3
Case - caps	8%	9	3	4	0	0	2
Case - motherboard	4%	5	0	2	1	2	0
Scientist videos	3%	4	0	1	1	0	2
Photo slideshow	3%	3	0	1	0	2	0
Wall panel	3%	3	0	1	1	1	0
Case - BCI	2%	2	0	0	2	0	0
<b>Most time spent at...*</b>							
Mindball - play	33%	39	9	7	7	5	11
Mindball - watch	22%	26	2	7	8	7	2
All equally	15%	18	6	2	4	4	2
Discovery Cart	8% (19%) <sup>†</sup>	9	n/a	n/a	n/a	7	2
Mouse brain	6%	7	2	2	1	0	2
Wall panels	5%	6	1	1	2	2	0
Career Machine	5%	6	1	2	2	0	1
Case - caps	2%	2	1	0	0	0	1
Case - motherboard	2%	2	0	0	0	2	0
Other	1%	1	0	1	0	0	0
Photo slideshow	1%	1	0	1	0	0	0
Scientist videos	1%	1	0	1	0	0	0

\* Stay times at individual elements were not separately timed. The evaluator reflected at the end of each visit to determine which element the individual stayed at the longest. If no one element stood out, the observation was tagged as “All equally.”

† Numbers in parentheses represent the percentage of just Saturday and Sunday visitors.

The mouse brain kiosk, the Mindball game, and Discovery Carts are three elements stood out as key exhibit attractors. While casual visitors were not questioned on their attitudes towards specific exhibit content, in-depth discussions were conducted with cohort members who provided insight into actions that were observed on the video-recordings.

**MOUSE BRAIN** (blue text in table): This exhibit element, a two-part interactive, paired a 70" flat screen monitor on the wall with its controller – a smaller, touch-screen kiosk – and featured an image of a mouse brain with the main neural pathways for hearing highlighted. The peach and neon green image was stunning, much more so than the image to the right communicates. This interactive was extremely attractive to Studio visitors with fully one-quarter (25%) stopping at the kiosk or big screen first. However, stay times at the mouse brain were limited. It was only the longest visited element for 6% of visitors. Discussions with cohort members revealed that while the two screens were very interesting at first, the experience itself left much to be desired. Users could zoom in and out and swoop around the screen; but that was the extent of the interaction. Cohort members, adults and children alike, wanted the brain model to *do* something – either spin around, show pop-up information when one zoomed all the way in, display labels of brain regions, or even compare a mouse brain side-by-side with a human or dog brain. Put simply, they viewed this as an interesting display but a boring interactive, and that may have been the general impression for causal visitors as well.



**MINDBALL** (rows filled in blue in table): The Mindball interactive, which pitted two visitors against each other in a competition to see who could relax more and therefore create more alpha brain waves, was an extremely successful element of The Studio's *Minds and Machines* exhibit. Cohort members ranked it very instrumental to their enjoyment of the space. They cited the novel concept (relaxing as opposed to concentrating) as well as the competitive nature of the game as reasons for



its success. That it was a very public competition, with crowds often exceeding a dozen spectators crowding around to watch. As described earlier, this element greatly increased stay times within The Studio; and 55% of all visitors spent the most time here, either watching or playing the game. Indeed, Mindball was occupied 90% of the time while recording took place. It was less often a first stop but considering its placement in a corner and the tough competition that both the mouse brain and live demonstrations offered, Mindball watching or playing still ranked high. Crowds and considerable wait times for a turn did not deter visitors either, but rather served to advertise that something quite exciting was taking place. Even solo visitors were able to partake in the interactive; several cohort members are participating in the project on their own and every single one successfully found another visitor to play against. Mindball was an example of an exhibit element that successfully attracted and engaged visitors in collaborative play. It also demonstrated the potential The Studio has to extend this experience into conversation, group interaction, and collaborative learning.

**DISCOVERY CART** (italic in table): Hands-on Discovery Carts were only present during recording on Saturday and Sunday of Thanksgiving week.<sup>9</sup> The carts were set up and facilitated by either Science Center Discovery Corps Teens or interpretive staff for two 45 minute sessions on Saturday and for one session on Sunday. Different facilitators attract people to the cart in different ways but it is clear that the presence of a person to show and explain something is attractive to Studio “Explorers.” For example, weekend-only data (Table 8) indicates that carts are more successful at attracting visitors in The Studio space, as compared to other exhibit elements (i.e. Discovery Carts = 23% of first stops; mouse brain = 18% of first stops). Additionally when looking at weekend-only data, 19% of visitors are spending the most time at Discovery Carts; that is second only to Mindball. While stay times at individual elements were not recorded, anecdotal evidence suggests that once visitors are hooked, these carts can hold the attention of visitors of all ages for five, to upwards of ten, minutes, far exceeding the average stay time (4 minutes, 7 seconds) in The Studio.



These attraction findings, combined with the observations on how visitors moved throughout The Studio, may suggest that while individual elements of the exhibit are definitely attractive to visitors, they are not serving as gateways to exploration of the entire space (as if it were a cohesive room unto itself); rather visitors seem to be attracted by novel interactives and they might then investigate one other element before continuing on their journey through the Science Center.

### ***The Studio’s Programs/Exhibit Effectiveness***

In addition to investigating the attraction and holding power of individual elements of the physical exhibit, the evaluation team also attempted to understand the effectiveness of The Studio’s programs and of the exhibit as a whole at addressing the Science Centers wellness initiatives. Two methodologies were used to tease this out: 1) exit surveys from monthly Scientist Spotlights for each topic, and 2) post-visit surveys that were completed by visitor cohort members following their visits to Themes 2 and 3.

#### ***Scientist Spotlights***

Local scientists and researchers, as opposed to interpretive staff, are the featured presenters in The Studio for six hours on the first Saturday of each month. They share their work with visitors through hands-on activities and conversations. Across the three exhibits, a total of 59 visitors provided feedback on their Scientist Spotlight experience. Visitors reported that their interactions with

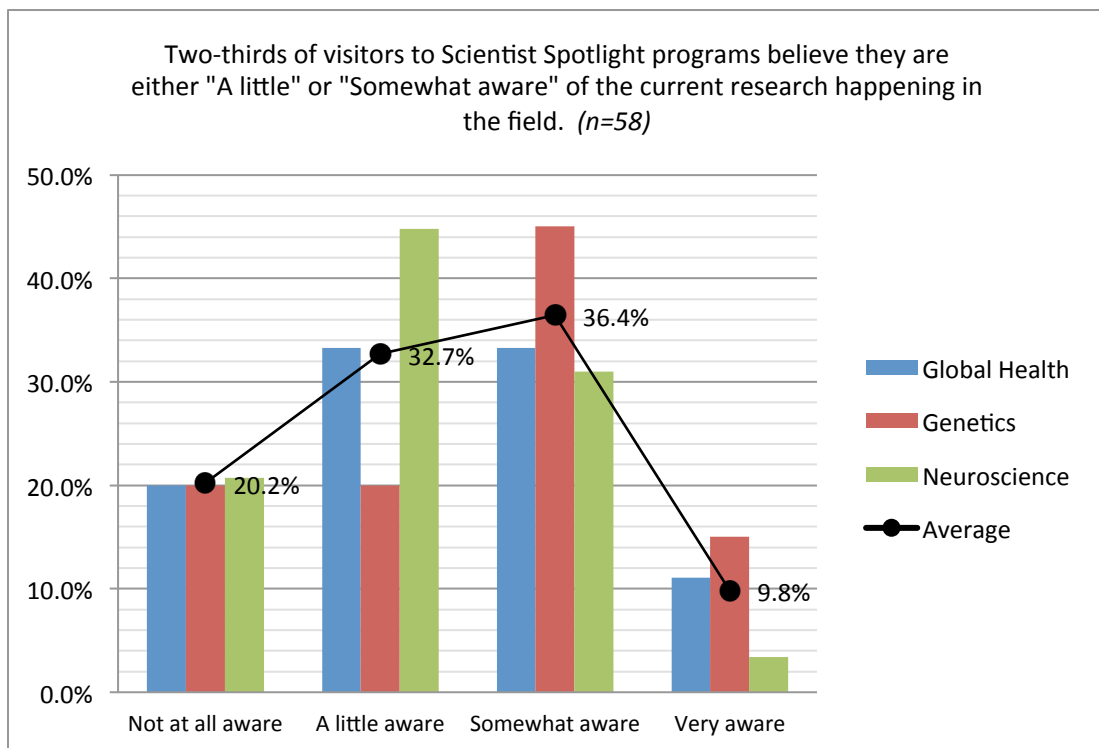
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<sup>9</sup> Generally, there is a cart present in The Studio for at least one 45-minute session every day. A cart was most likely present on Monday, Wednesday, and Friday but during non-recording times.



scientists were generally positive and they were described as “personable” and “knowledgeable” with one person stating that the scientists was “great at talking about the topic in an understandable way.” A few respondents commented on how well the scientists interacted with their children, particularly using games and interactives: “This is easier for kids to understand.” One person explained why the experience was enjoyable by saying that the scientist was “passionate about [the] subject,” and that she “could speak on any level.” These comments reflected the high overall ratings respondents gave to their Scientist Spotlight experience.

To provide context for their learning experiences, visitors were asked how much they thought they already knew about the topic in The Studio: global health research, genetics or neuroscience. Although neuroscience was a topic they seemed most familiar with overall, it had the least respondents who reported being “Very aware” of the research being done in the field. On average though, all four awareness categories were well represented.



**Figure 2:** Visitor knowledge of Studio topics

Despite professing some knowledge of the research currently happening in each of the three fields, every Scientist Spotlight visitor reported learning something new from their interactions with the scientists and in the exhibit (average of 4.56 out of 5). Visitors expressed high levels of interest in learning more about the topics presented as well. They also rated the communication skills of the scientists particularly high (4.82 out of 5) and left with most of their questions answered. These ratings, for the individual topics as well as the overall average, suggest that Scientist Spotlights are a very successful face-to-face program.

**Table 9: Scientist Spotlight ratings**

	<i>Global Health</i>	<i>Next-Gen. Genetics</i>	<i>Minds &amp; Machines</i>	<b>AVERAGE out of 5</b>
I learned something new today about the topic in The Studio.	4.78	4.25	4.66	4.56
This program made me want to learn more about the topics presented.	4.57	4.10	4.48	4.38
The scientists communicated their research in ways that I could understand.	5.00	4.70	4.76	4.82
On the whole, the scientists I met with today answered my questions.	4.89	4.75	4.86	4.83

When asked to what extent the Scientist Spotlight program added value to their Science Center visit, exit survey respondents across the three exhibits gave an average rating of 4.46 out of 5. Furthermore, ratings increased with each theme suggesting that interactions with experts are highly valued, regardless of topic. Scientist Spotlight visitors were extremely interested in attending a similar program again and an overwhelming average of 97% responded in the affirmative.

Visitors' high praise for this scientist-led programming became more evident when value-add ratings for The Studio were compared between visitors who experienced the exhibit with and without Scientist Spotlight programming. For comparison, the value-add ratings for The Studio exhibit sans programming have also been included in the table below.

**Table 10: Value-add and interest in Scientist Spotlight**

	<i>Global Health</i>	<i>Next-Gen. Genetics</i>	<i>Minds &amp; Machines</i>	<b>AVERAGE out of 5</b>
Value-add of Studio Scientist Spotlight	4.09	4.45	4.83	4.46
Interest in attending a similar program again	100%	95.0%	96.6%	97.2%
Value-add of The Studio exhibit (no programming)*	3.21	n/a	4.45	3.83

\*For *Global Health*, The Studio was in a temporary location. This question was not asked during *Next Generation Genetics*. The high exhibit rating for *Minds & Machines* was likely influenced by the popularity of Mindball.

While Scientist Spotlights represent a small sample of all programming that occurs in The Studio, they do provide indications that the face-to-face engagement strategy is successful. As noted during the first three exhibits and as demonstrated by multiple research weekends,<sup>10</sup> opportunities for scientist interactions are highly valued among visitors. It still remains unclear whether visitors will perceive PSC staff interpreters as highly as visiting scientists. This may be an interesting area for future investigation.

<sup>10</sup> PSC hosts three Research Weekends each year; each focusing on a particular science topic (e.g. polar and climate change science, biomedical and health science, showcase of science departments at the University of Washington). Data, similar to that attained for this study, is collected from visitors during these events.

### *Cohort post-visit surveys*

Over two themes, 42 cohort groups completed 63 post-visit surveys. Approximately one week following their visit, the link to an online SurveyMonkey® post-visit questionnaire was emailed. Up to two reminder emails were sent to each group that did not provide feedback within three weeks. This post-visit strategy was employed for several reasons: to keep the on-site visits as short as possible, to allow some time to pass so that groups had a chance to remember or forget exhibit elements, and finally, to provide a suitable way for them to provide thorough and critical responses at their own convenience. This highly engaged group did not disappoint and most respondents provided candid, actionable feedback.

The data from all the post-visit surveys is presented in aggregate below and discussions of topic-relevant feedback will be provided as appropriate. The bulk of the survey questions focused on four main areas: 1) importance of individual exhibit elements; 2) whether groups talked about what they saw; 3) whether they followed up on something they learned; and 4) how and why they ranked the two (or in rare instances, three) exhibits compared to each other.

**MEMORABLE VISIT:** A week or more after their visit, three-quarters (73%) of cohort groups said that something about The Studio was either “Mostly” or “Definitely” still memorable. It was rare (3%) that nothing about the exhibit stuck out after a week.

**Table 11:** *Memorable-ness of The Studio*

<b>Are there still elements of the exhibit or things you learned that are particularly memorable?</b>	<b>n=63</b>
Definitely	42.9%
Mostly	30.2%
A little	23.8%
Not at all	3.2%

Visitors’ commentary about their most memorable elements in the Studio centered on interactive experiences rather than things they had learned.

*“Mindball! The whole family enjoyed that part of the exhibit.”*

*“The Game with two people wearing the ‘mind reader’. It was fun, interactive, challenging and an interesting way to measure brain waves. Not much else was memorable. The mouse brain enlarged on screen didn’t have enough detail to mean much. The tv screen with scientists was not colorful or exciting.”*

*“The interactive elements. My children (and their dad!) were really only interested in what they could manipulate – like the rat pup! I remember the “timeline” that showed the history of genetics, but no one else was interested in that.”*

*“The ‘abacus’ that was intended or designed to teach about DNA-sequencing was particularly memorable. It was the only part of the exhibit that was engaging for the children in our group.”*

*“Tongue-rolling and how identical twins sometimes vary on it.”*



**EXHIBIT ELEMENT IMPORTANCE:** Non-computerized, hands-on activities were either “Extremely” or “Pretty important” elements of the exhibit to 87% of respondents. Facts and content (84%) and videos (67%) were the next most important features across the two exhibits.

**Table 12: Importance of exhibit elements to cohort enjoyment of The Studio**

How important were each of these elements to your group’s overall enjoyment of The Studio? <i>n=63</i>	Extremely important	Pretty important	A little important	Not at all important	n/a
Hands-on activities [not computer]	<b>65.1%</b>	22.2%	6.4%	4.8%	1.6%
Facts and content	38.1%	<b>46.0%</b>	15.9%	0%	0%
Videos	20.6%	<b>46.0%</b>	19.0%	9.5%	4.7%
Interactive computer activities	14.5%	<b>40.3%</b>	30.7%	9.7%	4.8%
Career Machine	4.8%	12.7%	<b>33.3%</b>	30.2%	19.0%
Scientist or PSC floor staff	9.5%	9.5%	12.7%	3.2%	<b>65.0%</b>

\*Note that two-thirds of respondents indicated that scientists and floor staff were “not applicable” components in judging overall enjoyment of The Studio exhibit. This reflects the fact that most groups did not experience The Studio with an interpreter present.

While facts and content were clearly important, there was little follow-up discussion about text panels. Some comments did acknowledge that the content, while “*great for adults*” was rather advanced or uninteresting for younger kids (in the six to nine year old range). In one case, for example, there was a desire for more information but not necessarily via text panel format:

*“The interactive computer activity about the brain – where you could zoom in was on the right track, but didn’t do enough to really engage us or give info. ...Once you zoomed we*

*wanted information about what we were looking at and the job that it did (the info was too far away on the wall)."*

Instead, as seen in the memorable visit section above, explanations focused on the activity-based exhibit features. In particular tactile elements – as opposed to screen based interactives – were requested and enjoyed the most.

*"The stuff we interacted with stuck with us longer. The facts on the wall tended to fade in our memory, but the visual samples (e.g. the brain probe set-up) was easier to remember."*

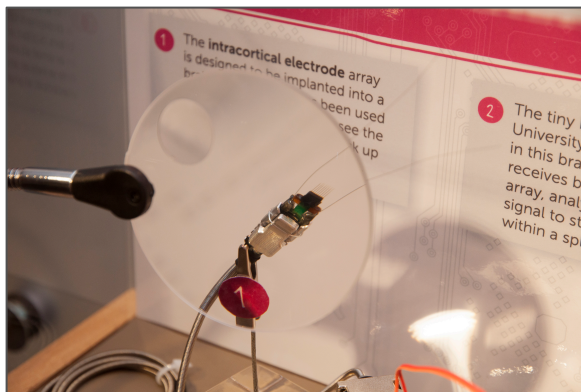
*"We would have liked more hands-on, non-computer, non-video activities."*

*"Hands-on content is the most important element. We also liked having the actual, real-world, scientific equipment there to look at."*

*"We have two toddlers and it is very important for us to have things for them to do so we adults can enjoy the rest of the exhibit and learn a few things ourselves."*

*"Computer activity is the main thing that kept our eight year old in the room. He was ready to leave after one minute until I showed him that. Our ten year old really liked both the beads and the computer activities because they were set up as something to "conquer."*

*"One team member was looking forward to the interactive computer activities but after thoroughly exploring the computer options, was a bit disappointed. The expectation was that it would be more interactive (brainteasers, puzzles, games, etc.) instead of just clicking on pictures." – referring to the Career Kiosk*



**MOST TALKED ABOUT EXHIBIT:** Two-thirds (67%) of respondents reported that they, or someone in their group, had talked about the *theme or content* presented in The Studio to someone either in or outside their group.

**Table 13:** Cohort discussion about The Studio

Has your group talked about the theme or content presented in The Studio?	Next Gen. Genetics n=33	Minds & Machines n=30
Yes	66.7%	66.7%
No	27.3%	30.0%
Don't know	6.1%	3.3%

This moderately high engagement rate was similar for both exhibit themes although the content of the reported conversations was varied. Most of the cohort's conversations about Studio content were initiated by general questions about what people had done lately or over the weekend. Or, they were explaining their involvement in the project with family members or co-workers. When asked to elaborate on what they talked about and what sparked the discussion, responses were often general in nature but there were quite a few specific and varied mentions of content learned following the *Next Generation Genetics* visit.

*"I heard my son explaining to his friend how genes match up to make you tall; they had a 10 minute discussion on family members, who is tall and short; I also heard them talking about being able to roll their tongues!"*

*"A. loves the epigenome. He's finding ways to bring it up constantly – different lifestyle and environmental factors that are "definitely" changing his epigenome such as music, stress, and food."*

*"Yes, we talked about inherited traits, since our Humane Society foster cat just gave birth to kittens and they were several different colors but none looked like the mother. Later we were out planting pea seeds and remembered the movie about the pink or white pea flowers and talked a little about plants, heirloom seeds vs. hybrid, etc."*

*"We have had a few discussions about diabetes since visiting; my son remembers looking at that exhibit and the discussion we had about research being done to help kids "who can't eat candy." We have also talked a lot about the way genes match up to make you short/tall; he often wonders how his genes matched up so he can be as tall as his uncle since he's going to be a professional basketball player someday."*

The neuroscience exhibit seemed to elicit less concrete conversations about the content. Based on the comments received following the *Minds and Machines* visit, a plausible conclusion is that there was less information that was explicitly relatable to the

everyday lives of most families. Their comments focus mostly on their enjoyment of the Mindball® game itself and rarely on the brain-computer interface concepts or research.

*“We did talk about the two person game. The conversation was more or less recapping what we were thinking about or not thinking while we were trying to get the ball across the table.”*

*“I talked about the moving the ball by relaxation; similar to something our family did during the Vancouver 2010 Olympics – turning on and off the lights of the Toronto Tower by thinking.”*

*“We talked a lot about the brain wave game, trying to better understand what was happening, why one side of the table seemed to win more often, and what it means for technology to help people with physical impairments. We had recently visited my grandfather, who had a stroke several years ago, so that prompted some of our thought and conversation around understanding and repairing injuries.”*

*“Yes, we talked about [a] neighbor who had [a] device implanted in his brain to help with Parkinson’s symptoms.”*

**FOLLOW UP ON THINGS YOU LEARNED:** While the majority of groups reported discussing their visit to The Studio, a smaller percentage (41%) indicated that they had done something to follow up on what they had learned. This included researching topics on the Internet, checking out library books or generally being more aware of the content being mentioned in traditional or social media. Across exhibits, there were variations in the rate of follow-up; nearly half of *Next Generation Genetics* visitors reported taking action or becoming more aware of the topic while just one-third of *Minds and Machines* visitors did so.

**Table 14:** *Further cohort engagement with Studio topics*

Have you done anything to follow-up on something you learned OR are you more aware of The Studio topic in daily life?	TOTAL n=63	Theme 2 (genetics) n=33	Theme 3 (neuroscience) n=30
Yes	41.2%	48.5%	33.3%
No	58.7%	51.5%	66.6%

While most of the open-ended responses accompanying this question elicited a simply “no” or “not yet.” Sometimes, however, the information struck a chord with individuals or families and they subsequently engaged in a variety of follow-up activities:

## **Theme 2 (Next Generation Genetics) follow-up**

*“The Studio sparked [our] interest in DNA. When I saw an experiment to extract DNA from food and household chemicals, O. and I had to do it. The onion DNA is floating in a little dish of rubbing alcohol in the freezer.”*

*“Looked into submitting a cheek swab to a testing program. Discussed with other relatives about what they have done so far in regards to genetic testing.”*

*“We are rolling tongues as 4 of 5 in our family can do it.”*

*“A. found an article online in his RSS feeds about the epigenome and read it. A. looked up epigenetics on genome.gov and found herself wandering around the genome building at UW just to check it out.”*

*“We’ve used the genetics topic from the studio to discuss news and social media and what gets published by the media versus which things get little press. We’ve also discussed the difference between articles written for sharing science information versus those written for the popular media (meant to entertain).”*

## **Theme 3 (Minds and Machines) follow-up**

*“J. did a little more reading on the internet about alpha waves and it reminded her to go back to regularly practicing meditation.”*

*“My son has done some internet searches on the brain and how it works. Yes, we have become more aware of neuroscience in the news. ☺”*

*“Read with more than the usual interest about research in the news showing once person’s brain could control another person’s body!”*

*“I looked up some of the spinal injury developments, medically it is such a huge advancement in technology and I wanted to read more about it.”*

*“I continue to be aware of and notice things relating to neuroscience and other science subjects in the news and social media but I did not follow up on anything we saw during this visit.”*

*“It was neat to see the article on researchers at the UW who had one person play a video game... that made another person’s hand in another part of campus actually play the game. This article was in a Scholastic magazine used at school so it was fun to tell teachers and students about other research I had learned about at the exhibit.”*

**THEMES RANKED:** Theme rankings are taken from the 30 post-visit surveys that were completed after cohort members visited Theme 3, *Minds and Machines* in response to the instruction “Rank the



themes you have seen so far.”<sup>11</sup> Cohort members were not given specific criteria by which to rank the themes, but were asked to explain their choice based on factors such as physical appearance, layout, topic, content, activities, etc. Criteria were specifically not given so that the cohort could describe aspects of their visit that were most important to them and data was emergent. *Next Generation Genetics* had an edge over *Minds and Machines* with 60% of respondents ranking it first. When groups explained why they ordered the themes the way they did, their answers were very thorough, about 2.5 to 3 times longer than for other open-ended responses. Responses were difficult to code, however, often with one comment seemingly contradicted by the next. The dichotomy served to underscore the extent to which individuals each bring their own history and understanding to bear when they engage with any exhibit.

Excerpts from a small sample of their comments are below; preceded by a “G” if the group preferred the Genetics theme or an “N” if they preferred Neuroscience.

**G:** *“This one [Minds and Machines] did have very cool interactive things (everyone wanted to “win” the brain wave thing). But we didn’t talk about this exhibit afterwards nearly as much as we did the last one. Essentially this exhibit was more fun than the last, but I really **don’t feel that anyone took away nearly as much** new knowledge as the last time.”*

**N:** *“Neuroscience. We enjoyed the hands-on alpha wave ball game and **really understood the purpose of the local research**. ... It took a little time to understand the overall theme, but we were in engaged in the game while our subconscious could process the info around us.”*

**G:** *“I remember neuroscience being **a lot more ‘looking’** and not as much ‘doing’ [as genetics].”*

**N:** *“The Genetics theme was too technical and left us wondering about some basic concepts in genetics. It also **didn’t have much interactive** content.”*

**G:** *“Genetics had more content that **grabbed the children’s attention** (without requiring reading). ...overall Genetics kept their interest longer. ... The kids still bring up genetics (in general, not the exhibit) from time to time.”*

**N:** *“Neuroscience definitely had something that **drew each of us in and kept us there**. The adults could relax and take in more of the interesting content while the 8 year old was well entertained.”*

Some groups, though forced to rank the exhibits in the survey, qualified that they appreciated both exhibits. They explained: *“I personally found both very interesting and informative,” “We liked both*

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<sup>11</sup> This sampling ensured that cohort visitors had seen at least two exhibits. That said, comparisons should be interpreted cautiously. Only one of the three groups who had seen the first theme (*Global Health*) participated in the neuroscience post-visit survey. They ranked *Global Health* as their second favorite following genetics explaining that it “seemed visual and up-to-the-minute.”

topics very much – interesting, fascinating,” and “Please note that BOTH Studio topics selected were excellent.”

### **Understanding the Concept, Fit, and Value of The Studio**

Comprehension of the big picture concept of The Studio was an important, if difficult, outcome to measure. To address whether the elements of overall concept, fit, and value of The Studio was understood, a facilitated exit survey was administered to adults (18 and over) who had spent at least one minute in The Studio.

#### **Concept Comprehension**

Visitors were asked if they remembered seeing or hearing anything in the exhibit about local, current, or health-related research. Of the 50 survey participants, less than half of all respondents (44%) reported seeing something about health and wellness research while about one-quarter saw something relating to the current or local aspects of the research (28% and 24%, respectively). That said, given the transient nature of their experiences and visitor’s substantial preoccupation with Mindball, the findings are not as disappointing as they initially seem.

**Table 15: Understanding of big picture Studio concepts**

<b>Do you remember seeing or hearing anything about...? (n=50)</b>	<b>Answered: Yes</b>	<b>Answered: Maybe</b>
<b>Health &amp; wellness</b> research	44.0%	6.0%
Research that takes place <b>locally</b>	24.0%	2.0%
Research that is <b>current</b> or happening now	28.0%	-
The Studio is <b>updated</b> regularly	10.0%	-

While signage inside and outside The Studio alludes to the changing nature of exhibit, the language may not be direct enough for visitors to come away with that understanding and it is suspected that these “accessory panels” are infrequently read. As a result, just one in ten casual visitors were aware that The Studio is a frequently updated space.

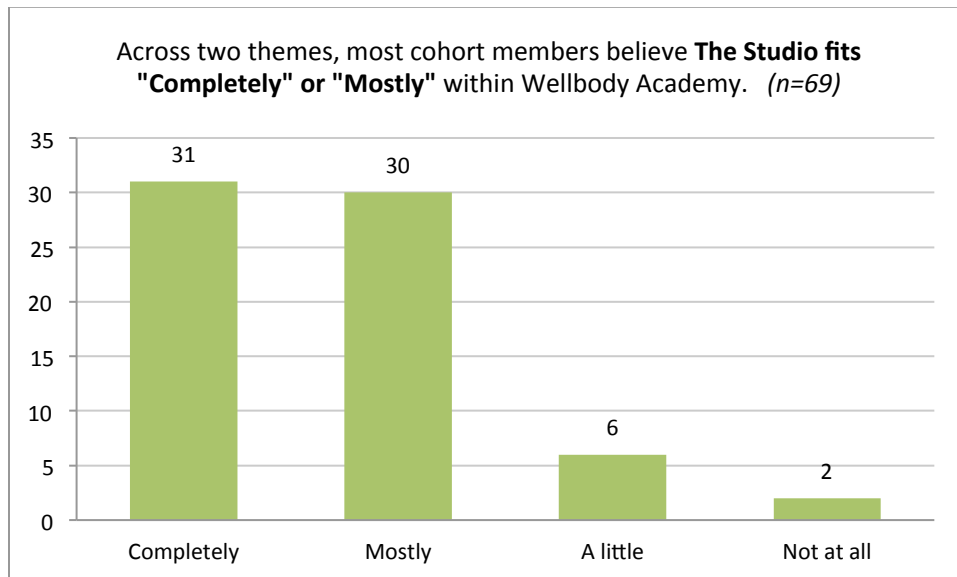
One cohort family who did visit Pacific Science Center while the *Global Health* was installed explained that they did not have a chance to explore it commented that, “*We assumed that the replacement was more permanent so we planned to explore more on a future exhibit.*” By the time the group returned, *Global Health* was gone. This suggests that there is an opportunity to continually message the transitory nature of The Studio (as well as its similarly structured sister exhibit – Portal to Current Research), particularly within the space itself.

#### **Studio Fit with the Wellbody Exhibit**

When asked how well they thought The Studio fit in with the larger Wellbody Academy, casual visitors gave an average rating of 3.51 (out of 4). Recognizing that these exit survey participants may not be

familiar with the Wellbody Academy itself, this rating should be interpreted cautiously. Still, 60% of respondents thought the exhibit fit “Completely” and an additional 32% responded more conservatively, stating that The Studio fit in “Mostly” with the Wellbody Academy.

Cohort members were also asked how well they thought the research-oriented Studio fit in with the Wellbody Academy. This question was asked during both Theme 2 and 3 visits since some groups did not have a chance to visit the Wellbody Academy on their first visit. Data from these responses were combined and results indicated that the majority (88%) of individuals who answered the question thought The Studio fit “Completely” or “Mostly” with its surroundings.



**Figure 3:** How well cohort members think The Studio fits in with Wellbody Academy

More important than their ratings though, they were able to articulate their reasoning. That everyone made the connection between The Studio’s health related topics and the health-related exterior area was not surprising; this was explained to them during the recruiting and onboarding process for the study. Instead, groups compared the energy, depth, and takeaways of the two spaces. Regarding the action they observed some adults commented:

*“The energy in there [Wellbody] is way higher. Wellbody equals interactive. Sends or teaches a message without making you read. The content fits but the presentation is totally different.”*

*“Aesthetic fit but **very different energy level**. Everything else is more energetic and alive, it [The Studio] feels a little bit detached. It’s the quiet wing... So in terms of continuity it was a bit disconnected. It’s not **uninviting** but in comparison it may not be as compelling for young children.”*

Some groups mentioned the complexity of the information that was being presented in The Studio:

*“It’s more in-depth than the rest; it’s not beginning level. More intellectual than a sneeze wall.”  
[said with a smile]*

*“Wellbody is very general. This is a nice space to **focus on specific things.**”*

Still others made it clear that the takeaways were much more obvious in Wellbody and they hinted at the desire for more directly applicable information:

*“Genetics is a key part of health and wellness – though there’s **not much you can do about it.**”*

*“Would have been a four for me [Completely fits] if it had **tied in more ways to keep the brain healthy.** I understand the tight focus of this theme however.”*

*“It’s similar the way it set up... [but it’s] about what the brain and technology is capable of **not about how it’s connected to health or daily life.**”*

Children often had opinions as well. The generally were along the lines of:

*“Wellbody Academy is about eating well. The brain’s not related to eating.”*

*“It **talks about parts of your body** but it’s not about eating or walking around.”*

In the end one respondent provided a comment that cut to the heart of the matter:

*“It kind of explains the other stuff... for people that want more detailed information they can drill down and learn more... I’m not sure it’s connected as well as it could be. It completely fits but the **connection could be made more explicitly.**”*

### ***Valuing The Studio***

Respondents provided an average rating of 4.45 (out of 5) for whether they felt The Studio added value to their visit to PSC. While 69% chose the highest level, “5: Very significant value-add,” there was a minority (6%) that did express the opinion that The Studio did not add any extra worth to their visit. One such visitor provided an unprompted reason, “*it’s a kids science center – needs to be less informative.*” This comment was significant in that it was completely contrary to the majority of other unsolicited feedback. While discouraging, it serves as an important reminder of the sheer breadth of visitor perceptions that the Science Center must acknowledge and work with.

That said, almost every respondent (96%) indicated that, given the opportunity, they would visit The Studio again in the future. The remaining 4% did not say outright that they would *not* visit The Studio; rather they explained that it would depend on the topic, whether they were in town, or if they had time.

Of those who had been to the Science Center before, one-quarter (24%) reported that they had been to The Studio on a previous visit. This is an encouraging statistic and provides a good baseline for future studies of repeat visitors to The Studio.

## PARTICIPATING SCIENTISTS

Because featuring current, local research was such an important goal in the overall Studio project, feedback from the individuals providing that content, both in the form of advising on subject matter as well as providing in-person programming, was an important aspect to capture. For this audience the goals to be measured were: 1) researchers increase skills in communicating with the public, and 2) researchers demonstrate positive attitudes toward, and interest in continuing, public outreach. Participating scientists were asked a series of questions about their background in science communication and outreach, the perceived success of their presentation or activity, the impact of The Studio exhibit on their presentation, and the impact of their experience on their confidence and competence in science communication.

Forty-three scientists and researchers representing 10 different organizations in the Puget Sound area completed Pacific Science Center’s Science Communication Short Course and developed a hands-on educational activity related to their own research which they facilitated at least three public program events, one of which had to be a Scientist Spotlight. **A total of 22 of these scientists participated in an online survey** following completion of at least one Spotlight. They were representative of each of The Studio exhibits to date.

**Table 16: Fellowship and survey participants**

Theme	Communication Fellows	Survey Respondents
1: Global Health	14	8
2: Next Generation Genetics	15	5
3: Minds and Machines	14	9

### Scientist Background

The majority of respondents were employed in research positions. Two were either medical doctors or education coordinators. The four individuals who did not fall into one of the provided categories described themselves as graduate students, combination educator/researchers, or user-centered design consultants. They represented departments within academia at several colleges including: University of Washington, Pacific Northwest University, Everett Community College, and Washington State University, as well as private research organizations like the Allen Institute for Brain Science, Fred Hutchinson Cancer Research Center, Seattle BioMed, and the Puget Sound Blood Center.

**Table 17: Current position**

Current position	n=22
Researcher/Research scientist	72.7%
Doctor of Medicine (MD)	4.5%
Education/Outreach Coordinator	4.5%
Educator	-
Other	18.2%

## Science Communication & Outreach

At the time that respondents completed the survey, one-third indicated that they were full-fledged Science Communication Fellows – a title conferred upon completion of at least three public outreach programs. The most common individual programs that respondents had engaged in were Scientist Spotlights (presentations in The Studio or the nearby Ackerley Family Gallery during the first Saturday of each month), or large-scale research weekends such as Life Sciences Research or Paws-on Science Weekends.

**Table 18: Engagement with Pacific Science Center over past 2 years**

Please indicate the ways in which you have engaged with Pacific Science Center over the past 2 years.*	22 respondents provided 66 responses
Science Communication Fellow	33.3%
Participated in a Scientist Spotlight	27.3%
Life Sciences Research Weekend	15.2%
Paws-on Science Weekend	10.6%
Spoken at a Science Café	4.5%
Participated in another type of talk	4.5%
General volunteering	4.5%

\*Participants chose more than one option, so percentages total more than 100%.

Respondents cited a variety of reasons that they participate in outreach including: “to inspire others about science or to promote science” (29%) and “to contribute to the public understanding of research” (26%). Additionally, they felt that these efforts are “personally rewarding” (17%). One respondent praised the PSC training staff by stating: “Because working with Steph and Dana is awesome!”

**Table 19: Reasons for participating in public outreach**

What are the TOP 3 reasons you decided to participate in public outreach?	22 respondents provided 66 responses
To inspire others about science or to promote science	28.8%
To contribute to the public understanding of research	25.8%
Because it is personally rewarding	16.7%
It is part of the scientific process to communicate its findings broadly	10.6%
To improve the public perception of the scientist institution	6.1%
To influence policy and regulation, make science matter	4.5%
To counteract misconceptions about science	3.0%
Because it is a duty to science and a commitment to society	3.0%
Other	1.5%

\*Participants were allowed to choose up to three options, so percentages total more than 100%.

Just over half of the scientists (59%) indicated that they were pleased with the amount of time they spend engaging with the general public. The remaining 41% expressed interest in spending more time than they

currently do conducting public outreach. No respondents reported wanting to participate in less outreach than they currently do.

### **Station Presentation/Activity**

Most of the Scientist Spotlight activities (82%) directly related to the presenters’ current research. The three reasons for the activity not matching the presenter’s work were: 1) they weren’t currently working in the field, 2) they weren’t currently pursuing that specific area of study, or 3) the activity was more about the practical application of their findings.

To provide context to their feedback, scientists provided estimates on the group composition and age ranges of those visitors that they interacted with. Consistent with general Science Center demographics, the majority of groups were described as families (90%) rather than adult-only groups (10%). The most commonly reported age range for children was elementary or middle school aged (46% of scientists said *many* of the people they spoke with were 6-14 years old). They also said that *many* of the visitors they talked to were young children under five (38%). Teens aged 15-18 were seen the least with 55% of scientists reporting that they spoke with few individuals in that age range.

Scientists were asked to reflect on their interactions with visitors and recall if, and how often, they observed specific behaviors. Respondents felt that about half of visitors (50%) asked questions about the topic or concepts presented and an even greater amount (77%) were interested in trying their activities most of the time. While scientists observed fewer visitors trying their activity more than once (23%), many scientists saw visitors engaged in observation and discussion most of the time (32% and 18% respectively).

**Table 20: Observed visitor behaviors**

<b>How often did you observe the following activities at your station?</b>	<b>Never</b>	<b>Rarely</b>	<b>Some of the time</b>	<b>Most of the time</b>
Visitors asked you questions about the topic and concepts presented at your table.	-	4.5%	45.5%	50.0%
Visitors were interested in trying the hands-on activity at your table.	-	4.5%	18.2%	77.3%
Visitors experimented with your activity (i.e. tried it more than once).	-	22.7%	68.2%	9.1%
Visitors were making their own observations about what was happening in your activity.	-	13.6%	54.5%	31.8%
Visitors talked with people in their group about the activity and concepts presented at your table.	-	4.5%	77.3%	18.2%

All participants reported that the activities were met with some degree of success and the respondents came to these conclusions based on their observations of visitors. Respondents felt their stations were “Very effective” in communicating their research about one-quarter (27%) of the time. The remaining three-quarters of respondents felt their tables offered activities that were “Somewhat effective” but they acknowledged that the activities were works in progress requiring either more practice in facilitation, tightening of concept, or tweaking to appeal to both older adults as well as very young children.



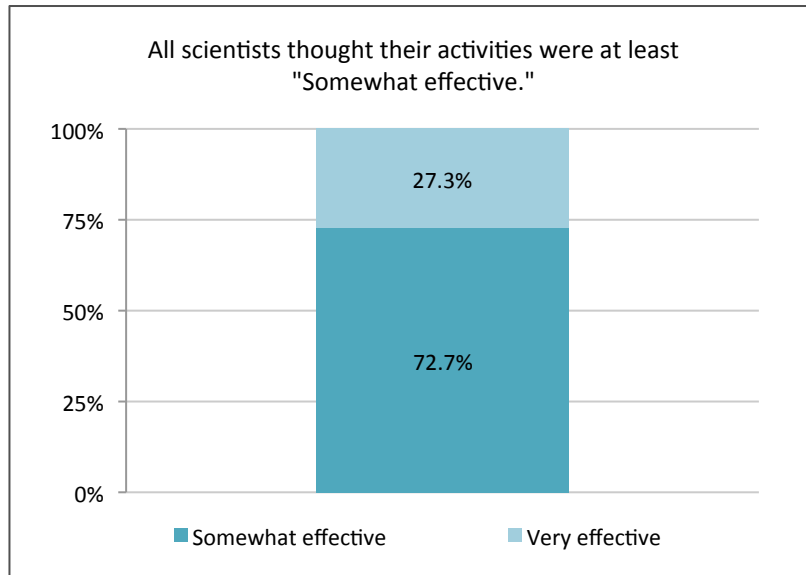
Regardless of the rating they gave, participants were positive about their experience and enthusiastic about continuing their efforts. Several participants reflected on their presentations and interactions with visitors and expressed interest in further refinements or enthusiasm at the connections that visitors were making.

*“Getting better every time. I want my activity to be more fun and interactive.”*

*“None of the adults that came to the table tried any of the activities unless they were accompanied by a child. So I need to tweak that a bit to get broader interest.”*

*“... I think that my activity gives both kids and adults an idea of what goes into the design process for these assays, and why it can be challenging. Plus I think they have fun with it!”*

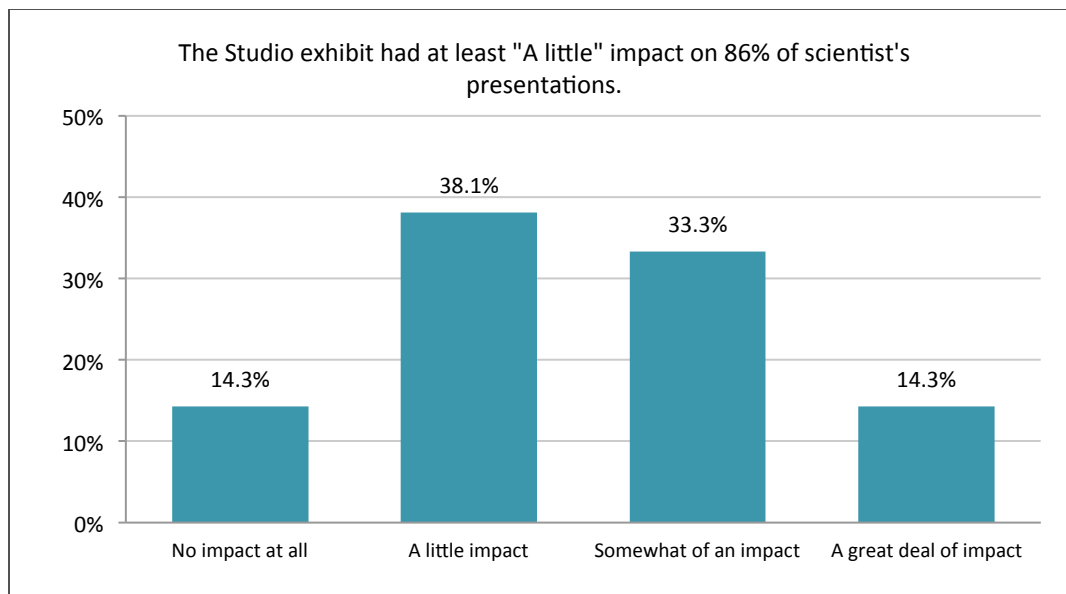
*“...each of my sessions has had a number of productive discussions with visitors to Pacific Science Center, which lets me know that I am at the very least communicating my enthusiasm and some of the science behind my work well.”*



**Figure 4:** *How effective do you feel your presentation or activity was?*

### ***Impact of the Physical Exhibit***

A unique feature of the overall Studio project is that the scientist’s current research presentations are related, at least tangentially, to the topics presented in physical exhibit space. The hope was that this aspect would: a) provide scientists with an opportunity to refer visitors to the exhibit for further background context or exploration of the presenter’s topics; and b) encourage visitors to learn more about what they are seeing in the exhibit. Data suggested that The Studio has at least “A little impact” for most of the presenters (86%). Just three indicated that their physical surroundings had “No impact at all” on their presentation.



**Figure 5:** To what extent did the exhibit positively contribute to your presentation or activity?

Scientists provided a variety of reasons for their responses; but in general, most comments addressed the degree to which their research related to the displayed content:

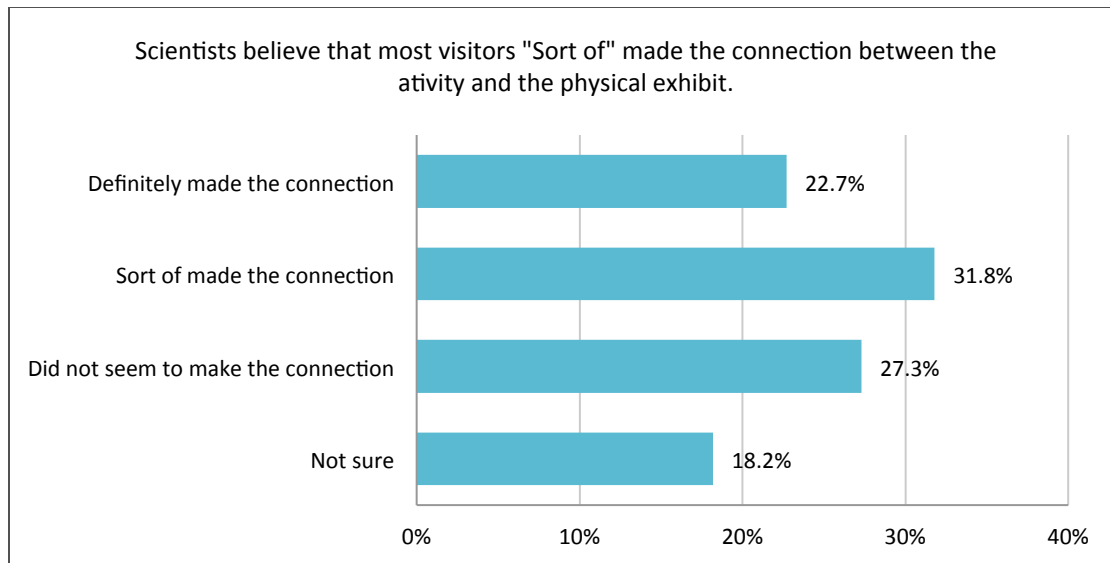
*"This time my table was right next to the area of the Neuroscience Studio exhibit related to my work/activity. It was great to be able to talk to people about it and relate to the studio at the same time. Sometimes, I was even able to walk with them to the studio itself and use some of the panels and activities presented over there to illustrate the points I was talking about. It definitely complemented my activity."* [A great deal of impact]

*"I think at least some visitors came to the Genetics studio because they were interest in the topic, so that might have made them a little more interested in my work."* [Somewhat of an impact]

*"The content of the exhibit is pretty different then the content of my activity, so there was not much connection there. However, being in the exhibit space provided a bit of a quieter atmosphere."* [A little impact]

*"My research and activity don't directly tie in with the materials in the exhibit. I didn't have long enough interactions to make the jump from my activity to the exhibit. I didn't need to make use of the exhibit materials to discuss my activity."* [No impact at all]

The flip side of the exhibit-presentation relationship is the perceived connections that visitors might make between the two. Scientists were asked to what extent they felt visitors connected their activity with The Studio exhibit. Results were mixed, with four scientists indicating that they weren't able to determine if visitors were associating one with the other.



**Figure 6:** *To what extent do you feel visitors connected your research activity with the exhibit?*

Based on their own understanding of the exhibit and their onsite experience, about half (46%) scientists preferred to have their activity located within the exhibit. The rest were equally split between having no preference, being outside but near the exhibit, and outside in an area away from the exhibit.

The exhibit location and treatment of the topic within the exhibit also seemed to have an effect on presentation location preferences. For example, the first theme, Global Health, was located in a small temporary space that was adjacent to the under-construction Wellbody Academy. Still, the content within was very specific to several of the scientist’s research. In fact, in the instances where they provided additional feedback, the scientists highlighted their preference to be inside the exhibit (5 of 8 scientists):

*“If there were a little more space in the global health studio, it would be nice to be inside (but still visible from outside), so that it is clear to visitors that my activity is related to the studio in some way. I sometimes felt a little extraneous standing outside of it.”*

*“As much overlap I could have with the [mosquito] net the better! I think drawing people into that area, especially since there is a bench would help keep people engaged and comfortable.”*

Conversely, in the new permanent Studio space, Genetics scientists were all divided on location:

*“My table was set up in the exhibit space itself which wasn't ideal since most people were utilizing the walkway to get elsewhere (i.e. IMAX, planetarium, etc.) and only wanted to ask for directions or didn't want to stop at the table.”* [preferred outside in a different area]

*“A larger area helps people to relax down and stop by and listen to me and ask questions. The narrower the space, the faster they proceed.”* [preferred outside but nearby]

*“Ackerley is far from the genetics props, outside the studio was the “kid running” area”*  
[preferred within]

Most Neuroscience presenters indicated a preference for being inside the new permanent space (6 out of 9) and cited similar reasons as presenters from the other cohorts:

*“Because I think it becomes more interactive, continuity of thought and has a wonderful location in terms of flow/exposure.”*

*“I feel the Studio is a smaller slightly less chaotic space than Ackerley which allows visitors to focus more on my exhibit.”*

*“Was outside, and couldn't really use the exhibit. Would like to be inside to be able to use it more.”*

*“I was a little outside the studio, in a place with not much visibility (people walking in the other direction would not see my table or poster). Also, it was a passageway, so their tendency was to flow, not to stop by (especially if they were in a hurry from one exhibit to the next). I noticed that sometimes people can have the concept of being 'done' with an exhibit and they might not stop for 'extras' (in case they are coming from the Neuroscience Studio). Or, they can be anxious to get to the Neuroscience Studio, in which case they would not stop for something prior.”*

### **Impact of Scientist Participation**

Upon reflecting on their experience participating in Scientist Spotlights, 68% of scientists and volunteers said that their interactions with visitors caused them to think about their work in new ways.

Those that positively responded elaborated as follows:

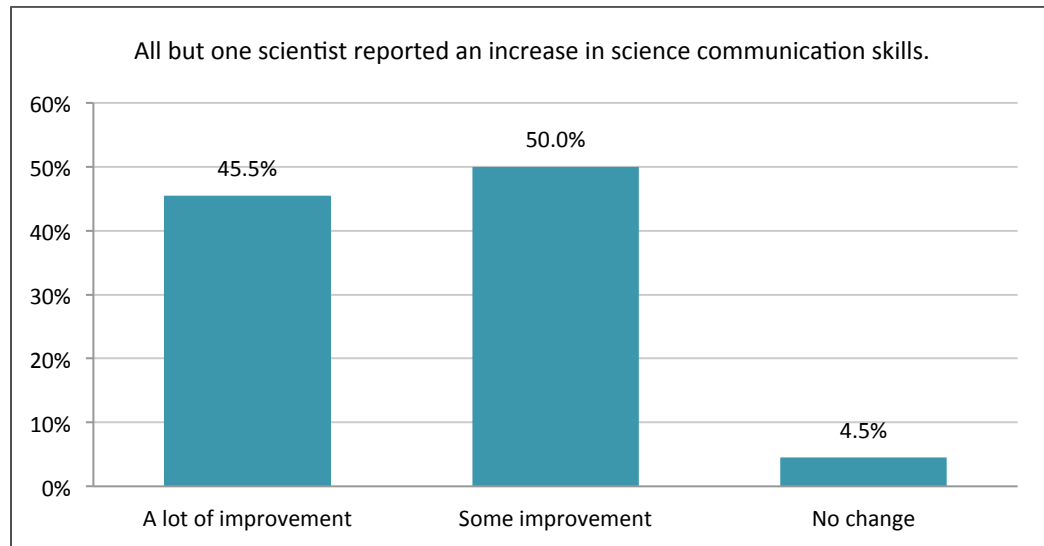
*“A few questions that some visitors asked helped me to think more broadly about my research; i.e. potential effects that I hadn't thought of before.”*

*“At the last spotlight, someone I spoke to brought up an idea for an experiment that I have been playing around with in my head for a while. I just may have to try it now.”*

*“One part of my activity is similar to the motivation behind my experiments, and it's interesting to see that visitors often walk through it in an unexpected way. This always makes me reconsider some assumptions I make in my research!”*

*“My interaction with visitors stimulate me to be more creative and to have a broader and practical view of my work. It makes me think of new questions and go beyond from the specifics of my research.”*

Beyond thinking about their work in a new way, approximately 96% of respondents believed their skills in communicating science and current research had improved to some degree since participating in the Fellowship program. This is encouraging feedback, as one of the main goals of the Science Communication Fellowship is to improve confidence in explaining science to the general public.



**Figure 7:** *Since participating in this program, to what extent do you feel your skills in communicating science and current research have changed?*

When asked to describe the main benefit of participating in Scientist Spotlights, most respondents provided responses that addressed enjoyment, disseminating their own research, and honing presentation skills. A few also specifically called out the opportunity to work with new audiences such as children or fellow scientists.

**Table 21:** *Main benefit of Scientist Spotlight*

What is the main benefit of participating in Scientist Spotlight?	18 respondents provided 21 general reasons
Enjoyment (share passion with others, have fun)	7
Talk about my/local research	6
Learn/practice communicating science effectively	5
Interact with and inspire young people/children through science	2
Meet other scientists doing work in a similar field	1

In their own words:

*"I really enjoyed having the chance to interact with visitors while talking about my own work. I've done more general science outreach before, but I find the kind of interactions I have at the spotlight to be more rewarding because I'm talking about concepts that I am personally invested in!"*

*“For me, each time it teaches me something about how to engage and sparkle scientific curiosity. Each person is unique and targeting/adapting the activities and the interaction for each of them is the most challenging and enjoyable part of it. For the public, I hope that they are having meaningful and long lasting positive experiences that make them come back/search for more.”*

*“I think that discussing my research and getting that interaction and feedback from people outside of my laboratory was the biggest benefit.”*

*“Fun to talk about science!”*

While respondents were more neutral on whether their participation in Scientist Spotlight influenced their thinking and approach to their research (rating of 3.91 out of 5), they were in strong agreement that this program was a worthwhile effort and is something they would encourage colleagues to participate in (rating of 4.86 out of 5).

**Table 22: Impact of Spotlight experience on scientists**

<b>Please rate the degree to which you agree with the following statements:</b>	<b>n=22</b>
I would recommend participating in Spotlight to a colleague.	4.86
Spotlight was worth the time and effort I put in.	4.82
I will continue to be involved in similar efforts at PSC.	4.68
Spotlight has encouraged me to do more to communicate my research to non-experts.	4.45
My participation in Spotlight has positively influenced the way I think about the public’s ability to understand or engage in thinking about my research.	4.41
My participation in Spotlight has influenced the way I think about my research.	3.91

\*Ratings were on a scale of 1-5 where 1=Strongly disagree and 5=Strongly agree.

As one researcher summarized: *“My interactions with visitors stimulate me to be more creative and to have a broader and [more] practical view of my work. It makes me think of new questions and go beyond from the specifics of my research.”*

Another researcher positioned Spotlight in a larger collaborative context: *“Overall, I think this program was an excellent opportunity not only to improve my personal communication skills but also to benefit society by making science more approachable and sharing about current research. The Scientist Spotlight represents a prime example of true collaboration between the Museum and local scientists to improve public understanding of science.”*

## MUSEUM PROFESSIONALS

To address the full impact of this project, it was important to go beyond its effect on museum visitors and participating scientists. Understanding this initiative from the project team's point of view would contribute to better understanding of whether The Studio is a model that informal science institutions can replicate or adapt. To this end, this summative evaluation study explored the extent to which Pacific Science Center/Studio staff **developed capacity and expertise in designing an innovative and sustainable model for current science exhibits/programs**; and consequently whether they have successfully **established strong partnerships with regional research organizations**.

### *Project Approach*

The Studio project was a unique undertaking for Pacific Science Center. Not only was the Wellbody Academy the first permanent exhibition to be installed at the museum in over a decade, it was the first time a small exhibit/program space was specifically designed to be embedded into a permanent gallery. Furthermore, the change-ready nature of The Studio concept was entirely new to PSC staff and required the team to manage complex deliverables within ambitious timelines for multiple cycles. For the PSC Studio team, there were two phases to this project—installation and iteration. Each phase required skillful coordination across internal and external groups and presented these museum professionals with both opportunities and challenges.

Among members of PSC's project team, there was a clear understanding of the goals and purpose of The Studio. They all saw this initiative as an opportunity to create a unique, quick-change exhibit that showcased local current science research to the public. The Studio is viewed as an exhibit and programming space—a venue where current science could be featured through objects and stories as well as face-to-face, hands-on experiences. Within this context, the team saw their efforts to develop The Studio as aligning with the Science Center's broader goals for public engagement, specifically with PSC's commitment to the Portal to the Public initiative.<sup>12</sup> Additionally, staff believed the changing nature of The Studio's exhibits provided fresh content that would help the Science Center establish itself as a resource for current science as well as give members and visitors reasons to revisit.

### *Project Challenges*

While the embedded nature of The Studio enabled visitors to experience both established and current science together, it presented one of the biggest challenges for the project. The 7,000-ft<sup>2</sup> Wellbody Academy was managed by a subset of staff from the PSC Exhibits team focused specifically on that exhibit's concept, design, fabrication, and installation. The scale of the project came with inherent organizational and logistical obstacles, and designing a small piece of that exhibit added to the complexity experienced by The Studio team. Planning for the Wellbody Academy preceded that of The Studio and this caused some friction in the design and fabrication process as the Wellbody team was well

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<sup>12</sup> Portal to the Public (PoP) was originally funded by the National Science Foundation (NSF) from 2007 through 2012. Led by Pacific Science Center, this initiative connects the audiences with current scientific issues and topics by providing scientists with the training, tools, and opportunities to share their work with the public and foster a true science conversation. The Portal to the Public program has earned field-wide recognition, and through the support of grants through IMLS and NSF, is currently in place at 23 science museums across the United States.

into their work when The Studio initiative was funded. Thus, the incongruent planning timeframe of each project resulted in the following issues:

- **Conforming to existing concept.** The Studio had to align with the aesthetic and narrative goals of the broader exhibit. The Studio team sometimes found it *“conceptually hard”* to integrate current science content or how that content was presented within the story of the Wellbody Academy. Often, current science aspects of health and wellness, like genetics and neuroscience, could not be conveyed as simply and were thus written to a higher reading level and may have appealed to an older audience than the rest of the exhibit. Hard design choices had to be made to ensure the goals of The Studio were not compromised and as such, the association between permanent and flexible exhibits was not as well matched as originally intended.
- **No control of exhibit design and fabrication.** The entire Wellbody Academy was fabricated and installed by a single external design group, Gyroscope, Inc. And while they were tasked to construct The Studio with flexibility in mind, the project team found the exhibit was not built as interchangeably as they had expected. The team expressed concerns over issues like power sources, wall construction, and layout. One Studio team member described a particular frustration, *“...the way there’s two entrances and people just walk right through the space, like a runway. I think that was a big oversight by them in how they designed the space. I think that keeps people from staying in [the exhibit.]”* Another team member explained the difficulty of predicting how The Studio space would function within the Wellbody Academy, *“...when the whole Wellbody exhibit opened, you realize the impact of the surrounding exhibit area on a smaller space – the noise levels, the commotion, the path people walk... We just didn’t know any of this before [it opened].”* Further discussions revealed how the reality of the space impacts the programming aspects of The Studio and the difficulties The Studio layout imposed when hosting scientist-led programs. The team acknowledged that these design compromises needed to happen, but coming in late on the design process and thus having little say in how the overall exhibition would be laid out made it more difficult when they had to execute The Studio’s goals within those limitations.
- **Impact of larger project delays.** One of the biggest challenges that The Studio team faced during this project was being tethered to the timeline of the larger exhibition. The Studio opened in June 2012 in a temporary location due to a one-year delay in the Wellbody Academy timeline. This strategy was employed to mitigate further delays in fulfilling the IMLS grant requirements but it put The Studio team at a great disadvantage because they had to essentially plan and build two different spaces concurrently – Theme #1 in a temporary location outside Wellbody and the permanent Studio space within the Wellbody Academy. *“We were doing two things plus figuring out how does this first theme even work,”* explains a team member, *“so it wasn’t just doing this for the first time, we were also designing the ultimate space.”* This was an extremely stressful situation, and although they successfully negotiated this problem through collaboration and creative problem solving, the demands of the experience greatly taxed the team, its resources, and morale.



In addition to the challenges brought about by the larger context of the Wellbody Academy, The Studio itself posed some difficulties for the project team. This was particularly evident with regards to the turnaround time for each theme. As explained by one project member, *“the scope of what we were trying to do in that space within a six-month turnover time was big. We had to learn an entire sub-field of research [for each theme], then learn the story and the people who do it [that science].”* From there, the team had to source content, artifacts, and media, and string them together into a cohesive, comprehensible story line. The team found that some themes were more difficult and technical than others. Some topics like genetics offered different pathways for exploration (e.g. should they present content at the chromosome level or the trait/characteristic level?). Science literacy became important, not just as a consideration for visitors, but for the project team.

Adding to the challenges of this project was the fact that Pacific Science Center has not one, but two, modular exhibit spaces—The Studio and Portal to Current Research both managed by the same small team. Whereas The Studio focuses its current science topics in line with the themes of health and wellness, the Portal to Current Research (P2CR) showcases local scientists’ advances in current research across the spectrum of science using a combination of digital media, graphics, objects and interactive displays and programs. Like The Studio, the content in P2CR changes twice a year and has included explorations of the solar system, polar ice melt, and the environment surrounding hydrothermal vent. Having competing exhibit priorities made managing The Studio initiative in isolation very difficult as staff and resources were shared across the department.

### *Successful Strategies & Practices*

To address these challenges, The Studio team adopted a number of best practices aimed to keep the project focused and problems minimized:

- **Establish a project advocate.** The project manager was critical to ensuring Studio’s success. This was someone who was clear and firm about the project’s goals and timelines, who was the key point of contact for the project, and who kept the project on course. Centralizing this role made the project’s overall complexity more manageable. Furthermore, in a recent reorganization, one project manager was designated to lead both The Studio and P2CR exhibits. This ensured that each project’s needs, budgets, and schedules were balanced and accounted for, and that neither project was marginalized.
- **Increase collaboration with Exhibits.** As earlier described, the Wellbody Academy and Studio projects were managed by two different teams and worked from slightly different schedules. To deliver a cohesive exhibit strategy, it was important for both groups to work together. While this was more difficult in the early stages of the project when each team was focused on their specific deliverables, this collaboration has deepened during the maintenance phase of the project. As one team member explained, *“I found that sometimes there was a perception that Portal does its own things, but when Studio became part of the Wellness exhibit project, and integrated into the bigger picture, it was so much better...that really helped me do a better job of getting things done.”* In that spirit, The Studio team has made it practice to begin integrating more of their work with the Exhibits team, bringing them into The Studio theme development process earlier. For example, The Studio

team started relying more on the expertise of the Exhibits team for developing and fabricating interactives. *“What they created looks great and they were able to help suss out some of the mechanisms. I hope that by giving them ownership earlier on those pieces, they can contribute to the process and idea development earlier,”* explained a team member. The goal of this mutual understanding is to increase opportunities to collaborate to deliver high quality experiences.

- **Rely on science community experts.** While it was not specified in the original grant, the project team found it useful to establish content advisory committees for each Studio theme. These committees were formed from science experts in the Seattle community who volunteered their time to participate in the exhibit development process. *“They got excited about it. They were willing to connect us with other people. They had perspective. They took the time to give us feedback and to think more deeply about content, and give us artifacts and exhibits,”* explained one team member, *“They helped promote the exhibit when it opened amongst their circles...they were advocates for us without even having been written into a grant.”* Their contribution was described by some members of The Studio team as invaluable and critical to the success of each exhibit and The Studio concept itself.
- **Improve team communication.** Because The Studio project encompassed exhibits and programs staff and resources, it was important to streamline how information about the projects was communicated within the team. Individual one-on-one meetings were inefficient and the pace of the project sometimes resulted in incomplete communications. Instead, The Studio project team meetings were integrated into broader Strategic Projects team meetings. This group of seven (7) met weekly to discuss issues affecting the entire department. *“It was one place where all of us would together hear all the same information and be able to make modifications and offer input. We’d have a common understanding,”* explained one person. Another commented that the weekly team meetings also allowed the entire department to contribute to problem solving, adding *“we showed all the layout panels to our entire team...we were trying to figure out one timeline treatment which we didn’t like and [colleague] was able to suggest an idea that we ended up using in the final exhibit.”* By implementing something as simple as a consolidated department meeting, The Studio team was able to leverage valuable perspectives of their peers and provide opportunities for collaboration and shared experience.

### ***Program Impact & Value***

The Studio’s unique characteristics generated several outcomes on a variety of audiences including museum professionals who were part of the project team, the Seattle science community, and the informal science education field.

### ***Personal & Institutional Impact***

When Studio team members were asked what types of impacts they experienced or observed as part of working on this project, almost all described this as a unique scenario that provided them with new situations and opportunities to learn and grow professionally. They spoke of learning processes and

practices, and being exposed to new aspects of exhibition development. One person said that the flexibility of The Studio and the iterative nature of the space allowed for a greater sense of creativity, and fostered problem solving and experimentation. *“I have the ability to fail...and that’s liberating,”* she explains, *“We can just try things and see what happens because we’re learning something every time.”* Another team member felt this project impacted her understanding of the visitor experience and science communication, saying she had the chance to *“learn about the ways different modalities work together, and what makes for a successful exhibit.”*

Because The Studio was embedded within the larger scope of the Wellbody Academy, the project team gained first-hand experience in dealing with organizational complexities, negotiating priorities, balancing timetables and competing resource needs, and collaborating with a myriad of experts both internal and external to the Science Center. This experience helped them realize that division of responsibility and relying on the talents of others are crucial to project success. Decisions were always grounded in the bigger picture, the institutional perspective. At a micro-level, The Studio project enabled the Strategic Programs Department to be sustained without operational funding and grow in number and expertise. At a macro-level, the project pulled together the exhibit and programming strengths of the institution and delivered an exhibit that has the potential to build visitor interest and visitation through refreshed content and relevant subject matter.

### ***Impact on Science Community***

The local Seattle science community played a critical role in the success of The Studio project and scientist engagement in content advisory committees was invaluable. The project team felt that without their contributions and enthusiasm, the exhibit would have been generic. Through their participation, current science themes like genetics became focused explorations of how local research into DNA sequencing is being used to identify and treat complex diseases; or an exhibit on neuroscience became a showcase for the cutting-edge research being done on how brain signals can be used to compensate for injury or lost function.

Project team members were impressed by scientists’ excitement and commitment to the project and its goals. Some scientists had previously worked with PSC in different capacities (e.g. Research Weekends, Science Cafés, etc.) while others were new recruits, often brought on at the suggestion of their more PSC-familiar peers. Regardless, the project provided a catalyst that enabled the Science Center to engage and re-engage with the local science community in new and more meaningful ways. For example, scientists gave tours of their labs, sourced artifacts for display, read exhibit content, and even provided on-camera interviews for videos used in The Studio. They came to celebratory events, and after their exhibit theme was de-installed, asked for pieces of the exhibit to place in their own offices and labs. And although different scientist cohorts have transitioned in and out of the spotlight with each exhibit change, their connections with the Science Center remain strong. Beyond their work with The Studio, relationships cultivated as part of this project have benefited other parts of PSC. Scientists have hosted tours for PSC’s Discovery Corps teen program, spoken at community Science Cafés, and are integrated as part of PSC’s volunteer roster. Sustaining these relationships and fostering ongoing collaboration remains

a key priority for The Studio team. As they described, The Studio *“is allowing us to deepen our connections with more people, new people,”* and that is integral to The Studio’s continued success.

### ***Impact on the Field***

At the core of this project was the goal of developing a modular exhibit/program hybrid model that showcases current science and can be integrated into a larger, permanent exhibit area. The design, execution, and maintenance of The Studio have provided the informal science education field with a viable example. Pacific Science Center staff were able to combine a current science exhibit with compelling science programming to deliver a high-quality visitor experience. The team explained the importance of this hybrid model as a critical feature of The Studio saying, *“it really works when you’re focusing on your [science] community because you’re able to have these authentic face-to-face interactions.”* As discussed earlier, without that link to the scientist community and their contribution to the development of the exhibits, The Studio would present general science issues. Also, the scientists add depth and meaning to the exhibit because *“talking to scientists within the context of the exhibit space is really an interesting and powerful experience.”* That was the experience The Studio aimed to deliver. By structuring their model such that the scalability and changing nature of the exhibit increased opportunities to engage many scientists of varying disciplines over time, The Studio team established a sustainable link to their science community that is dynamic and regenerative.

Moreover, the process and experience of the project team has been documented through this grant and can serve the field in an advisory capacity. These museum professionals are well versed in understanding fabrication alternatives, media sourcing, budgeting and scheduling, as well as organizational management. Informal science institutions would benefit from the pioneering work done by this group and learn from their challenges and successes.

To complement these reflections from PSC staff, data was collected from 35 museum professionals from 15 science museums from across the United States. As part of their involvement with the IMLS-funded Portal to the Project National Network project, these ISEs participated in PoP dissemination workshops located at Pacific Science Center and thus were able to see The Studio in person. Their response to The Studio and the embedded exhibit concept was positive; 56% indicated they were “very interested” in exhibit models that integrated a changing current science exhibit within a larger, permanent exhibit installation while 47% said they were “very interested” in a change-ready exhibit model like The Studio for their museums.<sup>13</sup>

While acknowledging that this model is not ideal for all institutional scenarios, those who were in favor of further exploring an embedded exhibit model liked that current science was featured with established science. *“I am all about bringing current science to the forefront especially through dynamic exhibits,”* commented one visiting ISE, *“At our museum people come to see their old favorites but it’s nice (and necessary) to “thrill” them with something new or innovative.”* Another noted, *“I believe it is critical to*

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<sup>13</sup> A further 44% of respondents indicated they were “Interested” in exhibit models that integrated a changing current science exhibit within a larger, permanent exhibit (total of 100%) and 29% were “Interested” specifically in a similar change-ready, Studio model for their museum (total of 76%).

*give visitors an opportunity to learn the ‘newest and greatest’ of science...and present it in a friendly format for our visitors.”*

Those who were particularly interested in The Studio’s change-ready model felt it provided a new way of thinking about how to design exhibits to support frequent turnover and accommodate regular programming.

*Space is limited in our museum and we are always looking for ways to create flexible spaces to maximize our impact. We are also planning to expand and want to consider options for changeable spaces – exhibit and on-the-floor programming.*

*I think this type of model could be appropriate for quickly responding to visitor interests or highlight science stories relevant to visitors. It is a good platform that provides multiple entry points - objects, live presentation, video, and addresses different learning styles.*

*I would say this model will present ISE institutions an opportunity to keep permanent exhibits relevant and connected to their community or topic of focus throughout the overarching exhibit’s lifespan.*

While museum professionals appreciated the benefits of The Studio model, they also recognized its challenges for their museum. Some professed to having limited exhibit space and few resources to manage ongoing exhibit change. Others explained that their museums had a rigid infrastructure in place with established processes and schedules that would be difficult to modify. A few said that they would need more details about cost and project plans before they could decide if this model was suitable for their situation. Regardless of whether they would pursue the adoption of the model at their institution, visiting ISEs saw value in current science and the exhibit/program hybrid model itself. And this model—to highlight current science in a dynamic, relevant, and experiential way—was supported by the large majority of ISEs program attendees.

*Informal science environments are great places to discover science principles and concepts. Bringing current research and discoveries to the museum is a way to show that we still don’t have everything figured out, there are so many things yet to learn, and we still need scientists. This model may be the inspiration for someone to go into the field of science – you never know.*

*Anything that helps lay-people feel a connection to current science is good. I think we have gotten away from understanding that science isn’t stagnant. Anything we can do to bring things that are new and innovative to the forefront is great.*

The evidence presented through both internal team reflections and feedback from science museum ISEs demonstrate that not only is the design and implementation of a change-ready, exhibit/program hybrid space possible, it is relevant and vital for informal science institutions to inspire scientific curiosity and foster science literacy.

## ***Adopting New Strategies to Sustain The Studio***

As The Studio project continues, the project team identified the following opportunities for change and improvement. Adoption of these strategies would provide a clearer and more successful path towards sustainability.

- **Increase research and planning time.** The challenges of maintaining two modular exhibit spaces have proven problematic for the project team. Balancing both The Studio and P2CR with limited, shared resources makes refreshing thematic content every six-months difficult to sustain. As such, the team has decided to increase the research and planning phase for each the thematic cycle to nine (9) months. This protracted schedule would allow for more design and prototyping time as well as opportunities for richer content development. Attaining feedback from more teams at the Science Center (e.g. marketing, design, exhibits, science education) becomes possible. All these factors would contribute to stronger ideas and solutions, a higher-quality visitor experience, more realistic timetables, and less burnout among the staff.
- **Produce more in-house content in partnership with scientists.** Searching for content for each theme was an exhaustive process. As described by one team member, *“You can look for a really long time and you might find something but it’s going to take a while and you don’t know if the science in those videos is accurate or whether you have permission to use them.”* Moving forward, there is an opportunity for the team to leverage relationships with their science community as a means to source materials and develop in-house solutions with the goal of doing less but at a higher quality.
- **Scale scope of content.** A 500-ft<sup>2</sup> space can only hold so much content. In selecting current science topics and stories within that topic, the project team is tasked with choosing something that is interesting/relevant to their audience and that showcases the local science community. Trying to cover too much or presenting too many facets of a sub-field of science can result in a confusing visitor experience. Moving forward, the team will tighten themes and present focused content. They will also devise a strategy to assessing strategies for content presentation—via text, media, or interactive, learning experiences.
- **Better integrate program and exhibit schedules.** One of the critical pieces of The Studio is the combination of exhibit space plus programming. The program has primarily relied on PSC’s Science Communication Fellows to facilitate face-to-face experiences with museum visitors. Initially, the plan was to enlist Fellows to help define the content for Studio themes and have them serve on the content advisory committee. In practice, this meant that only 2-3 scientists would have any expertise on The Studio content; the rest focused on science that was only peripherally connected. To ensure that the match between scientists and exhibit content was strong, The Studio team will first select the exhibit theme, then recruit and train PSC Fellows who fall within that field of science. This new process will ensure a greater number of content experts per exhibit theme and it will ensure greater connectivity between exhibit content and interactive scientist-led experiences.

## *Lessons & Advice*

Over the past three years, The Studio team has had an opportunity to immerse themselves in the challenges and internalize their experiences. When asked to provide advice to give other institutions that are considering adopting this model, they offered the following reflections:

- *Get institutional buy-in.* To ensure that the project is appropriately funded and prioritized, senior leadership must be on board. The project should align with the institution's key initiatives and mission.
- *Clear roles defined.* As part of prioritization, having a clear understanding of responsibilities mitigates confusion and ensures stakeholders are contributing in the most meaningful way.
- *Make time to plan adequately.* While having up-to-date content is a benefit to museums that traditionally feature established science, it is imperative that there is enough time in the project schedule to creatively brainstorm, effectively plan and design, prototype, troubleshoot, and refine exhibit themes.
- *Leverage the local science community.* Experts in the field are important resources. They provide baseline knowledge of that field of science and can help set a direction and a vision for the exhibit and its programs.
- *Collaborate with fabricators.* Several challenges of The Studio project stemmed from the project timeline and disconnect between the large and small exhibit development process. Working with the design and fabrication teams from the project inception would allow for more integrated thinking and practice.
- *Evaluate alternatives.* While the outcome of this project is a well-designed and aesthetically integrated exhibit area, institutions should consider whether their needs could be met with a simpler execution.

## CONCLUSIONS & RECOMMENDATIONS

The aim of the IMLS Studio project was to design and implement a cost-efficient, change-ready exhibit model that could serve as a means for museum visitors to learn about current science research. Being situated within a larger similarly themed permanent gallery, this exhibit offered an opportunity to investigate the nature of how visitors negotiate between the topics of current and established science and the spaces each of those occupy within their museum visit. The addition of science programming extended the opportunities for visitors to engage with authentic science experiences.

As described earlier in this report, The Studio presented the project team with challenges from the onset. Delayed timing of the Wellbody Academy and the need to concurrently design, develop, and install The Studio and an additional change-ready exhibit, Portal to Current Research, required team agility and tenacity. Yet despite these issues, The Studio team successfully created an aesthetically compelling, content-rich exhibit that showcased current health science research to museum visitors. The summative evaluation study shows that this changing exhibit/program hybrid space was effectively embedded within the larger permanent gallery and that it can serve as a flexible, cost-efficient model for other institutions.

The following provides a summary of the conclusions and recommendations of this project organized by audiences. It is important to note that since The Studio exhibit and programs are being sustained through the support of a National Institutes of Health (NIH) grant, several of the conclusions and recommendations outlined below have already been acknowledged and acted upon. This is particularly evident with Visitor and Museum Professionals. In essence, these summative findings contribute formative data for continued project innovation.

### ***Pacific Science Center Visitors***

Museum visitors are the primary consumer of The Studio experience. It is through them that we learn if the project was ultimately successful. Outcomes for this group were organized cumulatively—that is, that visitors were first exposed to current research on health and wellness (and its possible careers); then, that The Studio offered engaging exhibit and program elements that showcased this content in meaningful ways; and finally that this experience ultimately impacted visitors’ understanding of The Studio concept and contributed to a satisfying PSC visit.

The Studio was visited by the vast majority of Science Center patrons with the majority in mixed groups of adults and children. While about half only casually walked through the space, a high portion of the remaining visitors stopped and explored the exhibit more thoroughly. On average, visitors’ dwell times in The Studio were comparable to other similarly sized exhibits and the exhibit’s sweep rate was better than most. Visitors were most intrigued by exhibit elements that were visually stimulating and highly interactive; that drew their attention as they were walking by, or that involved group participation (e.g. games, puzzles, challenges). Complementary programs that enabled visitors to engage with interpreters and research scientists in a hands-on/minds-on way not only increased dwell times, but also increased satisfaction and perceived value to their visit.



Beyond their onsite experience, people indicated that their Studio visits were memorable. The majority of cohort members were able to recall specific exhibit elements, facts, and conversations several weeks after their visit. They commented on the enjoyment of the tactile hands-on activities and could remember bits of content they had read, saw, or heard. For some, their experience compelled them to talk to others about the exhibit and/or follow up on something they learned during their Studio visit.

While visitors were mostly positive about their experience in The Studio, they were still somewhat challenged by the exhibit. The following are conclusions about the visitor experience:

- **The Studio layout is a challenge.** It was obvious in watching visitors negotiate the Wellbody Academy and The Studio that the exhibit's doorways create a passageway between Buildings 2 and 3. While this layout may have been unintentional, a result from early design planning, it added a layer of complexity to the exhibit and programming design. Most often, this passageway caused visitors to simply walk through The Studio without stopping to explore the exhibit space. In essence, they used the exhibit to traverse two buildings. The thruway also meant that scientist-led programs (e.g. Scientist Spotlight) were often located in less than ideal locations – for both scientists and visitors. With less than half of visitors stopping to explore The Studio, there needs to be a more effective strategy to entice them to stay.
- **Visitors are selectively exploring.** While dwell times are comparable to other similar exhibits (e.g. Portal to Current Research), they can be improved. Traffic patterns reveal that most visitors are attracted to one or two areas within the exhibit but rarely explore it in its entirety. Visitors tend to gravitate towards the interactive or visually interesting elements, then leave. Through three iterations of The Studio, there still has not been a magic bullet for encouraging deeper exhibit exploration. The exhibit layout (described above) and juxtaposition of a 'serious' exhibit next to the more frenzied Wellbody Academy may contribute to the transitory nature of the space. Visitors may simply not be in a mindset to read, absorb, and reflect on the content presented. That said we have seen how elements like Mindball, Discovery Carts, and Scientist Spotlights have not only drawn visitors in, but also held them in the exhibit and at times, encouraged them to explore further.
- **Visitors are unsure of how to approach content.** In developing a coherent content presentation, the Studio team must balance between organizing the exhibit content to tell a story about the research topic as well as making it approachable from different angles so that visitors can engage the content in any order. Although The Studio content is intended to be modular, some visitors do infer some directionality to the exhibit because they feel stories build from one idea to the next. This was seen in tracking video, and most commonly described by cohort visitors who had seen two different content treatments. While some visitors traveled clockwise, others went counterclockwise, and yet others explored in no particular pattern. There was a sense among them that they were unsure if they were going the right way or if there was a right way. Their confusion over how to explore the exhibit indicates a need to further explore content presentation options.
- **Visitors are seeking personal relevance to topics.** While acknowledging the basic challenge of comprehending, translating, and transforming complex scientific topics into information easily digested by the average person, it should still be a priority of the project team to also make The Studio's content

meaningful for people who visit. Both casual and cohort visitors expressed an interest in learning information that they can relate to personally, or that have a personal impact or repercussion. They like learning about current research, but what does it mean for them? How does it affect their lives? What should they do differently or think about more deeply? From tuberculosis pills to tongue rolling, concepts that are related to visitors in ways that they can internalize are more often remembered and more valued.

- **Visitors are unaware of The Studio's nature.** While people who spent time in the exhibit indicated that they enjoyed their experience and appreciated both the current and local research presented, they were less aware that exhibits in The Studio were rotated on a regular basis. This was despite the signage on both the inside and outside of the exhibit. Since visitors indicate a high likeliness to return to the exhibit and members' interest in renewing their membership is often rooted in wanting to experience new things at PSC, it is advantageous for the Science Center to communicate this aspect more explicitly onsite and in our visitor/member communications.
- **The Studio audience is not clear.** A fundamental challenge for most museums, it is difficult to create an effective single exhibit that appeals to all audiences. Based on project team conversations, it appears the content for The Studio is targeted at visitors ages 10 and up. Unfortunately, this is not consistent with the Science Center's primary demographic. A December 2011 general visitor survey found that respondents most often visited in family groups (87%) with the majority of children between the ages of 6-10. A look into the membership levels as part of a November 2011 study showed that 88% of memberships were at the family level, once again with most member children being between ages 6-10. Thus, when adult visitors state that they are not able to take time to explore The Studio because there is little that appeals to younger children, it limits the exhibit's overall reach and effectiveness.

Given some of these challenges and the overall goals of the project, the following recommendations are suggested to the project team. These recommendations center on the idea that by in large, improving The Studio relies more on improving engagement and interactivity rather than improving content. The stories and science information are there; the key is to make it more compelling, accessible, and connected to visitors.

- **Develop visual visitor "hooks."** Of primary importance is to stem the stream of visitors walking through the exhibit and getting people to stop. Nothing can be done about the physical exhibit layout so effort must be made to attract and retain visitors in the space. In order to increase the number of "Explorers" and increase dwell times within the space, the project team should focus on designing exhibits with very compelling visuals, visual stimulation, and/or a visible outlet for active engagement. People are drawn into an exhibit by their eyes. Text panels on a wall, regardless of their aesthetics, will not get them to stop. Visual curiosity will. Data from casual and cohort visitors demonstrated how "hooks" such as Mindball or the mouse brain image can draw people into a space and be used as initiators for further exploration.
- **Connecting exhibit content.** The core exhibit attractors should explicitly and directly connect to other parts of the exhibit. Once the "hook" draws in a visitor, they should be compelled to learn more or do

more elsewhere in the gallery. This may be a strategy for organizing the modular content components. Since we cannot control how visitors will interact with the exhibit, nor can we assume they will explore all of it, we might focus on the element(s) that draws their initial attraction and expand from there. For example, it may be beneficial to have one or two exhibit focal points that then refer to other content areas distributed throughout the exhibit space. Perhaps the team should even consider centering their design on one or two showcase elements and building the content story around them. Regardless, the links need to be explicit. Subtly placing content/objects adjacent to each other has proven futile in helping visitors make the connection.

- **Make the experience more personal.** A visitors' active engagement in learning can result in more lasting and meaningful effect. The Studio team should therefore consider strategies for how to tie research content back to personal relevance and personal choice. They should reflect previously successful examples and consider new methods such as posing questions to visitors, introducing 'what if' scenarios, role-playing, cause-and-effect simulations, or 'choose your own adventure' types of elements. These do not have to be elaborate but should offer a way for visitors to affect an outcome or see where they fit in the relative landscape of the topic. Where possible, these experiences should inspire conversation and collaboration among visitors. The tongue rolling encouraged visitors to engage and discuss inter-generationally within their groups, while Mindball stimulated inter- and cross-group competition and conversation about the how and why of results as well as strategies for winning. These examples show the range of possibilities for effective elements that can initiate a higher level of engagement.
- **Solidify link between exhibit and program.** Programming such as Discovery Carts and Scientist Spotlights have positively impacted dwell time and were shown to sometimes encourage further exploration of exhibit content. This occurs most often when the interpreter or scientist links their activity to objects or panels in the exhibit and directs visitors to take a closer look. As such, both PSC science interpreters and PSC Fellows should be trained to encourage visitors to explore the exhibit. When possible, their activities or presentation topics should be developed such that they somehow link back to information in the exhibit so that their interactions with visitors provide a natural segue to further exploration.
- **Consider providing a repository or gateway for more information.** Once visitors are hooked, absorbed in the content, and understand the topic's relevance to them personally; some may be interested in learning more and exploring the available research further. It may be worthwhile to catalog exhibit development resources, in-house and web-sourced videos on the topic, or other interesting bits of information that did not make it into the physical exhibit. This would allow for extended exposure to topics for the general public as well as provide a digital archive of The Studio's achievements for both potential contributors (content advisors, presenting scientists, etc.) and even funders to examine. Additionally, in-exhibit resources such as a listing of websites and/or leaflets may be helpful if visitors want to continue exploring the topic in more depth.
- **Actively communicate/market the nature of the space.** Although there have been attempts to describe the changing nature of The Studio using panels inside and outside the exhibit space, these cues have not been picked up by most visitors. It may be necessary to be much more explicit in panels and marketing communications (e.g. "Coming in June..." or "From June to December 2014..." or "Come back in

December when we'll be featuring...") in identifying the value of a frequently changing exhibit. As the Science Center undertakes renewed efforts to maintain and engage its current membership base, The Studio has the potential to fill an important role – that of an in-house produced, frequently updated exhibit space. Between The Studio and the exhibits in the sister space, Portal to Current Research, there are four opportunities per year to see and experience something new – the number one request of lapsed members according to a 2013 membership survey.

- **Define a target age range but acknowledge visitor age diversity.** For The Studio to be successful it needs to put a stake in the ground with regards to the audience it is targeting. That said it is important to realize that visitor groups will include young children and that that group dynamic plays a significant role in whether visitors explore an exhibit, how they engage with a space, and ultimately how long they decide to stay. Being situated within a high-energy and highly interactive permanent exhibit makes this an even more critical decision. Without sacrificing the goals of the exhibit, the project team should consider designing and implementing small ways to appeal to young audiences. These could include placing images or objects at a lower eye level, having tactile objects for play or manipulation, or simply creating an activity (puzzle or drawing) that caregivers can give to young ones. If feedback from cohort visitor groups is any indication, this (small) effort would go a long way to making family groups feel more welcome in The Studio and increase capture and retention rates in the exhibit.

### ***Participating Scientists***

Gauging the impact of The Studio on scientists was important to not only determine the effectiveness of the professional development/training program but also the compatibility of the scientist-led program with the exhibit gallery. The study explored the extent to which scientists improved their communication skills and increased their interest in ongoing public outreach as a result of their Studio experience. Additionally, the study investigated the effectiveness of program integration into the exhibit and the attitudes of scientists towards this integration.

In general, scientists' experiences and attitudes were very similar to results from other Portal-related program evaluations (e.g. Research Weekends, PoPNet initiative, Scientist Spotlights, etc.). This positively reflects on the quality and consistency of the Science Communication Fellows program. These participants were motivated to participate in public outreach because of their passion for science and science education, with a high percentage indicating they wanted to do more work in this arena. Many of the scientists were reflective in their contribution and progress, noting that they had room for improvement and would appreciate more occasions to practice their craft. After several years of conducting the professional development workshop, the project team has incorporated many refinements and there are few recommendations to confer. The two opportunities to consider are to provide more prototyping time and to enhance preparation for interactions with very young children (under 6) as that is a prevalent group at the Science Center and it seemed to be the one audience most scientists found different to connect with.

The more interesting finding from this investigation relates to the compatibility between scientist program and exhibit space. While not all scientists who completed the online survey participated in public programs in

or adjacent to The Studio, those who did provided very mixed sentiments on the hybrid exhibit/program strategy. These mixed results likely reflect the diverse nature of the scientists and their areas of research. The result of initial recruiting strategies resulted in a robust scientist cohort but very few who did research matched to the exhibit topic. This meant that scientist-led programs like Scientist Spotlight were not able to fully leverage the exhibit content and elements. Few scientists had the opportunity to connect their station activity with the exhibit or direct visitors to learn more about their work in the exhibit. As a result, a more strident effort should be made to design a scientist recruiting strategy that maximizes the opportunities to support the potential for a hybrid exhibit/program model. Also as described earlier in the visitor conclusions, scientists should be more explicitly trained to help visitors make connections for between their work and The Studio exhibit experience.

On top of these programmatic issues, the physical and logistic challenges of locating scientist stations within or adjacent to The Studio presents an additional problem. Unfortunately, no prescriptive solution exists as it may depend on the preference of the scientist, the complexity and needs of their station activity, expected visitor traffic patterns, and the exhibit gallery layout. All these factors need to be considered before situating scientist stations; and the team should acknowledge that there are situations beyond their control. That said, given the frequency of the programs and rotating nature of The Studio space, the team should continue experimenting. They are encouraged to think about how to perhaps change the overall exhibit plan to incorporate scientists directly into the exhibit area rather than include them as an afterthought.

### ***Museum Professionals***

The IMLS Studio project was complex and presented the PSC museum professionals who were involved with it a unique experience to undertake an initiative that few have attempted. For PSC, the goals of this project were three-fold: 1) develop an innovative model for current science exhibit/programs that is appealing to the ISE field; 2) grow and maintain strong partnerships with regional research organizations; and 3) sustain the project beyond its grant-funded period.

Although the scope of the project was ambitious and this process was fraught with organizational, spatial, and scheduling challenges, the project team delivered an exhibit/program hybrid model that was proven viable and sustainable. In addition to contributing to the professional development of the project team, The Studio served as a pivot-point for the Seattle science community. Through their collaborations on exhibit themes, Pacific Science Center engaged and re-engaged with local scientists and researchers, cultivating new relationships, deepening existing ones, and identifying new opportunities for future partnership.

Furthermore, ISEs from museums across the U.S. acknowledged that this model not only contributes to field initiatives that involve current science, it offers a valuable approach for museums, like theirs, to consider in innovative exhibit development. In all, the outcomes for ISE museum professionals were met in that capacity and expertise for designing an innovative and sustainable model for current science exhibits/programs was attained and, as part of the process, productive partnerships between PSC and its science community were established.

Throughout this process, the project team had many opportunities for reflection and process redesign. Recommendations were already identified in a previous section and are restated briefly below. Several have already been adopted.

- **Establish a project advocate.** Centralizing this role makes the project’s overall complexity more manageable and ensures there is a clear decision-maker who can ensure the needs and resources of each project are not marginalized.
- **Increase collaboration with Exhibits.** The Studio team has made it practice to begin integrating more of their work with the Exhibits team, bringing them into The Studio’s exhibit development process earlier and relying on them for expertise in designing and fabricating interactive elements.
- **Rely on science community experts.** The project team leveraged the invaluable expertise of scientists in the Seattle community and recruited them to participate in the exhibit development process – reviewing content, suggesting local resources, providing artifacts and media.
- **Improve team communication.** Centralize project information flow and minimize redundancy of one-on-one meetings and miscommunications as a way to engage everyone in discussion and contribute to problem solving.
- **Increase planning time.** The team should move the exhibit development schedule to nine (9) months to one year to allow for more planning and prototyping time as well as opportunities for richer content development, stronger ideas and solutions, and a higher-quality visitor experience.
- **Produce more in-house content.** The team should leverage relationships with their science community to source materials and develop in-house solutions with the goal of doing less but at a higher quality.
- **Scale scope of content.** The Project team should tighten topics and present focused content that are meaningful and relevant to visitors, and devise a strategy to assess content presentation options.
- **Better integrate program and exhibit schedules.** To ensure that the match between scientists and exhibit content was strong, The Studio team should first select the exhibit topic, then recruit and train Fellows who fall within that field of science. This new process will ensure a greater number of content experts per exhibit theme and it will ensure greater connectivity between exhibit content and interactive scientist-led experiences.

### ***Areas of Further Study***

In August 2011 Pacific Science Center received funding from National Institutes of Health (NIH) for a five-year project entitled, **Out of the Lab and Into the Spotlight (OLIS)**, the goal of which is to bring vital health science research and career information to the Pacific Northwest. The Studio—its exhibit gallery and programs—will continue to play a central role in this project, and it will be joined by two additional robust programs: 1) Life Sciences Research Weekend (LSRW), an annual, four-day research festival, and 2) Science Cafés in three

locations providing multiple venues for a diverse variety of visitors to meet face-to-face with local researchers and to learn about health science and related careers.

OLIS will build on Pacific Science Center's strengths by integrating The Studio with a unique combination of tested, successful science engagement approaches already in place at PSC and by drawing on our established relationships with local research organizations. By presenting the groundbreaking research and innovations taking place in our own backyard, the proposed project will have particular relevance for the community. Over the five-year course of the project, OLIS will feature over two hundred researchers from the Puget Sound region—many of them NIH-funded, thereby giving the funding agency a higher public profile. Additionally, OLIS will further the goals of the SEPA program by connecting the community to NIH-funded research and increasing the awareness of young people in the Puget Sound region about careers in the clinical research fields. Specifically, this project aims to deliver on the following outcomes:

- PSC visitors gain an awareness of NIH-funded research.
- PSC visitors increase their understanding of the process of science research.
- Participating scientists increase their skills in communicating their work to public audiences.
- Teens in PSC's Discovery Corps internship program and PSC visitors increase their awareness of careers in health fields.

Thus, the findings and recommendations identified through this IMLS-funded summative evaluation process will support further project innovation. As The Studio evolves through this new funding source, there are continued opportunities to improve the strategies and practices of the exhibit/program hybrid model and further understand its possible impacts on museum visitors. Both formative and summative evaluation studies are being conducted for this new grant and will center on the following evaluation questions:

#### **Formative Evaluation**

1. To what extent are visitors valuing the unique content of The Studio exhibit and programs and how do those perceptions compare to other experiences they might have with the rest of Pacific Science Center exhibits?
2. How are visitors using The Studio exhibit? What elements attract them to the space and which ones hold their attention?
3. What value do Life Sciences Research Weekend visitors place on the opportunity to meet and interact with local scientists and experts? To what extent does the event inspire interest in local health-related research and careers?
4. What is the nature of Science Café attendee's relationship with both the cafés and Pacific Science Center? To what extent are they more likely to attend either, after experiencing the café?
5. To what extent do participating scientists increase their skills in communicating their work to public audiences? What are the benefits of participating in either/both training programs and outreach events (Spotlights, Cafés, LSRW)?

## Summative Evaluation

1. To what extent do visitors that engage with The Studio exhibit or programs gain an awareness of NIH-funded research?
2. To what extent do visitors increase their understanding of the process of scientific research?
3. Is there a difference between the different program components (e.g. The Studio, Scientist Spotlights, Science Cafés, Life Science Research Weekend) in terms of their effectiveness at meeting these goals?
4. Do visitors (particularly Pacific Science Center members) see the program components (e.g. Studio, Scientist Spotlight, Science Cafes, Life Science Research Weekend) as adding value to their experience of the Pacific Science Center?
5. To what extent do participating scientists increase their skills in communicating their work to public audiences?