PORTAL
to the Public

FACE-TO-FACE WITH SCIENTISTS

Exploring the Features of Face-to-Face Interactions
between Scientists and Public Audiences

January 2008

Dennis Schatz and Lauren Russell

DISCOVER | PACIFIC SCIENCE CENTER

Portal to the Public Mission Statement:

Portal to the Public develops a proven, scalable program model for Informal Science Educators to engage scientists and public audiences in face-to-face interactions that promote appreciation and understanding of current scientific research and its application.

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FACE-TO-FACE WITH SCIENTISTS

Exploring the Features of Face-to-Face Interactions between Scientists and Public Audiences

A report of the discussion and findings of the
Portal to the Public Synthesis Meeting

January 28 and 29, 2008
Pacific Science Center

Dennis Schatz and Lauren Russell

Portal to the Public is a three-year National Science Foundation funded project awarded to Pacific Science Center, the Institute for Learning Innovation, Explora and the North Museum of Natural History and Science.

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Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation.

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Dear Colleagues,

This report is the result of lively, two-day discussions among scientists and informal science educators who have extensive experience designing programs that convey the results and nature of current scientific research to a variety of public audiences. This report attempts to capture the nature of the discussions that occurred during the meeting, as well as lessons learned, best practices and research results that will be useful for the field as a whole including working scientists, museum educators, public information officers at research labs and other science communication professionals. The results have also informed the work of our Portal to the Public grant by identifying areas where we need to expand our efforts (e.g. strategies for rewarding and incentivizing partnership, defining the realistic audience impacts of face-to-face interactions, etc.). A summary of the recommendations can be found in the Conclusions & Key Learnings section of this report. A separate summary publication can be downloaded at pacificsciencecenter.org/portal.

Participants were not asked to reach consensus on the questions pondered during the meeting; in fact, it would not have been possible to do so. Because successful interactions between scientists and public audiences are dependent upon the specific context, you will need to determine what parts of the discussions and conclusions are relevant for your situation.

The results of this meeting will help our team focus the program activities and research of the Portal to the Public project. We expect that over the next few years, our research results will add to the growing knowledge about collaborations between scientists and informal science education institutions, and will make it easier for those people wanting to do similar types of programming.

Our thanks to all the participants who took time from their busy schedules to participate in these lively discussions. Our special thanks to Rebecca Reynolds (meeting facilitator) and Mary Frances Davidson (logistics coordinator). Without their help, the meeting participants would have been disorganized, hungry and homeless.

Dennis Schatz,
Principle Investigator

Lauren Russell,
Portal to the Public Project Manager

PORTAL
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MEETING BACKGROUND, PURPOSE & GOALS

The Synthesis Meeting was held in January 2008, at the front end of the Portal to the Public grant period. Portal to the Public is a three-year National Science Foundation-funded project awarded to Pacific Science Center, the Institute for Learning Innovation, Explora and the North Museum of Natural History and Science. Key deliverables of this project include public program models that bring scientists and public audiences together in face-to-face interactions, professional development experiences for participating scientists, research on the these models, and efforts to support a professional learning community in the field. See Appendix 1 for a project description.

In order to support a professional learning community around Portal to the Public, the project team conceived of and hosted the Synthesis Meeting at Pacific Science Center. For this meeting, 43 experts, stakeholders and members of the project team came together for two days of dialog and reflection. Participants brought diverse knowledge and experience, and represented public, research scientist and informal science educator (ISE) perspectives. See Appendix 2 for a list of participants.

The Synthesis Meeting goal was to facilitate in-depth conversation to identify current initiatives, best practices, and future directions regarding activities in the field that:

a. Support partnership and collaboration between research organizations and informal science education institutions,

b. Involve face-to-face interactions between scientists and public audiences, and

c. Involve professional development that prepares scientists to work effectively when face-to-face with public audiences.

The meeting began with three introductory, 15-minute presentations to frame key issues related to the meeting goal and the three topical areas as described above. Subsequently, each small-group breakout session was preceded by a speaker who provided "food for thought" for each of the three discussion sessions. See Appendix 3 for the full meeting agenda and Appendix 4 for the breakout discussion handout. Scribes for each of six groups recorded insights, observations and recommendations throughout these conversations and during plenary sessions.

Rather than attempt to reach a consensus, the findings in the body of this report summarize the discussions, presentations, and major points made by the participants.

INTRODUCTORY PRESENTATION HIGHLIGHTS

Three introductory presentations provided context for the meeting:

Motivations: The Ongoing Challenge of Building Public Engagement with Science

Alan Friedman, Ph.D.
Consultant and Director Emeritus of the New York Hall of Science

Creating Engagement with Science and Technology has been a centuries-long challenge addressed by some of the best scientists on the planet. We believe in this work and its importance, and we are committed to learning how to continue and improve upon what was started by Faraday, Einstein, Sagan and others. But what are our challenges, what are the stakes and what are our tools to do this work?

Public Audiences' Motivations for Visiting Informal Science Education Institutions

John Falk, Ph.D.
Sea Grant Free-Choice Science Learning Professor, Oregon State University and President Emeritus of the Institute for Learning Innovation

What motivates visitors is inextricably connected to visitors' prior beliefs, personal context and role played during the visit. The key to ISE institutions successfully facilitating current science learning for the majority of their visitors is figuring out how to make current science an appropriate learning goal for all types of visitors.

Comparing Scientists and Educator "Cultures"

Andrew Fraknoi
Chair of the Astronomy Department at Foothill College and Executive Director Emeritus of the Astronomical Society of the Pacific

Scientists and educators live in different cultures and, some may argue in entirely different universes. Knowing these differences can help us tremendously in setting up programs that link scientists to educational projects. Some of these differences include the use of jargon, a sense of expertise, patience with beginners, expectations of adequate resources and tools, having assistants, time for contemplation, and international-versus-local concerns.

Full videos of these presentations can be found online at pacificsciencecenter.org/portal.

Following these presentations, participants broke into small groups to consider and record the most striking insights expressed by these speakers. The following six themes were most frequently mentioned:

1 Public Audiences Goals & Motivations

Public audiences have their own goals and motivations for visiting ISE institutions and for participating in specific programming. These goals often are not the same as those of ISEs. ISEs need to be aware of the publics' motivations and consider them when designing programs. Additionally, tying science to visitor motivation and to the "real world" (e.g., careers, money, literacy, decision-making) is key to producing meaningful experiences.

2 Science Research versus Education

The culture (motivations, needs, language, assumptions and constraints) of science research and the culture of science education are quite different and can sometimes clash. Building awareness of shared goals, needs and resources while uniting to pursue shared goals is critical. This is accomplished by developing relationships, communicating, and sharing fears.

3 Triad of Science, Education, and Public Audiences

Acknowledging the scientist/science institution, the educator/ISE institution and the public audience as three equal partners in the design of face-to-face programs will make for success. This means understanding the different needs, motivations and cultures of each and creating ways to bridge them.

4 Science as Process (Method) versus Product (Outcome)

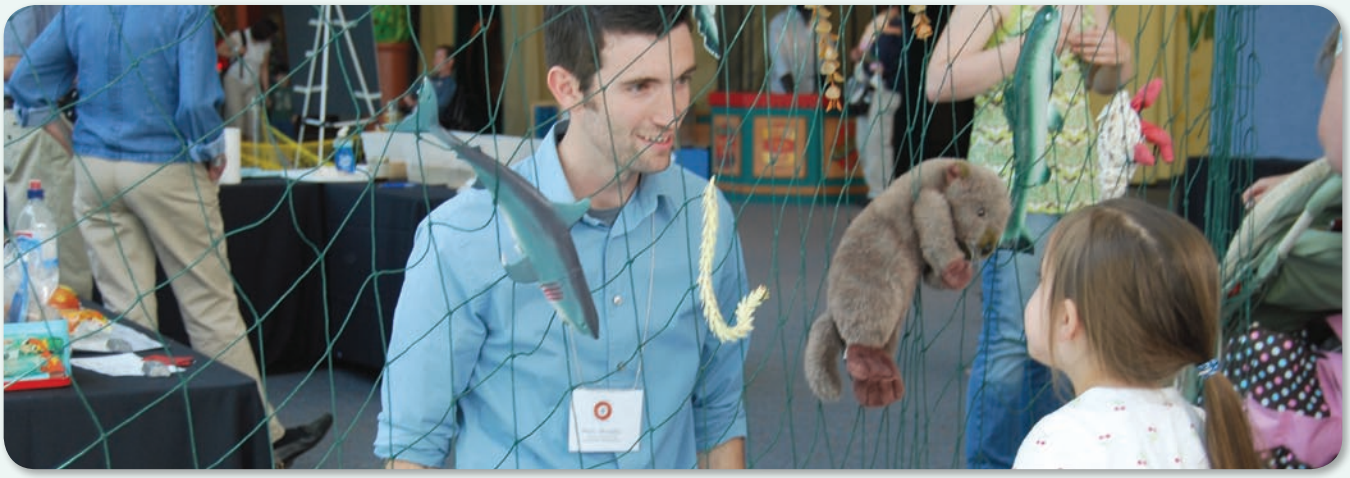
Science is both a system of thought and a body of knowledge. There is basic, foundational science, and there is current science. It is important to be clear about the specific desired learning outcomes and the balance of foundational and current science when designing programs.

5 New Tools

There is a need to develop new, innovative tools and techniques to support face-to-face interactions between scientists and public audiences (e.g., more effective training tools for scientists to interact with public audiences and additional strategies to effectively reach underserved audiences).

6 Professional Development

Scientists will benefit from professional development focusing on effectively communicating current research to public audiences, and ISEs are well-suited to provide this service. ISE staff will also benefit from professional development by gaining insight into the unique challenges of communicating current science and active research, as well as understanding the culture and motivation of scientists and scientific institutions.



INSIGHTS REGARDING BUILDING PARTNERSHIPS

This session addressed the dynamics between research organizations and ISE institutions regarding the formation and management of partnerships and collaborative projects.

This topic was introduced by the following presentation:

Connecting People: Building Partnerships and Collaborations between ISE Centers and Research Organizations

Marco Molinaro, Ph.D.
Chief Education Officer for the Center for Biophotonics Science and Technology at UC Davis

Successful partnerships between educators and researchers depend on creating meaningful personal relationships and setting clear roles and expectations for each partner and individual involved. The interactions can start simply and focus on the "fun" of science with the goal of growing into more substantial partnerships. External variables that can affect these interactions include funding, proximity, personalities, building an understanding and appreciation of each institution, etc.

Assumptions for the purposes of this discussion were:

- *Research organizations and ISE institutions both have a vested interest in improving the understanding and awareness of current science research by public audiences.*
- *Partnerships between research organizations and ISE institutions are a valid means to bring current science research to public audiences.*
- *Many research organizations and ISE institutions have a mutual interest in partnering and collaborating.*

Group findings fell into four categories:

1 The challenges and opportunities for partnerships and collaboration

Group findings indicate that the most striking challenge involves the differences in culture and structure between ISE and science communities. This difference ranges from a lack of mutual awareness to more negative sentiments of disregard

or superiority by either group. Much of what needs to be done can be summed up in the words of one group: "The more ISE staff mingle with scientists, the more likely the scientists are to respect, understand, and consider the role of an ISE"–and vice versa.

Time is another significant challenge. Busy people will not make the time to collaborate without first developing a mutually respectful relationship and a shared understanding of partnership benefits. Benefits of partnerships may be financial or an opportunity to raise the public profile of both institutions.

Another challenge concerns the importance of gaining buy-in and building relationships at the top levels of both organizations, since decision-makers set priorities. It can be challenging to identify appropriate individual contacts within an institution and to understand cultural differences between different levels of management. Individual partnerships that have developed through personal relationships will be strengthened and sustained by a broader institutional partnership–and vice versa.

Relationships are a two-way street, where both partners are involved and changed.

The understanding of what is meant by "collaboration" or "partnership" was also identified as a challenge. It is often defined too narrowly (scientist giving a presentation) and not in its broader and more advantageous application (e.g., a way to influence public policy, a way to leverage funding, a way to improve both professions). It is important to identify best practices for forming and working in partnerships (e.g., selection of partners, articulation of common goals, ground rules) so as to capitalize on successful models and avoid "reinventing the wheel." There is also the concern regarding the lack of long-term partnership funding and how to develop sustainable partnerships that last once the grant money runs out. An additional challenge is that funding support for education and partnership projects may not be uniform across scientific disciplines.

Other opportunities were identified in addition to those directly related to the challenges expressed. First, each realm (ISE and scientific fields) have "trusted access": ISE institutions have access to public audience educational skills, and scientists have access to knowledge, practice and academic or scientific audiences. This makes for a natural partnership between ISE and scientific organizations for achieving the mutual goal of improving the public understanding and appreciation of science. Science organizations and ISE institutions have a broad range of complementary interests and capabilities to be tapped for this work.

There was also mention of the need for a greater level of understanding of scientists' attitudes toward education. Within university culture, there is an important opportunity to change how education and outreach are viewed and valued. ISEs can have a positive impact through meaningful partnerships. There was also a caution about framing this as one group (ISE professionals) changing another (scientists). Relationships are a two-way street, where both partners are involved and changed.

Finally, three other striking opportunities were noted: 1) increasing public awareness of the need for science education, 2) addressing the funding pressures in research that encourage scientists to pursue broader impact and education outreach work and 3) a growing realization by scientists that there is a pressing need for the public to be scientifically informed in the interest of good public policy.

2 Characteristics evident in successful, mutually beneficial partnerships

All six breakout groups noted mutual respect between partners as an essential characteristic of successful partnership. This is critical for the success of everything else and is based on a cultivated relationship where each partner understands and values the other.

Shared ownership is another key characteristic for success. All partners must be vested in the relationship, including decision-makers and program implementers. Flourishing partnerships often have individual champions within each organization who ensure the partnership/project moves forward.

Successful partnerships are mutually beneficial – there are shared goals and clear benefits to all parties, including funding, recognition, etc. Providing incentives for both partners is also important. This could involve recognizing, rewarding, honoring, and otherwise attaching distinction to the partnerships and outreach activities.

Other characteristics of successful partnerships include:

- *Having a written agreement outlining the specifics of the partnership, such as roles, responsibilities, logistics, resources, and program strategies*
- *Being patient and responsive*
- *Realizing relationships take both time and nurturing – especially at the beginning*
- *Enjoying the work being done together*

Several groups also noted the need to develop partnerships prior to developing grant proposals so that the goals and needs of all partners are met in a project.

3 Barriers to institutionalizing partnerships and collaborations across broader research and ISE communities

Many of the barriers relate to findings in the previous section, such as the time needed to establish and nurture relationships, misconceptions about a partner organization, collaboration and public audiences, differences in institutional culture, the public preconceptions about science and disagreement between partners about goals and objectives. There also is often a huge variance in resources, staffing, and/or mission between scientific and ISE institutions.

Some groups noted that the lack of a common model for these kinds of partnerships leads institutions to "reinvent the wheel" each time. Alternately, another group noted that "one model does not fit all" and that striving to find one model may be a barrier in itself.

One group charged the field to move beyond the status quo by "challenging our assumptions and limited imaginations".

One group charged the field to move beyond the status quo by "challenging our assumptions and limited imaginations". Another group cautioned that efforts to minimize failure will lead to risk-averse strategies and produce programs that "retreat to the mean".

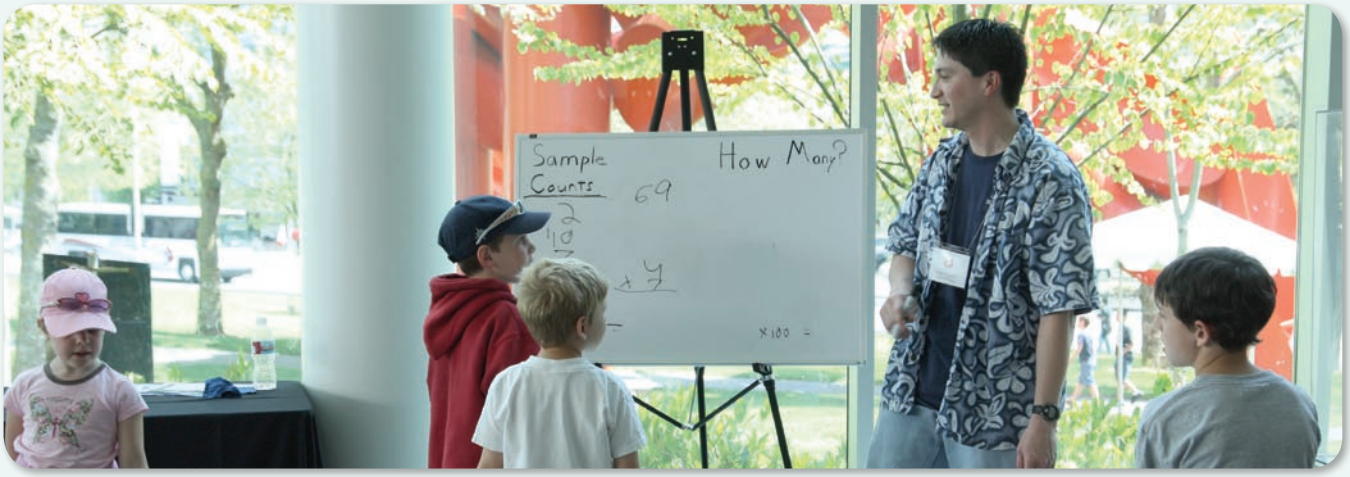
The lack of proximity of the collaborating institutions to the nature of the local culture can also be barriers to overcome.

Another barrier related to the long-term sustainability of these relationships: who has the responsibility for the growth trajectory of partnerships – especially after grant funding runs out? Best practices (tool kits, templates, models) need to be developed to support the institutionalization of these relationships. Partnerships should be considered during museum strategic planning due to the significance of the resources needed to establish and maintain them and their long term value.

Finally, the lack of a clear understanding of how to recognize and measure program success, or the partnerships behind them can be a barrier. One group suggested the use of goal-free evaluation to track unintended outcomes. Additionally, how program success is defined and evaluated must change as the relationship between partners evolves and grows. National Science Foundation's recently published *Framework for Evaluating Impacts of Informal Science Education* was mentioned as a valuable new tool.

4 Other Findings

Many groups discussed the importance of understanding that neither scientific nor public audiences are monolithic. Science research is not a single entity, but rather is composed of many entities. Each scientific organization or individual scientist has differing needs, goals, resources, perceptions and reasons for potentially becoming involved in a partnership. Likewise, it is essential that we understand public audiences are diverse, each with individual interests and motivations to participate.



INSIGHTS REGARDING FACE-TO-FACE INTERACTIONS

This session explored the nature and value of face-to-face interactions between scientists and visitors as a way to improve public audiences' understanding and appreciation of current science research.

This topic was introduced by the following presentation:

Face-to-Face

Carol Lynn Alpert
Director, Strategic Projects, Museum of Science, Boston, and PI for Research Center – ISE Partnerships (RISE) for the NSF Nanoscale Informal Science Education Network.

What do we mean when we say "face-to-face"? The modes and formats for researcher–public interactions are diverse; these need to be carefully characterized before generalizations can be made. Everything, including the choice of whom to invite and the structure of the interaction, reflects who we are, who we think the researchers are, and who we think our audiences are–as well as what impact the encounter is likely to have on all these participants. We must ask ourselves: What is it that we, our partners, and our audiences truly seek from these experiences and how can we best build on these collective yearnings and expectations?

A full video of this presentation can be found at pacificsciencecenter.org/portal.

Discussion parameters for this session were:

- *Many other delivery models exist (e.g., science center staff interpreting current science, scientists providing expertise for the design of exhibits or web-based materials) to connect public audiences with current science research. Because Portal to the Public specifically explores face-to-face interactions, the focus of the discussion will be on this delivery model.*
- *Programs that create face-to-face interactions between scientists and public audiences are a valuable and viable method of connecting public audiences with current science research.*
- *Face-to-face interactions provide a unique, personal experience for the museum visitor.*

Face-to-face interactions also provide opportunities for public audiences to engage and experience science in a way that is personally significant and memorable or to incite an "aha" moment.

Group findings fell into three categories:

1 Audience impacts best suited to face-to-face delivery

Face-to-face interactions can be transformative regarding the notion of "what a scientist is" – de-mystifying or humanizing the scientist who is often seen as a non-accessible stereotype. Many groups commented on the power of scientists to become role models and "neighbors" in their communities through these personal connections. Many issues relate to this idea, including the importance of the scientist being:

- *Genuine ("if s/he normally wears jeans, then present in jeans")*
- *Representative of the audience (racially, ethnically, gender, age, etc.)*
- *A good storyteller ("a hobbyist or a graduate student could be better suited to face-to-face interactions than a Nobel Prize winner")*

Individual scientists involved in face-to-face programming have an enormous impact on the quality of the interaction. It is critical to match the ability of the scientist-presenter with the appropriate presentation mode.

Face-to-face interactions can inspire interest in science among audiences, whether this is creating an interest in science careers among youth or making the experience of science accessible through the scientist, fostering an "I can do that!" feeling among participants.

One group discussed how exposure to research will humanize not only the scientist, but also the process of science, noting that "showing science–warts and all–can be valuable." Face-to-face interactions also provide opportunities for public audiences to engage and experience science in a way that is personally significant and memorable or to incite an "aha" moment. With face-to-face interactions, there is a tremendous opportunity for participants and scientists to "do science" together in a meaningful way where both parties are involved and affected.

Most groups noted that impacts on scientists should also be considered. Both parties, scientist and audience, are changed as a result of engaging interactions. One potential impact on scientists is to provide a "reality check" (i.e., explaining his/her work to a public audience gives the scientist an appreciation for what level of understanding or concern public audiences have about his/her work). A researcher's self-image may also be impacted by connecting to the social context of his/her work through dialog with public audiences. Social context reflects how public audiences use and interpret an area of research.

Creating positive feelings about the ISE host institution was also mentioned as an important audience impact. In particular, face-to-face programs involving local scientists establish an ISE

institution's credibility and contribute to an image of being "the place for conversations about science" and not just the "conveyer of knowledge".

Potential negative impacts associated with face-to-face interactions were also discussed. These include disenfranchising or alienating the audience and scaring, confusing or intimidating them by the content or by an ineffective presenter; all of which could lead to people being turned off to science and to ISE institutions.

And finally, the concept of quality versus quantity of impact was mentioned. Face-to-face interactions are well suited to make a deep impact on a small number of people. Personalized and tailored experiences were cited as the main reason for the quality (and also the limited impact) of these programs.

2 Effective face-to-face approaches for achieving maximum audience impact

Groups discussed the value of higher-level criteria for measuring programs versus evaluating specific approaches (e.g., a lecture or activity table). It was determined that constituted effective approaches was largely dependent on the audience, as well as the physical space where the program occurs. A matrix of program specifications that allows professionals to select a program design that aligns with the intended audience, desired impacts and evaluation data would be a useful tool for the ISE field. Approaches are not transferable, but should be crafted to suit the particulars of the situation. A set of criteria may assist in disseminating best practices within the field across diverse situations. Specific criteria discussed include:

- *Be daring, innovative and fresh*
- *Be flexible and responsive to the audience in real time*
- *Meet the needs of both parties*
- *Provide a two-way dialogue*
- *Value storytelling*
- *Integrate experience with other museum programs*
- *Provide experiences where parents and children are equally involved*
- *Make connections to everyday life and culture*
- *Layer diverse program models together for extended experiences*
- *Consider audience motivations*
- *Provide authentic experiences that include doing real science*

Groups noted that face-to-face interactions are more costly per number of people served than other delivery methods (e.g., TV, internet) and that it is difficult to evaluate and measure success. One group discussed the importance of extending the experience beyond the face-to-face interaction. How do we get the audience to take action related to the experience afterwards? How can we create a community of learning together over the long term?

One group discussed the importance of extending the experience beyond the face-to-face interaction.

Many people thought that the "scientist" providing the face-to-face interaction does not have to be a high-level scientist. A hobbyist, a graduate student or a retired scientist could be just as or even more effective given certain circumstances or audiences. Some suggested using additional ISE staff as a go-between to provide context, support and even interpretation for the "live" scientist.

With regard to specific approaches, various groups brainstormed effective face-to-face approaches for on- or off-site programming, as described in the list below:

- *Forum encouraging dialog and deliberation between and among members of the public and experts*
- *Informal Q&A sessions*
- *Interactive "cart" or smaller scale hands-on activities*
- *Stage demonstrations or shows*
- *One-on-one mentoring experiences*
- *Debate or panel discussion with experts*
- *Research conducted in museums for visitors to observe*
- *Science cafés and events in non-traditional locations like pubs, malls, etc.*
- *Field trips to scientists' laboratories*
- *Citizen science opportunities for visitors to participate in research alongside scientists*

3 Other Findings

Time was spent discussing what is really meant by face-to-face interactions, and several individuals challenged Portal to the Public's definitions and expectations. Some individuals thought it was important to consider when face-to-face would not be viable or valuable (e.g., on sensitive topics like sex, religion, stem cells or when group interaction could feel threatening). Some also noted that intense emotional connections can occur via mail, internet, and text-messaging, proving these modes are powerful techniques to use along with face-to-face interactions. They wondered whether it is the format of the interaction (e.g., lecture, activity table, demo, iChat) or the quality of the individual presenter that is critical to having the desired impact.

One group discussed the need to do a better job of incorporating the public's points of view when designing programs. This group felt that the public's views should be central and valued.

Another group expressed the importance of impacting audiences when they are young (8th grade or younger), especially since the number-one predictor of whether someone will go into science is not mathematics achievement or grades, but the person's interest in science at a young age.

One group thought that including the media in discussions with ISEs about effective strategies to communicate current science research is important, since they play a huge role in general science communication.

One group discussed how face-to-face experiences build a relationship between scientists and public audiences, which develops interest amongst involved parties for future science programs of all types.

Some also expressed the concern that we may be focusing on attentive audiences who are already interested in current research, rather than working to reach inattentive audiences. It was suggested that providing face-to-face programming in the community (e.g., churches, after-school programs) would be an effective way to reach these audiences.

Finally, everyone agreed that if the mission of ISE institutions is to become the social hub of science in the community, then face-to-face interactions with scientists are a critical component.

INSIGHTS REGARDING PROFESSIONAL DEVELOPMENT FOR SCIENTISTS

This breakout session addressed the creation and execution of professional development experiences designed to prepare research scientists to work with public audiences in an informal learning environment.

This topic was introduced by the following presentation:

Dealing with Your Expert Blind Spot

Dennis Schatz
Portal to the Public Principle Investigator and Senior Vice President for Strategic Programs at Pacific Science Center

Just as we have an actual blind spot in our vision, we all have an "expert blind spot" in our interaction with others, i.e., we know our subject so well that we make unreasonable assumptions regarding what our audience already knows or understands, or what is needed to get them to understand a topic. Meeting participants took part in an interactive exercise in which participant acting as the "scientist" had to verbally tell other participants acting as "members of the public" how to draw a picture that the "public" could not see. The exercise demonstrates the expert blind spot concept and showcases challenges scientists face when communicating with public audiences, as well as the challenges ISEs face when designing professional development for scientists.

Assumptions for the purposes of this discussion were:

- *Research scientists who interact face-to-face with public audiences should participate in professional development experiences to prepare them for these activities.*
- *ISE professionals who work with research scientists should gain a solid understanding of the scientific research culture and practice through professional development or other experiences. However, this breakout session specifically addressed professional development experiences for scientists.*

Group findings fell into three categories:

1 Critical impacts that professional development should have on scientists preparing to work with public audiences

All groups identified three impacts as critical to professional development for scientists:

1. Increased self-awareness of their strengths, weaknesses and fears regarding interacting with public audiences
2. Increased communication skills with public audiences
3. Increased understanding of public audiences (motivations, learning styles, etc.)

Groups used different terms to describe self-awareness. Some noted the importance of the scientist/researcher's ability to do a self-inventory of skills and abilities to identify his or her strengths, weaknesses, and fears as an important component of professional development. Others mentioned the ability to self-reflect and evaluate one's own progress and room for growth. Self-awareness was also linked to one's ability to discover and recognize the value of his or her personal story.

Developing a scientist's knowledge of and ability to use effective communication strategies is paramount for successful face-to-face interactions. Strategies may include using a "hook," storytelling, identifying alternatives to jargon, setting realistic goals for the experience or presentation, or developing effective listening skills.

Groups also noted that an increased awareness and understanding of public audiences would allow scientists to better communicate and relate in other professional settings. ISE communication skills may be broadly transferrable to a range of explanatory experiences (e.g., communicating with grantors, peers, media and students). Specific topics suggested for inclusion in any professional development experience include how people learn, visitor types, and motivations and strategies for working with various age groups.

Another important impact mentioned by one group is developing the ability to select and design engaging and meaningful experiences that effectively use visuals and other presentation materials.

Finally, professional development experiences can assist relationship building between scientists and ISEs, enhancing the scientist's appreciation of the free-choice learning community and the ISE role in increasing the publics' understanding of science.

Strategies may include using a "hook," storytelling, identifying alternatives to jargon, setting realistic goals for experience or presentation or developing effective listening skills.

2 Effective strategies and best practices for achieving maximum impact

The groups identified that effective professional development for scientists should include the following elements:

1. Demonstrate and model what effective face-to-face interactions look like
2. Provide ISE support (e.g., mentoring, coaching, co-presenting) to aid, encourage and provide feedback to the scientists
3. Give opportunities for scientists to practice their new skills
4. Offer a range of ways for the scientist to reflect, self-evaluate and get feedback on their face-to-fact interactions with public audiences
5. Bring individuals who excel back to do #1 and #2

Some people suggested creating a "hierarchy" of diverse professional development experiences starting with broad, introductory-level workshops and materials and ending in mentorship, practice and immersion in informal environments. This range of scalable options can be matched to individual scientists' needs, interests and programs. One group suggested that professional development be designed to focus on a specific role or event. This provides a reason for the scientist to develop his or her interaction skills and focuses the training on preparing for a type of interaction. A number of

meeting participants suggested that demonstrating both good examples and bad examples would be effective, and that it is important to create some kind of reward or award so that scientists have an incentive to participate.

The professional development experiences should be time-efficient (not a drain on a busy scientist or researcher's time), low stress, inclusive of diverse groups (a mix of disciplines, researchers and educators), and fun. Professional development experiences should also be conceived with the long term in mind and as a way to build relationships that will be an asset to the ISE institution into the future.

Meeting participants mentioned a number of tools and resources that would be useful to have, including:

- *A clearinghouse for professional development experiences that can be shared with research institutions and ISEs*
- *A range of self-assessment tools for scientists*
- *Structure for peer support groups*
- *Strategies/instructions for the use of video in providing professional development and feedback to the scientists*

3 Other Findings

An important question that emerged concerned who will participate in the professional development and how experiences can be designed to match the varying professional development needs of different participants. For instance, one group asked if there are differences between corporate, federal and soft money-funded scientists, and another asked about the difference between amateurs (e.g., star-gazers, bird-watchers) versus "top-level" scientists.

One group noted there seemed to be a greater interest in professional development among younger scientists and wondered if the reason was that they did not know where to find professional development opportunities elsewhere. A target group for professional development might be early-career scientists and graduate students, since their development will have long-term effects and implications.

Professional development experiences should also be conceived with the long term in mind and as a way to build relationships that will be an asset to the ISE institution into the future.

A number of people noted that making every scientist capable of face-to-face interactions is not a realistic goal nor desirable, especially if the individual is not interested or known to be an ineffective communicator. Recruitment and selection should focus on scientists already interested in working with ISEs and public audiences–"pick the low-hanging fruit first." A number of motivations that would pique such an interest are:

- *Intrinsic motivation*
- *Grant requirements*
- *Desire to convey the passion of their field*
- *Motivation by their own children, which is then extrapolated to other children in the community*
- *Desire to avoid the "spinach dip" brush-off (i.e., loss of interest when scientist explains their job)*
- *Interest in the social context of their work and in gaining an understanding of public values and perceptions related to their specific research area*
- *Desire to improve in related skills (e.g., tapping into applications, strengthening grant applications by making research more applicable, requirement to include laymen's abstracts in journal publications, being an effective blogger, presenting papers, teaching university courses, testifying)*

Several groups were concerned about the phraseology of "professional development" for scientists/researchers, thinking that it might imply something patronizing—that they are inadequate and need "fixing." They suggested finding a different term and also talking about providing "tips and tools" for scientists to become better communicators. Another related idea was that professional development should not be one sided. ISE professionals could also benefit from professional development.

Finally, several groups indicated that professional development for scientists and researchers offers ISEs the opportunity to communicate to scientists the value of informal education and working with public audiences; i.e., to advocate for our mission.

CONCLUSIONS & KEY LEARNINGS

After reviewing the scribed notes, poster notes, each group's report-backs, speaker presentations and participant handouts generated at the Synthesis Meeting, a number of insights emerged that will help the field and inform the Portal to the Public project. The conclusions and key learnings appear in three categories, below: best practices, considerations and recommendations for the field.

BEST PRACTICES

1 Partnerships

Thriving partnerships between ISE institutions and research organizations are crucial to delivering successful current science programming. Effective partnerships require:

- *Understanding the difference between the cultures of the scientist and the ISE staff*
- *Developing mutual respect*
- *Building buy-in at the top and collegial relationship on the ground*
- *Sustaining the relationship after the grant dollars are gone*
- *Having a clear understanding of the relationship, roles and responsibilities and putting it into writing*
- *Creating rewards and awards for work well done*
- *Ensuring a mutually beneficial relationship*
- *Realizing that building the relationship takes time*

2 Face-to-Face Interactions

Face-to-Face interactions between scientists and public audiences are a critical element in improving the public understanding of research. These experiences occupy a unique niche among other tools and program formats that ISEs can use to accomplish their missions. Diverse program-format possibilities include low-risk options like small group programs on noncontroversial topics and high-risk (but potentially high-payoff) formats like forums on controversial science. Face-to-face interactions:

- *Humanize not only scientists, but also the process of science (putting a face on science)*
- *Provide effective role models*
- *Create an opportunity for scientists and visitors to "do science" together in a meaningful way where both partners are involved and affected*
- *Enhance the ISE institution's credibility and image as a place for conversations about science and not just content*
- *Are personalized and tailored experiences*
- *Are well suited to make a deep, high-quality impact on a small number of people*
- *Deliver the unique experience of live conversation and personal interaction with scientists*

3 Professional Development

Professional development is an important component of a scientist's preparation to interface with the public. Professional development should lead to an increase in scientists':

- *Self-awareness of strengths, weaknesses and fears regarding interacting with public audiences*
- *Communication skills with the public*
- *Understanding of public audiences (motivations, learning styles, etc.)*

Specific topics/strategies suggested to include in any professional development experience are:

- *How people learn*
- *Visitor types and motivations*
- *Strategies for working with various age groups*
- *Designing engaging and meaningful experiences that effectively use visuals and other materials*
- *Providing a model of what effective face-to-face interactions look like*
- *Opportunities for scientists to practice their new skills*
- *A range of ways for scientists to reflect, self-evaluate and get feedback on their face-to-face interactions with the public*
- *Scientists who excel at working with the public mentoring and training others*
- *A focus on a specific role or event which provides motivation and focus to prepare for a specific type of interaction*

CONSIDERATIONS

1 Audiences

Public and professional audiences involved in face-to-face-interactions are diverse, each bringing their own motivations to participate, prior beliefs, understandings and learning styles.

Scientist audiences:

- *Engaging high-level scientists may not be the most effective strategy; early-career scientists (e.g., graduate students) should be a target audience*
- *Look beyond the traditional view of scientists and invite others to participate, such as amateur enthusiasts, lab technicians and others that work in scientific fields*
- *Face-to-face interactions are not for all scientists; engage only those who are interested and have the ability*

Public audiences:

- *Public audiences are not monolithic; vary engagement strategies to match the specific individuals participating*
- *Reach public audiences when they are young*

2 Overcoming Our Own Preconceptions

Synthesis Meeting participants tended to have strong opinions on many subjects. These conceptions are often grounded in each professional's (research scientist or ISE staff) personal experiences, not necessarily from real data or collective experience. Specific preconceptions included:

- *The potential impacts on public audiences through face-to-face interactions with scientists*
- *How much time scientists are willing, and able, to commit to education*
- *Which types of educational projects scientists can excel at and, conversely, which types they will struggle with*
- *What sustainability and success look like*

RECOMMENDATIONS FOR THE FIELD

1 Evaluation

It is critical that we apply rigorous evaluation to measure partnership and program success and to share findings with the field. Specific needs include:

- *A common understanding of what success looks like, metrics to evaluate it and language to discuss it*
- *A matrix of program specifications that allows professionals to select a program design that aligns with the intended audience, desired impacts and evaluation data*
- *Tools and instruments to measure success and failure*
- *A central clearinghouse where evaluation and research data can be compiled and cross referenced*

2 Sustainability

Sustaining engagement and creating long-term impact on public and professional audiences (ISE staff and scientists) is a critical challenge. Needs include:

- *Sustaining a professional learning community of ISE and science professionals who are committed to improving the public understanding of research*
- *Strategies to extend the experience beyond the initial face-to-face interaction for public and scientist audiences*
- *Financially sustainable program models within ISE institutions*

3 Advancing the Field of Public Understanding of Research

There is a need for development and growth among professionals at ISE and scientific institutions who endeavor to improve public understanding of research. Specific needs include:

- *Professional development related to managing partnerships and delivering current science programming*
- *Establishing a framework of proven best practices for conveying current research to public audiences*
- *Supporting the exchange of ideas and networking among professionals*

This report provides a snapshot of key learnings and critical conversations occurring among professionals in ISE and scientific fields who are committed to improving public understanding of research. Clearly, we have much more to learn about effectively and meaningfully connecting scientists and public audiences in face-to-face interactions. The goal of this document is to be useful for generations of professionals to come, allowing us to learn from and challenge each other.

APPENDIX 1: PORTAL TO THE PUBLIC PROJECT SUMMARY

Portal to the Public develops a proven, scalable program model for Informal Science Educators to engage scientists and the public in face-to-face interactions that promote appreciation and understanding of current scientific research and its application.

PROJECT PARTNERS

- **Pacific Science Center** *(Seattle, WA) is the lead institution and collaborating museum; Dennis Schatz, PI*
- **Explora** *(Albuquerque, NM) is a collaborating museum; Kristin Leigh, co-PI*
- **North Museum of Natural History and Science** *(Lancaster, PA) is a collaborating museum; Margie Marino, co-PI*
- **The Institute for Learning Innovation** *(Edgewater, MD) is a research collaborator; Martin Storksdieck, co-PI*

Each museum collaborator has developed partnerships with at least three local scientific research organizations who are committed to working collaboratively on Portal to the Public activities. An advisory team informs the direction of the project. It is composed of eleven expert advisors, and five advisors representing a museum user group (institutions that are potential adopters of Portal to the Public models). Carey Tisdal conducts summative evaluation.

PORTAL to the Public

Portal to the Public is made possible with funding from the National Science Foundation under Grant No. DRL-0639021

PROJECT DELIVERABLES

1. **Public Programs:** Develop, evaluate and disseminate various cost-effective delivery models that promote public appreciation and understanding of current work being done in science, technology, engineering or mathematics. These events bring scientists and public audiences together in face-to-face interactions and are facilitated by scientists who have participated in professional development.

2. **Professional Development:** Develop, evaluate and disseminate modular professional development elements that ISE staff can facilitate to prepare scientist volunteers to work with public audiences. Elements include workshop activities, resources for one-on-one support and written documents. A professional development program can be designed from these elements to match the specific needs of scientist volunteers and the particular program.

3. **Research:** Research the implementation and outcome of the professional development and public programs across all three museum sites. The research project will ensure that the Portal to the Public project results are applicable and useful to the science center and museum field. The overarching question guiding the research is: "how can ISE institutions successfully engage their visitors with current science by featuring scientists in programming?"

4. **Support a Professional Learning Community:** Endeavor to support a professional learning community of institutions and individuals committed to improving public understanding and appreciation of current science research and its application. Specific activities to accomplish this include "bookend" meetings with stakeholders, mid-course dissemination with the museum user group, and dissemination of Portal to the Public deliverables.

PROJECT AUDIENCES

Portal to the Public primary audiences are science center professionals and research scientists; the secondary audience is the visiting public.

APPENDIX 2: SYNTHESIS MEETING PARTICIPANTS

Betsy Adamson, *Explora*

Katey Ahmann, *North Carolina Museum of Natural Sciences*

Carol-Lynn Alpert, *Boston Museum of Science*

Rick Bonney, *Cornell*

Rick Borchelt, *Johns Hopkins University*

Theresa Britschgi, *Seattle Biomedical Research Institute*

David Chittenden, *Science Museum of Minnesota*

Tinsley Davis, *National Association of Science Writers*

Terry Devitt, *University of Wisconsin, Madison*

John Falk, *Oregon State University*

Susan Foutz, *Institute for Learning Innovation*

Andrew Fraknoi, *Foothill College*

Alan Friedman, *Consultant*

Heather Gibbons, *Pacific Science Center*

Julie Jones, *Ontario Science Centre*

Kimberly Kandros, *North Carolina Museum of Natural History*

Kim Kiehl, *Center of Science and Industry*

Barry Kluger-Bell, *Exploratorium*

Nancy Landes, *Biological Sciences Curriculum Study Center for Professional Development*

Kristin Leigh, *Explora*

Maris Lemba, *University of Washington*

Ellen Lettvin, *University of Washington*

Jay Levine, *North Carolina State University*

Troy Livingston, *North Carolina Museum of Life and Science*

Margie Marino, *North Museum of Natural History and Science*

Eric Marshall, *New York Hall of Science*

Heather Mayfield, *Science Museum of London*

Patricia MacGowan, *Washington State Mathematics Engineering and Science Achievement*

Timothy Miller, *Boston Museum of Science*

Marco Molinaro, *UC Davis, Lawrence Hall of Science*

Richard Moritz, *University of Washington*

Angie Ong, *Institute for Learning Innovation*

Rebecca Reuter, *National Oceanic and Atmospheric Administration*

Jim Ringlein, *North Museum of Natural History and Science*

Chris Roman, *St Louis Science Center*

Lauren Russell, *Pacific Science Center*

Dennis Schatz, *Pacific Science Center*

Bryce Seidl, *Pacific Science Center*

Martin Storksdieck, *Institute for Learning Innovation*

Mac West, *Informal Learning Experiences, Inc.*

Cheryl Wojciechowski, *United States Agency for International Development*

Greta Zenner, *University of Wisconsin, Madison*

Additional Participants

Mary Frances Davidson, *Logistics Coordinator, Pacific Science Center*

Rebecca Reynolds, *Meeting Facilitator, Rebecca Reynolds Consulting, Inc.*

Carey Tisdal, *Portal to the Public Project Evaluator, Tisdal Consulting*

Scribes

Nancy Blanco, *Pacific Science Center*

Colleen Dilenschneider, *Pacific Science Center*

Natasha Hippler, *Pacific Science Center*

Eve Klein, *Pacific Science Center*

Brooke Rivera, *Pacific Science Center*

Liz Ruiz-Puyana, *Pacific Science Center*

Julie White, *Pacific Science Center*

APPENDIX 3: SYNTHESIS MEETING AGENDA

DAY 1	Monday, January 28, 2008	
8:30 – 9:00 a.m.	**Registration & Opening Breakfast**	
8:30 – 9:00 a.m	**Welcome and Opening Remarks**	Dennis Schatz Lauren Russell Pacific Science Center
8:30 – 9:00 a.m	**Agenda Review & Introductions**	Rebecca Reynolds Facilitation
10:00 – 11:00 a.m.	**Background & Context**	
10:00 – 10:15 a.m.	Why the Public Needs to Know	Alan Friedman, Consultant, NYC
10:15 – 10:30 a.m.	**Break**	
10:30 – 10:45 a.m.	Public Perspectives	John Falk, Oregon State University
10:45 – 11:00 a.m.	Research & ISE Perspectives	Andrew Fraknoi Foothill College & Astronomical Society of the Pacific
11:00 a.m. – Noon	**Small Group Discussion:** **Top Three Items to Keep in Mind**	*All*
Noon – 1:00 p.m.	**Lunch (Provided onsite)** **Greeting**	 Bryce Seidl Pacific Science Center
1:00 – 1:45 p.m.	**Breakout Session 1: Building Partnerships**	
1:00 – 1:15 p.m.	Context Setting	Marco Molinaro UC Davis & Lawrence Hall of Science
1:15 – 1:45 p.m.	Participant Guidelines	Rebecca Reynolds
1:45 – 3:30 p.m	**Breakout Session 1** (15-min break included)	Small Groups (6) See PPT for list/locations
3:30 – 4:15 p.m.	**Breakout Session 1** Group Report-Backs	Group Reporters
4:15 – 5:00 p.m.	**Day 1 Wrap Up & Day 2 Preview**	Rebecca Reynolds Lauren Russell
5:00 p.m.	**Day 1 Adjourn**	Dennis Schatz
6:15 – 8:30 p.m.	**Group Dinner** (Location: Fare Start Restaurant)	

DAY 2	Tuesday, January 29, 2008	
8:30 – 9:00 a.m.	**Opening Breakfast**	
9:00 – 9:15 a.m	**Welcome Back** Agenda Review	Dennis Schatz Rebecca Reynolds
9:15 – 9:45 a.m 9:15 – 9:30 a.m. 9:30 – 9:45 a.m	**Breakout Session 2:** **Face-to-Face Interactions** Context Setting Participant Guidelines	 Carol Lynn Alpert Boston Museum of Science Rebecca Reynolds
9:45 – 11:30 a.m.	**Breakout Session 2** (15-minute break included)	Small Groups (6) See PPT for list/locations
11:30 a.m. – Noon	**Breakout Session 2** Group Report-Backs	 Group Reports
Noon – 1:00 p.m.	**Lunch (Provided onsite)**	
1:00 – 1:30 p.m. 1:00 – 1:15 p.m. 1:15 – 1:30 p.m.	**Breakout Session 3:** **Professional Development** Context Setting Participant Guidelines	 Dennis Schatz Rebecca Reynolds
1:30 – 3:15 p.m	**Breakout Session 3** (15-min break included)	Small Groups (6)
3:15 – 3:45 p.m.	**Breakout Session 3** Group Report-Backs	 Group Reporters
3:45 – 4:00 p.m.	**Session Closing Remarks**	Dennis Schatz
4:00 p.m.	**Day 2 Adjourn**	Dennis Schatz
4:15 – 5:30 p.m.	**Advisory Meeting** Pacific Science Center Board Room	Portal to the Public Project Team and Advisors

APPENDIX 4: BREAKOUT GROUP HANDOUT

PACIFIC SCIENCE CENTER
PORTAL TO THE PUBLIC: SYNTHESIS MEETING
JANUARY 2008

BREAKOUT GROUP HANDOUT

INSTRUCTIONS APPLICABLE TO ALL BREAKOUT GROUP SESSIONS:

1. Each breakout will be preceded by one or more context-setting presentations. These are meant to prompt your thinking about the questions that you will be addressing in your breakout. The presentations are not intended to be the focal point of your discussions but rather food for thought.

2. Breakout groups have been pre-assigned with the intention of mixing the groups to provide the broadest range of perspectives in each group. Groups are made up of about six people per group to facilitate meaningful discussion among all participants. The lists for the breakout session groups as well as their meeting room locations will be announced prior to each breakout session.

3. Each group has one Pacific Science Center staff member who will record the session's findings and aid the group in staying on course with the session timeline and objectives. This person is not the group facilitator, but rather the group scribe and time steward. The group will self-facilitate as it chooses.

4. At the end of each breakout session, each small group will report back to the main group on the session's key findings. At the start of each session, the group should select a reporter (not the scribe, please) who will give a brief overview (5 min) on the session's highlights. Note: the scribe will have captured all of the group's findings, which will be included in the Meeting Report; therefore, group reporters will only need to mention the key points from each session. A reporter template will be provided for each session to guide this brief report.

5. Please review the instructions specific to the session you are in (below). Specific discussion points/ questions have been outlined to assist in focusing the group's efforts. In addition, time allotments for each have been suggested to aid the groups in accomplishing their objectives. Please use these to monitor the group's time so that all aspects of the breakout session are completed.

6. Rebecca Reynolds will be circulating to address any questions. She will also provide time-interval notices, particularly for the last 15 minutes of each session, so that the group's notes may be reviewed to ensure that they represent the group's findings and so that reporter presentations may be finalized.

BREAKOUT SESSION 1
MONDAY, JANUARY 28, 1:45 – 3:30 PM

BUILDING PARTERNSHIPS AND COLLABORATING WITH RESEARCH ORGANIZATIONS

Breakout Group Instructions

This breakout session will address the development and maintenance of rich partnerships between ISE institutions and research organizations.

Assumptions for this conversation:

- *Research organizations and ISE institutions both have a vested interest in improving the public's understanding and awareness of current science research*
- *Partnerships between research organizations and ISE institutions are a valid means to bring current science research to the public*
- *Many research organizations and ISE institutions have a mutual interest in partnering and collaborating*

The purpose of this session is to enhance our collective understanding of the dynamics between research organizations and ISE institutions as they relate to forming and managing partnerships and collaborative projects. Groups will highlight characteristics of successful partnerships and consider implications of partnership building for the broader research and ISE fields.

The questions to engage during this session are:

1. Discuss the differences and similarities between ISE and research cultures. Given this, what are the most striking challenges and opportunities for partnerships and collaboration?

2. Start by brainstorming a list of specific characteristics that are evident in successful, mutually beneficial partnerships (e.g., partners experience each others' work environments, a written agreement outlining specific roles and responsibilities is in place, partners articulate mutually agreed-upon goals). Then, from that list, please identify the top 3-5 characteristics and briefly explain why they are top.

3. Now that you have considered success at the local level, what will be the 3-5 greatest barriers to institutionalizing partnerships and collaborations across the broader research and ISE communities? Please give a brief rationale as to why they are the greatest barriers.

Scribes will record the session's findings (not a transcription of the discussion), which will be included in the meeting report. Reporters will present highlights from the group's work (5 min) to the main group. (See the reporter template for this session.)

Suggested Time Allotment

1:45 – 1:55 p.m.	Get oriented, make introductions, select reporter (10 min)
1:55 – 2:10 p.m.	Question 1 (15 min)
2:10 – 2:35 p.m.	Question 2 (25 min)
2:35 – 3:00 p.m.	Question 3 (25 min)
3:00 – 3:15 p.m.	Finalize group notes & report (15 min)
3:15 – 3:30 p.m.	Break (return to main room by 3:30 p.m.)

BREAKOUT SESSION 2
TUESDAY, JANUARY 29, 9:45 – 11:30 AM

FACE-TO-FACE INTERACTIONS

Breakout Group Instructions

This breakout session will address bringing scientists and the public together in face-to-face interactions designed to improve the public's understanding and appreciation of current science research.

Assumptions for this conversation:

- *Many other delivery models exist (e.g., science center staff interpreting current science, exhibits, web-based programs) to connect the public with current science research. Because Portal to the Public specifically explores face-to-face interactions, the focus will be on this delivery model*
- *Programs that create face-to-face interactions between scientists and the public are a valuable and viable method of connecting the public with current science research*
- *Face-to-face interactions provide a unique, personal experience for the museum visitor*

The purpose of this session is to explore and discuss the impacts we are best positioned to make on museum visitors through face-to-face interactions with scientists. Groups will identify existing and suggested best practices for achieving maximum impact.

The of discussion points to engage during this session are:

1. Discuss the range of impacts that face-to-face interactions with scientists can have on museum visitors (e.g., increase awareness of current science research, increase understanding of research processes, affect ability to relate current research to public policy, inspire visitors to learn more or to become scientists). List all the impacts that are discussed and any associated target audiences.

2. Then, considering the nature of face-to-face interactions, list which 4 impacts are best suited to this delivery model, and please explain your reasoning for each.

3. Do a quick brainstorm of the approaches (e.g., strategies, program designs, best practices) that achieve maximum impact in face-to-face interactions. From this list, select the most effective 3-5 approaches, and please give a brief rationale for each. Feel free to include any relevant examples of existing programs.

Scribes will record the session's findings (not a transcription of the discussion), which will be included in the meeting report. Reporters will present highlights from the group's work (5 min) to the main group. (See the reporter template for this session.)

Suggested Time Allotment

9:45 – 9:50 a.m.	Get oriented, make introductions, select reporter (5 min)
9:50 – 10:10 a.m.	Discussion point 1 (20 min)
10:10 – 10:35 a.m.	Discussion point 2 (25 min)
10:35 – 11:00 a.m.	Discussion point 3 (25 min)
11:00 – 11:15 a.m.	Finalize group notes & report (15 min)
11:15 – 11:30 a.m.	Break (return to main room by 11:30 p.m.)

BREAKOUT SESSION 3
TUESDAY, JANUARY 29, 1:30 – 3:15 PM
PROFESSIONAL DEVELOPMENT

Breakout Group Instructions

This breakout session will address the creation and execution of professional development experiences designed to prepare research scientists to work with the public in an informal learning environment.

Assumptions for this conversation:

- *It is important for research scientists who are interacting face-to-face with the public to participate in professional development experiences that prepare them for these activities.*
- *It is also important for ISE professionals who work with research scientists to gain a solid understanding of scientific research culture and practice through professional development or other experiences. In this meeting, we are specifically addressing professional development experiences for research scientists.*

The purpose of this session is to explore and discuss the impacts that are most important to make on scientists through professional development experiences and to note how these might be envisioned differently from a research scientist or ISE perspective. Groups will identify existing and suggested best practices for achieving these impacts.

The discussion points/questions to engage during this session are:

1. Discuss the range of impacts that professional development experiences can have on scientists preparing to work with the public in an informal environment (e.g., increase their understanding of how people learn, improve their ability to create and facilitate engaging experiences). List all those discussed.

2. Considering the nature of face-to-face interactions, what are the 3-5 impacts that should inform the design of any professional development experience? Please note any significant differences between the research scientist perspective and the ISE perspective.

3. Do a quick brainstorm of the strategies or best practices that achieve the most important impacts identified above. From this list, select the most effective 3-5. Feel free to include any relevant examples of existing programs. Please note any significant differences between the research scientist perspective and the ISE perspective.

Scribes will record the session's major findings (not a transcription of the discussion), which will be included in the meeting report. Reporters will present highlights from the group's work (5 min) to the main group. (See the reporter template for this session.)

Suggested Time Allotment

1:30 – 1:35 p.m.	Get oriented, make introductions, select reporter (5 min)
1:35 – 1:55 p.m.	Discussion point 1 (20 min)
1:55 – 2:20 p.m.	Discussion point 2 (25 min)
2:20 – 2:45 p.m.	Discussion point 3 (25 min)
2:45 – 3:00 p.m.	Finalize group notes & report (15 min)
3:00 – 3:15 p.m.	Break (return to main room by 3:15 p.m.)

PORTAL
to the Public

200 Second Avenue North
Seattle, Washington 98109