

**CAISE Forum on Practice-and-Research  
January 16 – January 22, 2013  
Forum Topics and Responses**

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**Welcome!**

*by Kevin Crowley - Wednesday, January 16, 2013, 08:31 AM*

Welcome to day 1 of the CAISE forum on practice-and-research!

I'm Kevin Crowley and I'm a CAISE Co-Principal Investigator, a learning sciences researcher, and the director of the University of Pittsburgh Center for Learning in Out of School Environments (UPCLOSE). We'd like to kick off today's discussion by asking you to introduce yourself to the community and to give us your thoughts on one or both of these questions:

1. What projects or initiatives have you been a part of that attempt to connect research and practice? What are some key lessons learned from that work?
2. Have you seen successful collaborations between practitioners and researchers? What made them work? What barriers had to be overcome, and what strategies did you employ?

Thanks for joining us! We're looking forward to several days of rich and provocative discussion.

**Re: Welcome!**

*by Larry Bell - Wednesday, January 16, 2013, 09:52 AM*

As Director of the NISE Net, there are many examples of collaborations between nanoscale science and engineering researchers and museum educators and exhibit developers, but I think the topic of this forum is not meant to be scientist-informal educator collaborations, but rather connections between ISE practitioners and those who research learning, in out-of-school environments for instance. So that is what I will talk about.

Years ago, actually starting in 1988, we launched a long-term exhibit plan at the Museum of Science in Boston that was connected with constructivist learning theory. We worked with George Hein at Lesley University and he both provided the field with perspective on constructivist approaches and served as the evaluator for one of the exhibits in our series. Several of the practitioners who were building upon those concepts, organized sessions at the ASTC conference with very dynamic ways of presenting the concepts in George's book on Learning in the Museum -- costumes, songs, audience participation, rewards, etc. So it was a very nice relationship. We felt really good about working at the cutting edge of the educational theories and research, worked hard to build exhibits that lived up to those ideas, and had fun sharing our thoughts, and George's, with the ISE community.

More recently I have gotten quite interested in the idea that in addition to informal education research, our field might benefit by being more knowledgeable about science communication research, especially in activities that are meant more for adult audiences and deal with applying scientific knowledge to socio-scientific decision-making. The National Academy of Science's Sackler Symposium this past year on the Science of Science Communication presented some interesting ideas that might benefit our work. I can say more about that later but others might have some thoughts on that topic.

**Re: Welcome!**

*by Jamie Bell - Wednesday, January 16, 2013, 11:05 AM*

Thanks Larry. I'm Jamie Bell, Project Director and PI for CAISE. One area that emerged while we were researching background for this forum was how ISE practitioners and researchers makes decisions about their work, and the degree to which either is influenced by the other. Are you finding that any of the new knowledge you are gaining from the science communication literature/work is informing your decisions as a designer of experiences or exhibits? If so, an example?

**Re: Welcome!**

*by Joy Maburger - Wednesday, January 16, 2013, 12:11 PM*

As a National Park Service research coordinator, I facilitate research projects with educational and outreach products resulting from the research in the Great Lakes national parks. We also engage students through internships that allow them to gain hands-on experience with cultural and natural research via mentoring with a park service manager and a scientist. This has worked out really well for both the managers and the students. It has also resulted in peer-reviewed publications. I have also developed a website with the USGS scientists that allows the public, students, scientists, and managers to enter data that can provide clues to the rate of cattail expansion via hybridization in wetlands across North America. Now all we need is a phone app to enter info directly while in the field!!

**Re: Welcome!**

*by Billy Spitzer - Wednesday, January 16, 2013, 12:23 PM*

Thank you to Kevin, Larry, and Jamie for getting the conversation started. I am Billy Spitzer, VP of Programs, Exhibits and Planning at the New England Aquarium in Boston.

I can give an example of how communications research has had a very strong influence on our approach to interpretation. Over the last several years, we have become increasingly involved in figuring out how to interpret climate change, explain its impacts on the oceans, and motivate visitors to increase their level of engagement in this issue.

Our approach to this issue has been shaped by several areas of cognitive and social science research. This body of research indicates that (1) climate change is the environmental issue of most concern to the public, yet most people do not associate climate change with the oceans; (2) the public expects and trusts aquariums, zoos, and museums to communicate solutions to environmental and ocean issues, and to advance ocean conservation, and (3) the prevalent "cultural models" for understanding climate change are inadequate to the task given the conceptual complexity and psychological and social factors attached to this issue.

Through projects such as the National Network for Ocean and Climate Change Interpretation (funded by NSF CCEP, see attached logic model), we have been bringing together three domains of expertise to tackle this challenge:

1. Climate and decision science experts – who can summarize and explain what is known, characterize risks, and describe appropriate mitigation and adaptation strategies;
2. Social scientists – who can bring to bear research, theory, and best practices from cognitive, communication, knowledge acquisition, and social learning theory; and
3. Informal educators and program designers – who bring a practitioner perspective and can exponentially facilitate a learning process for additional interpreters.

We have been using employing a “strategic framing” approach to communication (Bales and Gilliam, 2004) that supports meaning-making by building on careful empirical research to understand what people already value, believe, and understand, and then designing and testing communication strategies that help translate complex science in a way that allows people to examine evidence, make well-informed inferences, and embrace science-based solutions. This evidence-based approach can help to address conceptual, psychological, and social barriers described above by creating new and more effective ways to recruit positive cultural models for understanding climate change. By providing scientifically accurate and well-tested metaphoric language, we can address conceptual complexity and overcome misconceptions. By focusing on specific applications and solutions to real-world problems, we can counteract “crisis” framing and despair. By appealing to strongly-held universal values such as responsibility and stewardship, we can minimize polarization and contention.

These three areas of expertise are brought together via Study Circles -- teams of 20 interpreters working with climate scientists and communication experts to build a community for learning and practice. The Study Circles meet in person and online for approximately 100 hours over 6 months, involving reading, practice, coaching, and reflection. It is here that research and practice connect and are integrated within a context that provides cognitive, social, and emotional support.

One thing we have learned is that learning strategic framing is a lot like learning a new language. There is certainly a cognitive learning component, but a social context for learning/practice/reflection and an emotional support network are equally important.

**Re: Welcome!**

*by Eric Siegel - Wednesday, January 16, 2013, 01:11 PM*

Billy, the Study Circles idea is VERY cool. I am circulating to some colleagues who are not on this conversation. If you have more info to share, I'd be glad to know about it on or off line.

**Re: Welcome!**

*by Billy Spitzer - Thursday, January 17, 2013, 08:18 AM*

Eric, I would be happy to talk further with you, or anyone else on the forum. My email is bspitzer@neaq.org.

**Re: Welcome!**

*by Joy Maburger - Wednesday, January 16, 2013, 02:14 PM*

I looked at the model visual - this is a great model for us to apply here in the Chicago region. I want to talk to you more about it. We are applying various educational techniques to convey climate change impacts to the Great Lakes region.

**Re: Welcome!**

*by Kevin Crowley - Wednesday, January 16, 2013, 04:02 PM*

Billy,

I'm glad you brought up NSF's Climate Change Education Partnership program. This program is a good example of a funder building research and practice connections into an RFP. Each project needs to have Co-PI's who represent education, climate sciences, and learning sciences.

There's risk in that kind of top-down, funder driven mandate. We're starting to hear a lot already in the forum about the need to learn each other's language, develop shared goals, and building trust. It sounds like you've got set of network practices in place that will do exactly that.

Do you have someone studying the collaboration as part of your project? I'm hoping there will be opportunities for the CCEP projects to compare notes about what they are learning about collaboration and to share those findings with the broader field.

**Re: Welcome!**

*by Billy Spitzer - Thursday, January 17, 2013, 08:15 AM*

Kevin,

Yes, Joe Heimlich from COSI is conducting process evaluation for our project, so he is keeping track of how the collaboration is working. I agree that a top-down

mandate can be problematic, but in this case I think NSF has done a good job of identifying the kinds of expertise that are necessary to do the work. As Larry Bell and others have pointed out, we really do need learning and social science experts engaged in science education especially when we are dealing with value-laden issues.

**Re: Welcome!**

*by Billy Spitzer - Thursday, January 17, 2013, 08:19 AM*

Joy,

I would be happy to talk with you. We are already working with other institutions in the Chicago region. My email is [bspitzer@neaq.org](mailto:bspitzer@neaq.org).

**Re: Welcome!**

*by Larry Bell - Wednesday, January 16, 2013, 06:04 PM*

One of the speakers at the NAS Colloquium on the Science of Science Communication was Dan Kahan of the Cultural Cognition Project at Yale University. Dietram Scheufele of UW-Madison, one of the co-organizers of the symposium, suggested we talk to Dan in connection with a project we have been working on called Provocative Questions. That project is about creating an unfacilitated exhibit that provides visitors with skills related to conversations and decision-making around potentially controversial societal issues that can be informed by science. Kahan presented data at the NAS Colloquium that showed that when it comes to certain issues on which people are strongly divided, more knowledgeable people are even more divided. So the idea that if we just communicate the scientific facts and findings of research to folks they will all come to the same informed conclusion, doesn't seem to hold water, in part because social values play a key role in how people process the information. We used three social values scales that we got from talking with Kahan in the Provocative Questions prototypes and people seem to get that their place on these values scales influences their decisions and the decisions of others despite what the science says. So we include that in the exhibit experience along with the science and ask people to make choices and talk with each other about it.

**Re: Welcome!**

*by Kirsten Ellenbogen - Wednesday, January 16, 2013, 12:15 PM*

Hi Larry,

I'm glad you brought up the Sackler Colloquia

[http://www.nasonline.org/programs/sackler-colloquia/completed\\_colloquia/science-communication.html](http://www.nasonline.org/programs/sackler-colloquia/completed_colloquia/science-communication.html)

I agree, that was an inspiring meeting. I went away with a lot of ideas from it on practice-research connections, specifically, how can science communications research inform informal

science education practice (ISE). One that I've followed up on is that ISE could learn a lot from science communication about reframing our audiences. In ISE we tend to group audiences by type: family visitors, adult-only groups, etc. But if you take a science communication lens, you are more likely to group audiences by their attitudes and beliefs: late-adopters, indifferent, etc. Related to this, I've been reading more about the science communication research on "framing." Here's a brief summary interview. (A google search will show you lots of articles, but of course most of us won't have access to them. I do have links to a few articles on Framing that can be downloaded - I have to dig those up.)

[http://www.pointofinquiry.org/matt\\_nisbet\\_framing\\_science/](http://www.pointofinquiry.org/matt_nisbet_framing_science/)

The Sacker Colloquia was so inspiring to me that I wrote an editorial for the journal *Curator* on the convergence of science communication and informal science education for this month's issue. The entire contents of the issue are available to download free (thanks *Curator* and Wiley!):

<http://onlinelibrary.wiley.com/doi/10.1111/cura.2013.56.issue-1/issuetoc>

Ok, clearly you hit on a topic that is exciting for me Larry. Thanks, Kirsten

P.S. I am a co-Principal Investigator of CAISE and as part of that have led work on resources like the ISE Evidence Wiki ([www.iseevidencewiki.org](http://www.iseevidencewiki.org)) and the PI's Guide: Managing Evaluation in Informal STEM Education Projects [http://caise.insci.org/pi\\_guide/](http://caise.insci.org/pi_guide/)

As Senior Director for Lifelong Learning at the Science Museum of Minnesota, I lead the departments responsible for evaluation, learning research, and programming for adults, families, youth, and schools.

**Re: Welcome!**

*by Billy Spitzer - Thursday, January 17, 2013, 08:27 AM*

We have been using a strategic framing approach as part of our climate change education initiative (described in another post on this forum). Our main partner in this area has been The Frameworks Institute. They have a number of excellent resources on their website at [www.frameworksinstitute.org](http://www.frameworksinstitute.org).

**Thanks Larry**

*by Judah Leblang - Wednesday, January 16, 2013, 12:39 PM*

I'm an evaluator at the Program Evaluation and Research Group at Lesley University, which was founded by George Hein and Brenda Engel back in the mid-1970s. PERG is still engaged in evaluating museum exhibits and informal learning in various settings, and we often provide feedback to exhibit developers and museum educators. Part of my work was an outgrowth of the Museum of Science's long-term exhibit plan.....I was an evaluator for Natural Mysteries, Making Models, and other exhibits at the MOS.

In our evaluations, one area we looked at was the accessibility of the exhibits for visitors with disabilities, and visitors who preferred various learning pathways--those who were more visual, auditory, kinesthetic, etc. We were also guided by George Hein's text:

"Learning in Museums" and various other studies of visitor learning in museums. I think exhibit developers and museum education staff are (or should be) constantly thinking about how to meet visitors 'where they are' in terms of interests, learning style, abilities, etc....

**Re: Welcome!**

*by Kelly Sturner - Wednesday, January 16, 2013, 11:36 AM*

Hi Kevin! I wondered if you could clarify your questions a bit for me, as someone who is not so familiar with the primary interests of CAISE. I think I need to be brought up to speed on the terminology.

When you talk about connecting research and practice -- do you mean research in education/pedagogy for informal learning environments and practicing the recommendations of that research in informal learning environments? Or do you mean connecting current scientific research content to creating relevant informal science education programs?

Are you only interested in collaborations between people that practice informal education and people that do research in informal education? Or, are "practitioners" any educator and researchers might be biologists, mathematicians, engineers, and other people that do scientific research?

Hope I asked those questions clearly. Basically I'm trying to tease out whether your interest in is teacher-scientist partnerships or education researchers-educators partnerships. Or both!

**Re: Welcome!**

*by Kevin Crowley - Wednesday, January 16, 2013, 12:20 PM*

Hi Kelly,

Thanks for the question. We launched this forum as a response to a number of requests from the field to explore the topic of partnerships between informal STEM practitioners and learning/educational researchers. We've posted a link to a talk that NSF's Joan Ferrini-Mundy gave at the last AISL PI meeting, which highlights many of the points we hope to explore.

<http://caise.insci.org/caise-pi-meeting/2012-video>

CAISE does have another initiative that will explore collaborations with STEM researchers, especially in the context of broader impacts and outreach as part of NSF grants . You can read a little more about it here:

<http://caise.insci.org/activities>

**Re: Welcome!**

*by Lucy McClain - Wednesday, January 16, 2013, 11:52 AM*



Greetings!

I am a doctoral candidate in the Learning, Design, and Technology program in the College of Education at Penn State and work as a graduate research/teaching assistant at Shaver's Creek Environmental Center (Penn State's Nature Center). I've worked at Shaver's Creek (SCEC) for over 5 years as both an environmental educator and graduate research assistant.

The nature center itself is home to over 20 injured birds of prey (or raptors), amphibians, and reptiles. We have a full time staff that teach university courses, offer public programs, have annual festivals, school programs, and summer camps.

I work with Dr. Heather Zimmerman at Penn State and our research interests have revolved around how families and youth learn and talk about their natural world when they are visiting the nature center. Through our work, we aim to facilitate a deeper learning experience for casual weekend visitors, which are most often families.

Understandably, the live animals at SCEC are the main 'pull' for our visitors, especially families with younger children. We also have many hiking trails that branch off from our property and wind through 7,000 acres of state forest land; yet, we rarely see families take advantage of these hiking trails on their own.

Our research group has recently been working with volunteer families who have embarked on short hikes in order to observe what they talk about, what 'hot spots' (if any) they are drawn to on the trail, what scientific tools they use, etc. We are recording and documenting these broad observations with the hope that we can design for a better learning experience for those casual family groups- a goal that the environmental center fully supports!

**Re: Welcome!**

*by Jamie Bell - Wednesday, January 16, 2013, 04:17 PM*

Thanks for sharing a little about your work at Penn State, Lucy. Am I interpreting correctly that at the Shaver's Creek Center some of you are wearing two hats at the same time- as environmental educators and learning researchers? If so, what have you found are the particular strengths of that model, and what are the challenges? If not, are there people also working as guides or facilitators only, or do the families hike and discover on their own?

**Re: Welcome!**

*by Hana Dethlefsen - Wednesday, January 16, 2013, 11:53 AM*

My response straddles the two questions.

In my role at a mid-sized science museum, I manage and after school program and also do some exhibit evaluation work. As such, I have naturally tried to do some evaluation work on the after school program.

We teamed up with a scientist practicing within our building (in a Living Lab - a fantastic project) to have him and his team come out to our after-school locations to do pre/post surveys of students' subconscious attitudes towards science.

Our first attempt at collaborating resulted in too few samples, and I think our biggest lesson learned was that we needed to take much more time to think about the logistics together, clarify the steps, and confirm who was responsible for each. It seems like basic stuff, but the experience really showed me that we both made assumptions about what the other knew. Us about the researcher's knowledge of schools and how they run, and his assumptions about our ability to anticipate his requirements and adjust our programming quickly.

I know that the results of such an evaluation would be fruitful, and a great learning tool for us, but would like to hear about other successful collaborations and what we can do to make sure that our next attempt is more successful.

**Re: Welcome!**

*by Amy Rager - Wednesday, January 16, 2013, 12:16 PM*

My name is Amy Rager, I am an Extension Educator and the state program director for the Minnesota Master Naturalist Program. Our program is a joint venture between our State Department of Natural Resources and the University of Minnesota. We train volunteers in natural and cultural history of Minnesota (40 hours) and then ask them to provide 40 hours of service in our state each calendar year. We often help volunteers connect with researchers via citizen science monitoring projects, or sometimes direct data collection by the volunteer. The Master Naturalist Volunteers love the opportunity to be asked to assist in something that they see as very important, and perhaps not feasible with out the help of many data collectors.

In most the cases the collaborations have been positive, there are still some researchers who doubt the ability of the volunteer to accurately collect data for them. We may never win over all researchers, but those who have used the volunteers have found them to be diligent and respectful of following the protocols set up by the programs.

Here in Minnesota, 30% of our Master Naturalist Volunteers have a Phd! They are familiar with following protocols and make great volunteers.

**Re: Welcome!**

*by Joy Maburger - Wednesday, January 16, 2013, 01:47 PM*

Amy - that's a great idea - to connect with Master Naturalist program. We have a lot of citizen scientist projects at the National Park Service and these trained people could help with them.

**Re: Welcome!**

*by Amy Rager - Wednesday, January 16, 2013, 02:36 PM*

There is a national umbrella group called ANROSP that can help you locate a program near you. And they are always looking for great projects for the

volunteers. Or I would be happy to help you find a program, I serve on the board of directors for ANROSP. [www.nralliance.org/](http://www.nralliance.org/)

**Re: Welcome!**

*by Chris Myers - Wednesday, January 16, 2013, 12:17 PM*

Project Dragonfly at Miami University is an inquiry-driven initiative that is currently involved with participatory science media, a national exhibit network (iSaveSpecies), and graduate programs, including two Master's programs for ISE and other professionals co-delivered with ISE institutions: the Advanced Inquiry Program and the Global Field Program.

On behalf of the Project Dragonfly team, I'd say our best experiences connecting research with practice have emerged in situations that:

- 1) broadened who is assumed to be a practitioner (shop staff, grounds crew, and others traditionally marginalized from these activities can become more powerful advocates for the institution if given the opportunity)
- 2) pushed the researcher/practitioner boundary, particularly in ways that enable diverse practitioners to become researchers themselves.

**Re: Welcome!**

*by Kalie Sacco - Wednesday, January 16, 2013, 12:48 PM*

Hi Chris,

Thanks for your response. I'm Kalie Sacco, Program Manager at CAISE. One thing that emerged in our preparation for this forum was the issue of practitioner ability to access research, in terms of both actual publications as well as understanding terminology/perspectives.

I was wondering if you could expand a bit on your second point about pushing the researcher/practitioner boundary. Specifically, what kind of resources or strategies were helpful for allowing practitioners to become researchers? It sounds like that could be a really powerful professional development experience for practitioners.

**Re: Welcome!**

*by Chris Myers - Wednesday, January 16, 2013, 04:59 PM*

For a general resource, I like Roger Hart's book, *Children's Participation, the Theory and Practice of Involving Young Citizen's ins Community Development and Environmental Care*. For strategies, I favor any that expands who is considered a researcher (beyond external or in-house research professionals). For example, I saw some excellent presentations by "practitioner" teams at the Shedd who were given the opportunity to construct and test their own hypotheses about visitor responses to animal encounters. One team experimented with how a conservation message is delivered, another team addressed the impact of

ambassador animals, another team focused on the transition period between animal encounters. The expert role of the professional ISE researcher remains absolutely critical in this approach (providing the conceptual context, improving experimental designs, providing relevant references, etc.)--but practitioners also play vital research roles, and staff inquiry teams inform each other. Even better when this approach is embedded in a larger plan to envision the institution, including every staff member, as part of a broader community of inquiry.

While acknowledging the many good reasons to draw the line between ISE researchers and practitioners, I am inclined to believe it is worth questioning the integrity of that division, and perhaps stepping back from it a bit by envisioning both researchers and practitioners as investigators capable of generating knowledge to inform shared goals.

**Re: Welcome!**

*by Kalie Sacco - Thursday, January 17, 2013, 12:16 PM*

Chris, thanks for sharing that resource and examples. It's clear from your response and others that providing an environment in which goals are shared across all members of the project team, or even within the wider institution as a whole, is key to making this kind of collaboration work. It seems common sense, but I can also see how many practical barriers could get in the way--such as the differing timelines of valid research results and the need to quickly generate a product.

**Re: Welcome!**

*by Linda Wilson - Wednesday, January 16, 2013, 12:26 PM*

Hi Kevin

I'm Linda Wilson, Director of Impact Assessment at Shedd Aquarium. My work looks at the impact a visit to Shedd Aquarium has on guests/visitors. Theoretical research has provided us with models that broaden our view of where our impact might occur.

Since we are concerned about conservation we have looked broadly at social science research to help us understand where our potential impacts may lie. While a 3 hour visit to a zoo, aquarium or museum is unlikely to have a direct impact on conservation behaviors, we have seen where we impact the areas where people can get information, provide a sense of belonging to a group concerned with conservation, and one that models behavior, and provides experiences that open up a small window of attention where changes in perspective (or reinforcement of already held beliefs) can occur. The field of Conservation Psychology has been of immeasurable value.

Similarly, we are looking at the sociology of human development where we may be able to show how a visit to the aquarium can influence general well-being, family cohesion and self-efficacy.

Science education exists within a complex, nuanced context. I look forward to the conversation

**Re: Welcome!**

*by Linda Zuckerman - Wednesday, January 16, 2013, 12:41 PM*

I work in a public library and we are getting more and more involved in providing STEM opportunities for children and their parents. Unlike most Science Museums, we have the opportunity to interact with the same population repeatedly over time and have access to populations who may not like or be interested in science.

Like Lucy, I am interested in the dynamic between parents and children during their science experiences. I find that many parents readily admit to me (and their children) that they don't like or were never good at science. (I find this interesting because these same people would never admit to not liking or being good at reading.) But, these same parents who exhibit science anxiety/apathy can become engaged in science activities and encourage their children to become interested as well.

We are currently raising horseshoe crabs (right on the reference desk) and have the opportunity to talk to adults and children about them. It is wonderful to see the parents put their experience in context ("remember seeing the horseshoe crab on the beach during our last vacation...."). There seems to be a lot of potential for public libraries to teach parents how they can help inspire their children to pursue science and overcome their own anxiety or apathy in the process. (We do this for reading, why not science?)

There is a lot of research on ISE in Science Museums and lots of research on Science Anxiety among teachers and students. I am not finding much research or many established models on public libraries and what role we might have.

**Re: Welcome!/libraries**

*by Maija Sedzielarz - Wednesday, January 16, 2013, 05:46 PM*

I will also introduce myself in another post, but I had to respond to this one, since we have a partnership with two local libraries for science education. One of our partners wrote an article about our collaboration for the Public Library Association trade journal, *Public Libraries*. Vol. 49, #4, July/Aug 2010: Science Education in Public Libraries. We are in year 3 of this program, which focuses on kids and their families bringing in and talking about objects from nature.

**Re: Welcome!**

*by Eric Siegel - Wednesday, January 16, 2013, 01:05 PM*

Hello, all, thanks for putting this together.

Since Margaret Honey, a learning scientist with decades of experience in research in STEM and technology learning, came to be CEO of NYSCI, we have been working on reinvisioning the place as a laboratory in which new ideas for STEM learning can be tested.

We now have 4 or 5 PhD Learning Scientists (with degrees ranging from science education to computer science) working at NYSCI. Most-but not all--of these are working with David Kanter,

a bio engineer turned learning scientist, who runs our Institute on Science, Play, and Technology. He has built new collaborations and landed some major grants that are research driven.

But we have also worked on building a broader research agenda and programmatic strand that we call Design Make Play. This came from the incredible influx of energy that results from hosting World Maker Faire for the past three years. Last year, we had 56K people in two days, 500 makers, dozens of speakers and performers as part of World Maker Faire. Something's going on here, and we don't know what it is. Unlike Mr Jones, we have been hosting symposia of learning scientists, educators, policy makers, informal and formal education leaders to help us learn from the Maker Movement. We have been issuing reports from these symposia, and a book published by Routledge Press and co-edited by Margaret Honey and David Kanter (with articles written by many of you!) will come out this winter.

All this said, it is a big part of our work to figure out how to continue to apply what we are learning from research to our exhibition and program offerings.

Here's is where things get very complicated. Research practitioners are not program developers or exhibition designers, and the goals of researchers do not necessarily align with the goals and timetables for program development. With all the good will in the world from both the researcher and program development groups here (and those who straddle both), it continues to be a challenge to bring research based work into the actual public arena.

We are working hard on this and have some progress to show for sure. But I am very eager to learn from others who grapple with the research into practice continuum.

Thanks again for pulling this together.

**Re: Welcome!**

*by Hana Dethlefsen - Wednesday, January 16, 2013, 01:38 PM*

Hi Eric,

Thanks for articulating so aptly the struggle to reconcile researchers' timetables and goals with educators timetables and goals. Although you mention there is a ways to go, you say you have made some progress... can you elaborate? I would certainly like to put in place any methods you have found helpful in bridging the logistical divide between researchers and educators.

Re: Welcome!

*by Eric Siegel - Wednesday, January 16, 2013, 02:27 PM*

Yes, in our research programs that rely on software development we are moving from using university research lab partners to using professional software developers. The latter project manage much better and more proactively and actually deliver working products as their deliverables, as opposed to the prototypes that you get (if things go well) from university research labs. This is a

new transition and we are feeling our way through it, so I don't want to oversell it. Ask us in a year.

**Re: Welcome!**

*by Hana Dethlefsen - Wednesday, January 16, 2013, 02:39 PM*

Thanks, Eric. This is really helpful. It reminds me to talk to our development team to think of me when connecting with partners in the software industry. Perhaps they'd be willing to contribute in helping develop our research tools. I'm currently struggling to do so on my own, with Google as my guide! I would certainly appreciate professional support with this part of my job!

**Re: Welcome!**

*by Erika Shugart - Wednesday, January 16, 2013, 03:08 PM*

In our collaborations we have always brought in a professional multimedia developer. The developers also bring in experience with HCI. We have found that it is the only way to get a product that is robust and has high production value. I have found that this has been very eye opening for the researchers who have appreciated the quality of the final products.

**Re: Welcome!**

*by Kevin Crowley - Wednesday, January 16, 2013, 03:53 PM*

So it sounds like robust and effective software development is an area that you have found research/practice collaborations to be ill-suited. I agree that researchers do not have the same goals as software developers -- researchers are most interested in projects that innovate and/or inform theory, which are goals that sometimes work against stable, predictable development.

More generally, how do you know when you have a problem of practice that could benefit from research/practice collaboration vs. a problem that won't?

**Re: Welcome!**

*by Elizabeth O'Connell - Wednesday, January 16, 2013, 01:13 PM*

FrontierScientists.com is a web based project using short videos and social media to connect the public with Arctic science research.

The research revolved around developing techniques to help the scientist convey their research to the general public, have the videos be entertaining as well as informative, and understanding how people navigate a website to design the site to keep people engaged deeper and longer with the science materials.

What worked was the web designer, the PI/video producer, social media developer, and the

evaluation group was open and willing to try new things and listen to the feedback, and make changes.

What seemed lacking was the small sampled group that gave us feedback. The sampled group seemed to diverge in some instances with the web statistics and comments that were not evaluated except noted. A larger sampling might have been better.

The strategies that FrontierScinetists.com employed have been posted in an evaluation report on the CAISE web site. However, despite trying to get the report to be view-able on the CAISE web site, it seems to have failed. After some web consultation it worked, but recently I checked again and it seems to be nowhere to be found.

**Re: Welcome!**

*by Kalie Sacco - Wednesday, January 16, 2013, 03:51 PM*

I'm sorry to hear you weren't able to see the evaluation report when you recently searched for it; I just did a quick search on informalscience.org and fortunately, it does seem to be there now. Here's the link in case others are interested:

<http://informalscience.org/evaluation/show/566>

You might also want to weigh in on the other discussion that Kevin just posted on broader impacts and STEM scientists working with ISE.

**Re: Welcome!**

*by Justin Dillon - Wednesday, January 16, 2013, 01:14 PM*

I'm Justin Dillon and I work in the Centre for Research in Education in Science, Technology, Education and Mathematics at King's College London.

What projects or initiatives have you been a part of that attempt to connect research and practice?

I'm working with colleagues on the NSF funded Relating Research to Practice project (<http://www.research2practice.info>). I also supervise (advise) doctoral students who are co-funded by King's and ISEs including the Natural History Museum, London and Kew Gardens. We also work with botanic gardens and their educators on an EU funded project - INQUIRE.

What are some key lessons learned from that work?

Never underestimate how much potential there is for such collaborations. [I'll think more about this question]

2. Have you seen successful collaborations between practitioners and researchers? What made them work? What barriers had to be overcome, and what strategies did you employ?

[I'll give this more thought, too]



**Re: Welcome!**

*by Kelly Sturner - Wednesday, January 16, 2013, 01:59 PM*

Thank you, Kevin, for answering my silly questions and sending the resource. I'm excited to hear that teacher-scientist partnerships are another interest of CAISE, because they interest me very much. This discussion also interests me greatly.

I work at a national math and biology research center, supported by NSF, USDA and the Department of Homeland Security, at the University of Tennessee. While research is the main thrust of our center, we have a small education and outreach arm that I coordinate with one other. We have participated in no projects or initiatives that attempt to connect research to practice in ISE, and so I can't speak to these questions unfortunately. It's not for lack of trying, and we would welcome such collaborations. It may be that this in part to ISE in math and science not being a major research interest among our science education faculty, although it may simply be that we're not connected to the right people just yet.

Without this kind of direct interaction, I find myself combing the literature often for best practices to follow in our programs. In a way, this is my "practitioner-researcher" partnership. I would say that there are probably quite a few people out there like myself with science backgrounds that are in these ISE positions that are very interested in the work that ISE researchers do and applying it. It appeals to us, trained as scientists, to treat our informal education programs as science experiments. However, any time that people cross disciplinary boundaries -- as I am trying to do with moving between life science and education -- there is a steep learning curve. Every discipline has its own specialized vocabulary, it's "best journals" and best practices in research design. I would say the best resources I have personally found avoid jargon and focus on reasonable and actionable recommendations, with empirical evidence supporting their usefulness. Also, it's helpful if these resources are easy to find, by using plenty of intuitive keywords so that they may be found in ERIC without knowing at first the particular ISE jargon required.

**Re: Welcome!**

*by Linda Wilson - Wednesday, January 16, 2013, 03:12 PM*

I know what you mean, Kelly about the difference in language (and intent) in research and applying that research in practice.

In looking for reliable, validated scales measuring aspects of impact we've found there are many science knowledge and attitude scales that have been developed for students in the formal education arena (and these I am sure can be modified fairly easily for use with students in informal education classes). I would guess that connection is one this discussion group will delve into.

What has been more difficult is finding equally rigorous scales that are appropriate for adults visitng with a wide range of ages of children, and that can be applied to an entire visit rather than a specific exhibit. We have one on views of science that has worked well for us (Rennie & Williams 2000)

One of the rather surprising finds outside of science is in the area of social work. While the scales there have been developed for therapeutic use, it has been possible to apply them to a leisure setting in looking at the social aspects of a visit. These aspects strongly influence learning of science and application of science, so we are gathering a model that includes both areas. We anticipate that building social capital will also fit in there somewhere.

In talking to social scientists, most find it surprising that their work can be applied to a museum visit - the crossover was not on their radar.

**Re: Welcome!**

*by Hana Dethlefsen - Wednesday, January 16, 2013, 05:48 PM*

Hi Linda, if you're looking for a tool you can use to examine learning for all ages, generic to all exhibits, I highly recommend the Visitor Experience Profile developed by Chantal Barriault at Science North (Barriault & Pearson, 2010). It does not track one family through an entire visit, but does allow for the same tool to be used across exhibits. I wonder whether it could be adapted to follow one visitor at many exhibits, though, since the behaviour coding is not exhibit-specific.

**Re: Welcome!**

*by Kevin Crowley - Wednesday, January 16, 2013, 03:42 PM*

Not a silly question at all Kelly!

In fact I've started another discussion strand on this forum those who want to explore this area specifically. I'm actually starting on a project that looks exactly at the question of what makes for strong collaborations between STEM researchers and informal learning practitioners. The NSF funds big Centers for Chemical Innovation, which are groups of scientists across multiple institutions studying related areas in chemistry. Recently they provide supplemental funding to the centers to build partnerships with informal learning organizations in order to build some of their broader impact work in the informal world. My group will be studying these partnerships to see if we can identify what characteristics of collaboration seem to lead to the most sustainable and successful work.

So anyone who's interested in following up this thread, please meet us over in the other discussion strand.

**Re: Welcome!**

*by Maria Parente - Wednesday, January 16, 2013, 02:12 PM*

Hello Everyone, Thank you for organizing this.

My name is Maria Parente. I recently received my Ph.D. from the University of California, Irvine in Education. Currently, I am the Coordinator for Science Outreach at Yale University. In

partnership with local school districts, Yale has initiated Pathways to Science, a coordinated data-drive approach to helping local students achieve success in science. At this stage in the rollout, Yale has designed and uploaded a customized longitudinal database which tracks student participation in Yale STEM programs over time, Yale STEM outreach programming, and university employee/student participation. We hope to come to know K-12 students, be able to customize opportunities for them, track gaps in our programming, and make it easier to evaluate programming.

We are excited about this new venture and I am involved today in the forum to get a sense of what is going on in the are of STEM informal education and it's evaluation. However, my schedule is limited over the next few days and therefore may be in and out of the discussion sporadically. Please feel free to contact me at maria.parente@yale.edu if you ask a question about my work and I have not answered.

**Re: Welcome!**

*by Liz Kurzawa - Wednesday, January 16, 2013, 02:30 PM*

I am Liz Kurzawa and I am the Educational Outreach Program Manager in the Educational Activities Department at IEEE. Our department offers global educational resources in the fields of engineering, computing, and technology for audiences ranging from the pre-university level all the way up through continuing education. My focus is in the pre-university arena cultivating resources for teachers, parents, school counselors and students. Our pre-university offerings include online resources, member training on conducting engineering /technology based in-services for educators, funding for humanitarian engineering projects involving pre-university students, and some involvement in the development of museum exhibits.

Our volunteers bring a wealth of technical expertise from their own research to the table, which helps us align the content of our offerings with what is most salient and relevant in the field and what's on the horizon. At times, bridging the gap between the technical content and what research tells us about how to deliver that content in terms of pedagogy and student learning can be a challenge. At present we don't currently have educational researchers amongst our professional staff, although some of our volunteers do have some experience in this area. We are also starting to look to more formal evaluation of our programs for impact, so it is has been very interesting to hear what is being done by members of the group in this regard.

**Re: Welcome!**

*by Erika Shugart - Wednesday, January 16, 2013, 03:05 PM*

I am Deputy Director at the Koshland Science Museum in Washington, DC. I oversee the content development for exhibitions, online, and programs.

I have enjoyed reading through the range of collaborations have been mentioned. At the Koshland, I have typically not worked with learning scientists (the exception is you Kevin!), but I have worked with several decision scientists and a neuroeconomist, who also looked at decision making, to conduct research on the floor.

The fields of decision science and neuroeconomics are particularly relevant for museums who are interested in civic engagement.

In our collaborations we created digital versions of the types of experiments that the researchers were conducting in their using facilitation. Issues that had to be overcome included

1. the self-selection of the visitors in a free choice learning environment,
2. the validity of the data collected and
3. the need to shorten the experience in order to ensure that visitors can actually complete it. I am happy to provide more specific examples as the conversation continues.

In the end the collaborations were very successful from both perspectives.

**Re: Welcome!**

*by Linda Wilson - Wednesday, January 16, 2013, 03:39 PM*

Hi Erika

We faced similar issues (self-selection, validity and limited time). We also found that when the topic was not directly related to the exhibit experience (say trust in the institution, or measures of family cohesion) we sometimes found quite a pushback from visitors, eliminating some scales and causing us to modify others.

I look forward to seeing those more specific examples you mentioned. regarding research on civic engagement. How did you get connected to these researchers? I'm impressed!

**Re: Welcome!**

*by Erika Shugart - Thursday, January 17, 2013, 11:55 AM*

Hi Linda,

I never tried to present a topic that was not related to the exhibition. I think that this would create confusion for the visitor.

In terms of the specific examples of research related to civic engagement, we have done a couple of recent projects. In the Koshland Science Museum's Earth Lab, which features an exhibition on climate change, we worked with Dr. Joe Arvai to create a "decision table." It is a 5 - 10 minute self-guided digital experience in which visitors first weight their values (ie cost, air quality etc) then try to put together a portfolio of mitigation strategies that lower US greenhouse gas emissions to a certain target. It was a very collaborative process of development because he hadn't done anything like this before. Typically his decision support approaches take hours and are facilitated. In this case we are gathering data, but he has not yet done the analysis.

In our Life Lab, we worked with Dr. Paul Glimcher, to duplicate an experiment on risk and ambiguity. In this case, visitors make selections between "lotteries"

where they can either choose a sure thing or opt for a potential higher payout but unknown odds. In this case he normally did over 200 rounds of choices with a single user, but we managed to shorten it to 40 rounds. We also worked with him to develop a final message that gave the visitor a little feedback on what their response meant in terms of their own risk and ambiguity tolerance.

We use a scientific steering committee to help guide all of our exhibition development. In both cases members of these committees recommended colleagues who were doing the research.

How do you find the researchers with whom you work?

**Re: Welcome!**

*by Christine Castle - Wednesday, January 16, 2013, 03:11 PM*

*What projects or initiatives have you been a part of that attempt to connect research and practice? What are some key lessons learned from that work?*

I tend to think about informal education in all disciplines so forgive me if some of my input veers away from informal science education per se. My work with the Museum Education Monitor, a monthly electronic newsletter, is dedicated to helping bridge the gap between theory and practice in the field of museum education/learning.

More directly related to ISE, recently I co-edited with Kirsten Ellenbogen the initial version of ISE Evidence Wiki

Key lesson? This work takes a lot of time and patience.

*Have you seen successful collaborations between practitioners and researchers? What made them work? What barriers had to be overcome, and what strategies did you employ?*

The most successful collaborations that I've seen have occurred when both practitioners and researchers clearly had something to gain from participating. It helped, too, when members of each group had some experience of the life/work of the other group; for example, a researcher who has been a museum practitioner or a practitioner who has done some solid research.

**Re: Welcome!**

*by Kalie Sacco - Thursday, January 17, 2013, 03:53 PM*

Thanks for your response--I'm glad that you're able to participate in this discussion. Quite a few other people in the forum have brought up the connection between practice and research in other disciplines--social science, social work, etc.--and how learning from those fields has been useful for their own collaborations. Since your work crosses many different aspects of the informal learning field, I'm curious to see if you do have examples from the art or history museum world (or elsewhere!).

**Re: Welcome!**

*by Christine Castle - Monday, January 21, 2013, 08:37 AM*

Hi Kalie,

Thanks for your note. Yes, there are some interesting things going on in informal learning research to practice related to other disciplines, particularly art. An intriguing new addition is *ArtsEdSearch* which is "an online clearinghouse that collects and summarizes high quality arts education research studies and analyzes their implications for educational policy and practice." A recent discussion on STEAM seems particularly relevant. *Arts Research Monitor* is a Canadian version of same.

I'll keep an eye out for history-related work.

**Re: Welcome!**

*by Fan Kong - Wednesday, January 16, 2013, 04:00 PM*

Hi everyone,

I am the project manager for a website resource called Relating Research to Practice: [www.research2practice.info](http://www.research2practice.info). Funded by NSF, we are a collaboration of hybrid researcher-practitioners working at the Exploratorium, the University of Washington, King's College London, and the Afterschool Alliance.

The main goal of this website is to provide readable summaries of current peer-reviewed education research that would be relevant for practitioners in ISE. There are over 150 research briefs already on the website, and with feedback from our pilot year, we are experimenting with expanded resources that will hopefully be more easily taken up by practitioners in professional development settings.

A barrier to dissemination for us had been the need to login to the website (even though it was and continue to be free). All of content is now available without the need to login.

Re: Welcome!

*by Maureen Callanan - Wednesday, January 16, 2013, 04:15 PM*

Hello everyone! I'm Maureen Callanan and I'm on the faculty in developmental psychology at University of California, Santa Cruz. I study cognitive development in young children, especially their understanding of the natural world, and how development occurs in social context of conversations and activities with parents and others.

Kevin Crowley and I began a research partnership with Children's Discovery Museum of San Jose about 16 years ago, and I've continued this partnership since Kevin moved to Pittsburgh. Through several NSF funded projects we've combined basic research on family conversation, applied research evaluating new prototype museum exhibits, and the practice of designing those exhibits. My partner from CDM, Jenni Martin, will probably say more about this. We've

learned a lot about variation in families' approaches to science activities, about the ways that parents' attitudes and background connect with children's learning, and about creating experiences that foster conversation about scientific evidence and explanation.

I think our partnership has worked very well, and I think the key reasons are related to some of the other comments made in this forum already. One key to our success has been that there has been strong overlap between the goals of the museum staff and the goals of the researchers. A second key element is that we have worked closely together as a team -- with researchers and practitioners present together in bi-weekly meetings through the life of the project. I look forward to learning and sharing more on this important topic with all of you!

**Re: Welcome!**

*by Kalie Sacco - Thursday, January 17, 2013, 12:42 PM*

Maureen, thanks for your comments and for joining on the forum. You mention that this research partnership between UCSC and the Children's Discovery Museum has been going on for sixteen years-- quite substantive! I am curious as to whether this was intended to be a long-term partnership--that is, did you plan on staying with the museum to work on a variety of projects indefinitely, or was it intended to be a one-time project that evolved into a deeper relationship? I ask because I wonder if it would be helpful for practitioners or researchers seeking to establish this kind of relationship to have an idea of what time commitment/expectation they should anticipate in the partnership.

**Re: Welcome!**

*by Karen Elinich - Wednesday, January 16, 2013, 04:29 PM*

This introduction thread is bursting with ripe ideas and examples of how ISE institutions are already bringing research and practice.

In my role as Director of Learning Technologies at The Franklin Institute, I look at new technologies (two current examples: augmented reality and soft circuitry) from a research perspective to see what impact on learning they may have. Then, based on what we discover, I seek practical applications in our ISE programming.

**Re: Welcome!**

*by Kalie Sacco - Thursday, January 17, 2013, 03:49 PM*

Hi Karen,

Thanks for your response! Your role at The Franklin Institute sounds very interesting. I'm curious about what kinds of barriers, if any, you encounter in translating that learning research to the museum's practice. Do you feel that the questions addressed by the research in learning through technology mesh with the needs or wants of your visitors, your staff, your funders, or even the museum's mission?

I'm interested in other's experiences with this translation issue as well.

**Re: Welcome!**

*by Ari Epstein - Wednesday, January 16, 2013, 04:34 PM*

I'm Ari Epstein; I teach at MIT, primarily in a program that focuses on teaching first-year students how to work in teams to solve large environmental problems, and I direct Terrascope Youth Radio, an outreach program in which local urban teens create radio/audio on environmental topics.

Sorry to join this conversation late; it's been a day of meetings. I haven't had a chance to read all of this thread yet, so pardon me if I refer to events or programs that have already been mentioned.

A number of years ago I had the opportunity to serve as a member of the board of trustees at the Institute for Learning Innovation, where there were a number of initiatives that nicely blended research and practice. A signature program was a series of meetings that led to the "In Principle In Practice" publications, in which practitioners and researchers worked together to outline issues and propose solutions. A number of people engaged in this conversation played important roles in that project, and so may already have mentioned it.

Within Terrascope Youth Radio, we have been looking for ways to blend research more directly into our practice. We have a number of ideas we're acting on, but I'm interested to see others' thoughts, especially for programs that involve media, where there are so many open questions about how to understand reach and impact.

**Re: Welcome!**

*by Sarah Chicone - Wednesday, January 16, 2013, 04:54 PM*

Hi all! My name is Sarah Chicone and I am the Assistant Director and a fulltime faculty member of Johns Hopkins University's graduate program in Museum Studies. I am so excited to be sharing in the conversation, as I have been thinking quite a bit lately about the ways I need to best prepare my students for the professional collaborations you are all expanding upon here.

**Re: Welcome!**

*by Jane Acton - Wednesday, January 16, 2013, 04:58 PM*

We are a small not for profit agency running sessions in woods and on beaches where people need us using grants or profits from private events. We work with vulnerable children, young people and adults. Specifically people with behavioural issues, mental health problems or children who have to care for their own parents.

We use a Forest School model where the needs of the individual participants are addressed by understanding learning styles and using play and skill building to improve well being. We are working with 2 local universities and use Emotional Literacy Checklists or Warwick and Edinburgh Well Being scales to produce quantitative data and the Good from Wood Well Being scales to code and analyse the qualitative data.



Where people are over 14 we run accredited training. We use sites across the county and made 8 new sites available to the public over the last 2 years.

The research with the Good from Wood project has been conducted by our own staff using qualitative methods designed at a regional level and coding standardized via a central lead researcher. The same staff have also conducted the quantitative research with the children, parents and teachers.

As an agency we use research in practise so every session we deliver is evaluated and most of the session leaders are conducting their own research for their own learning. Within each successive session reflection and repetition is part of the learning and we use the reflective activities to assess learning styles within the group to inform the content of future sessions.

As participants learn they get the option to have their learning accredited and then they too are on the ladder. So we have learners from Foundation stage, early entry through to HE and one of us is hoping to start PhD in 2013.

We are a young organization so it is too soon to say what overall lessons we have learnt so far. Step by step however we are using research to inform practise on a weekly basis. Being part of a region wide research project our findings are fed into a central bank of information so although all the projects are different the findings are presented in a uniform format.

Key to the way we operate is to completely blur the distinction between practitioner and researcher and the subjects so each become interchangeable. We have found accruing formal accredited qualifications in the woodland environment can be achieved successfully in a seemingly informal setting.

The major problem is finding the funding to continue delivering sessions and research. Even though we are not for profit, working with vulnerable people, helping to conserve vulnerable habitats in impoverished communities access to funding is incredibly difficult.

**Re: Welcome!**

*by Lisa Peterson - Wednesday, January 16, 2013, 05:20 PM*

Hi,

I'm a recent graduate of Stanford University's Learning, Design and Technology program and am currently working as a research associate at SK Partners. Our current project is called "Enhancing Informal Science Learning Initiatives: Developing Measurement and Evaluation Capacities". We are trying to link theory, research, evaluation, and practice in order to develop a framework that synthesizes 'best practices' for assessment and evaluation in informal science education. In addition to reading research articles and evaluation reports, we have been talking to people in the field about their needs and how evaluation studies could be more useful to them in practical ways. We have also struggled with the connections and differences between research and evaluation and how findings are actually used (or not) by practitioners.

One question I have is how much 'should' evaluation be like research? And a related, follow up question: if evaluation should be more like research (I know, I know, it's a big IF), what would it take in terms of additional resource requirements to make that leap and what additional knowledge would that buy us?

Re: Welcome!

by Hana Dethlefsen - Wednesday, January 16, 2013, 09:59 PM

Lisa, how do I learn more about your project? I am really interested in learning about your findings and applying them to our young evaluation program as we grow our capacity for measurement and evaluation of our exhibits and programs.

**Re: Welcome!**

by Kalie Sacco - Thursday, January 17, 2013, 12:56 PM

Hi Lisa--thanks for your post. Like Hana, I'm interested in learning more about your project. Is this being developed specifically for one institution, or to be used across multiple institutions/informal learning settings? How are you tackling the problem of different sectors--i.e. the difference in museum settings vs. afterschool programs--or are there no substantive differences? I apologize if this is diving too deep in the work you're embedded in; I find the premise of the project really intriguing!

Your evaluation-as-research question is also interesting, and I've seen related ideas pop up elsewhere in the forum (where people are applying evaluation in a substantive way to their work). I would be curious to hear your thoughts on it, especially given the research question you're currently trying to address. In terms of resource requirements, as you say, I can easily see it coming down to a question of manpower. That is, what kind of training does someone need to have to be able to do both evaluation of specific programs while answering larger research questions at the same time? And is that feasible for one person to do, or would it require a large, collaborative team? Thanks again for your thoughts.

**Re: Welcome!**

by Maija Sedzielarz - Wednesday, January 16, 2013, 06:03 PM

Hi everyone -

I was an evaluation assistant at the Exploratorium on the Going APE project, which had a strong research/evaluation component in the exhibition project, then an exhibit developer at the Life & Science Museum in Durham, NC. Now on the research side, I am a doctoral student at the University of Washington's Learning Sciences program and part of the Learning in Informal & Formal Environments (LIFE) Center & the UW Institute for Science & Math Education with Philip Bell. I am currently a writer for the Relating Research to Practice website mentioned by Fan Kong & Justin Dillon, and was an original contributor to the ISE Evidence Wiki started by Kirsten Ellenbogen and Chis Castle. Seeing all this written in one place, I feel that I've been straddling the research/practitioner role since I started working in science centers.

A couple of key lessons that come to mind:

--what counts as valid, reliable and useful evidence differs for the on-the-ground practitioner and in academic research.

--Theory is present in informal setting's practitioner work but not always articulated as such, and it doesn't always align with theory about learning developed in school settings. (Big opportunity here!)

Beyond perhaps the APE project (of which I was only a participant a portion of it's time), I haven't been a part of collaborations that seemed true partnerships where roles are exchanged, rather divisions of labor were split along expected lines.

**Re: Welcome!**

*by Josh Gutwill - Wednesday, January 16, 2013, 07:17 PM*

Hi Folks,

What a great discussion so far, full of powerful stories and ideas for better collaboration between researchers and practitioners. Thanks Kevin, Jamie, Kirsten and others for putting together this forum. Please forgive me for joining so late in the day -- my museum is physically moving this week and next (!), so things are a bit hectic.

I'm Josh Gutwill, Director of Visitor Research at the Exploratorium in San Francisco. This topic is quite near to my heart -- my goal is to produce research that is actually used by practitioners. My colleagues and I don't want our studies to gather dust on a shelf.

Kevin asked: Have you seen successful collaborations between practitioners and researchers? What made them work? What barriers had to be overcome, and what strategies did you employ?

We are a research group housed within a museum, so nearly all our projects involve collaborations between practitioners and researchers. One memorable one for me was the Fostering Active Prolonged Engagement project, in which exhibit developers worked closely with researchers to design and test open-ended exhibits that would deepen learners' engagement. We put out a book that describes our questions, studies, results, and exhibits in the voices of both types of team members.

Currently, research staff and I are working with practitioners from our Tinkering Studio, trying to understand the kinds of learning experiences that happen while people engage in "making." What does learning look like during such activity? How does the design of the space and activity lead to desired learning experiences? We researchers started by trying to learn all we could about what the practitioners value about their work, what kinds of learning outcomes they see, and how they believe their designs foster learning.

In these and other projects, I've found that productive collaboration required:

- Intentional efforts to build trust. For example, I often describe my work as an extension of theirs, because we both have the goal of improving practice through better understanding of learning. More practically, we've also built trust through going on overnight retreats together, sharing occasional meals, etc.
- Time and effort spent communicating and clarifying goals and values. This involves really listening to practitioners' needs and values. I spent 6 months once arguing with a developer about the goals of a project until I finally heard that he was afraid that my goals would exclude his. Once we had that realization, we reframed the goals a bit and found compatibility.
- Blending of roles, with researchers sometimes developing exhibit ideas or even fabricating exhibits and developers generating research questions or even collecting data. (This was mentioned earlier.)
- Valuing practitioners' questions and letting them drive research. One role researchers may play is detective, ferreting out practitioners' questions, transforming them into testable research questions, and then conducting studies to answer them. A final piece of the process could be involving practitioners in the interpretation of findings.
- Iterative project structures. By creating projects that use iterative development cycles, research results can sometimes be incorporated back into practice within the timeframe of the project. (Certainly formative evaluation results can be timely enough for this.) This may promote refinement of practice and generation of new research questions.

Challenges have included:

- Time, time, time. Do we really have to spend all this time talking and listening, arguing and convincing? I believe so, at least I haven't found a more efficient way to align our values, goals and understanding of the joint project. But sometimes it can be exhausting. I'd love to hear if others have ideas about this. I like the Study Circles idea.
- Different lenses for viewing the practice. In several projects, I've run into the issue that we researchers often take an analytic stance, meaning we pull things apart a bit in order to understand the relationships among components. Many of the practitioners I've worked with, however, want to view the work holistically, preferring to think simultaneously about all the features of a program (design and outcomes). Sometimes, we've been able to ameliorate this challenge by identifying it and then creating representations and language that shows the whole picture as comprised of its parts.
- Finally, language barriers. I've been in situations where researchers and practitioners use the same terms in very different ways; and situations where one group uses a common term in a specialized, domain-specific way. I suppose this goes back to the issue of taking the time needed to work out confusion.

I'll end by mentioning a recent article in which the authors posit an approach for integrating research into practice that I found helpful:

Penuel, W. R., Fishman, B. J., Sabelli, N., & Cheng, B. (2011). Organizing research and development at the intersection of learning, implementation, and design. *Educational Researcher*, 40(7), 331-337.

Here's the abstract:

This article describes elements of an approach to research and development called design-based implementation research. The approach represents an expansion of design research, which typically focuses on classrooms, to include development and testing of innovations that foster alignment and coordination of supports for improving teaching and learning. As in policy research, implementation is a key focus of theoretical development and analysis. What distinguishes this approach from both traditional design research and policy research is the presence of four key elements: (a) a focus on persistent problems of practice from multiple stakeholders' perspectives; (b) a commitment to iterative, collaborative design; (c) a concern with developing theory related to both classroom learning and implementation through systematic inquiry; and (d) a concern with developing capacity for sustaining change in systems.

**Re: Welcome!**

*by Bill Watson - Thursday, January 17, 2013, 09:18 AM*

Hi, everyone -

It has been great catching up on these posts this morning. Thank you all for such stimulating ideas; I'm learning a lot and have lots of notes to follow up to learn more.

I'd like to offer a resource that shows some of the "raw data" from the kinds of collaborations that are being discussed here.

In February 2012, the Smithsonian's National Museum of Natural History hosted the 4-day, NSF-funded conference "21st Century Learning in Natural History Settings". We assembled about 100 professionals whose work is in or related to natural history museums. These included informal educators, natural history scientists (biologists, geologists, etc.), learning researchers, web developers, evaluators, and others. Our goal was to begin to develop a learning research agenda as a foundation for innovative practice in natural history museums.

One of the most fascinating parts of the conference was that almost immediately it was evident that the word "research" meant something very different to each role represented at the conference - perhaps even to each person. When we thought we'd clarify things by narrowing it down to "learning research," things became even more sticky because "learning" means so many things to so many people.

The result was four days during which everyone at the conference worked very hard to try to make sense of how learning researchers, practitioners, science researchers, administrators (and others) could find common language, build trust, and work together to reach the potential of natural history museums to make a difference in the public understanding, engagement, and participation in scientific and sustainability questions of the 21st Century.

The working groups kept their notes on a live wiki, which you can review at: <http://21centurylearningnmnh.wikispaces.com/>. The notes reflect the struggles of the 6 groups to find the common ground and begin to pose questions.

In the end, we heard from many participants that it was the kind of experience that made their brains hurt \*and\* that inspired them to build more collaboration to rethink the traditional means of education and communication at natural history museums and using natural history resources. I think the wiki is a relevant resource here because it documents some of the work we did to start to build common ground around learning research. The wiki also includes an ad hoc mission statement for the group (still being revised) and an initial list of questions and trending topics for research in and around natural history museums around which the group began to coalesce.

**Re: Welcome!**

*by Jamie Bell - Thursday, January 17, 2013, 10:51 AM*

Thanks Bill. It's great to hear this example from the Natural History Community, and about how calling it "learning" research opened up an unexpected can of worms at your conference. We were struggling a bit also with how to be as inclusive of all of the types of social science research that ISE practitioners read, use, cite and even contribute to. This discussion has made us aware of more categories, which we welcome.

We've now also heard from nature centers, museums, science centers, professional associations and citizen science projects here. It would be great to hear more from the media, cyber learning and gaming folks who are registered for this forum.

We also invite all to join the "Decision-Making.." discussion thread that we started on this Day 2 of the forum. Thank you all for the rich contributions!

**Re: Welcome!**

*by Sasha Palmquist - Thursday, January 17, 2013, 11:31 AM*

Thank you to everyone for sharing so many great examples and insights about practice and research. I have really enjoyed catching up on the discussion this morning.

My name is Sasha Palmquist. I am a learning sciences researcher and evaluator currently working in Washington, D.C. I completed my Ph.D. at the University of Pittsburgh (advised by Kevin Crowley). In connection with my dissertation work with the Carnegie Museum of Natural History we established a strong research and practice partnership between the museum and UPCLOSE that informed the design, development, and installation of the Dinosaurs in Their Time exhibition. As many posts have already suggested, the success of that collaboration required consistent communication and taking the time to clearly articulate goals and expectations along the way.

The recently funded NSF "My Sky Tonight:Early Childhood Pathways to Astronomy" project

[http://www.nsf.gov/awardsearch/showAward?AWD\\_ID=1217441&HistoricalAwards=false](http://www.nsf.gov/awardsearch/showAward?AWD_ID=1217441&HistoricalAwards=false) is also engaged in an active practice and research collaboration that includes: astronomers and astronomy educators, social scientists and learning researchers, and

staff from children's museums and science centers. The partnership between Maureen Callanan and Jenni Martin (described above) is an important part of this larger project collaboration. As the evaluator on the team I am conducting a process evaluation of how this research and practice collaboration develops and changes over the course of the project. I look forward to sharing the results!

**Re: Welcome!**

*by Kishore Hari - Thursday, January 17, 2013, 12:57 PM*

I'm Kishore Hari, Director of the Bay Area Science Festival organized by the University of California-San Francisco. I work at the Science & Health Education Partnership, which is hosting a teacher-scientist partnership conference at AAAS next month.

I just wanted to introduce myself on the welcome page since that's where a majority of the activity lies. I'll largely be posting on the broader impacts page.

I wanted to echo the comment regarding the evaluation/research divide. With the festival experimenting heavily in non-traditional ISE programs and locations, I have found it difficult to find applicable science education research as a guide. Since festivals are new on the scene, it has been hard to engage beyond evaluation - even though some interesting research questions are emerging.

I have started to reach beyond traditional social science/science education research - delving into festival tourism research to understand motivations and community impact. The maker movement also struggles with this - given the large numbers "flocking" to festivals and large maker programs (as mentioned), I wonder if anyone has seen attempts at connect research and practice in these areas?

**Re: Welcome!**

*by Anna Lindgren-Streicher - Thursday, January 17, 2013, 03:20 PM*

Hi all. I'm Anna Lindgren-Streicher, the Project Manager of Research & Evaluation at the Museum of Science, Boston.

As an internal Research & Evaluation Department, we often work with practitioners to develop the research questions that will define studies of mutual interest. In addition, we also partner with outside researchers who are interested in the ISE setting to help them shape their research so that findings will be relevant and interesting to the field and push our institution's knowledge and/or practice forward.

We are also serving as evaluators on the national implementation of the Living Lab (<http://livinglab.org/>), which is a partnership model for museums & academic researchers. In the Living Lab, researchers conduct their studies on the floors of the museum. They are trained by museum educators to interpret their own researchers for visitors, so participating in research becomes an educational experience for visitors on the process of scientific research as well as the content area being investigated in the study. In addition, museum educators learn

directly from academic researchers about their particular field of study. This program has been in place for over six years at the MOS, and some of our eight partner research labs have been a part of the program since its inception.

In the most successful collaborations I've been a part of or observed, both parties come to the table with a respect for what the other brings, or that mutual respect is quickly built. When partnering with (most) academics, it becomes apparent that there are cultural differences between museums and universities, but having mutually agreed-upon goals for the partnership can go a long way to overcoming those differences.

Re: Welcome!

by Cathy Maris - Thursday, January 17, 2013, 03:59 PM

I am Cathy Maris, Education & Grants Director at Kidzu Children's Museum in Chapel Hill, North Carolina. We are a small children's museum planning an expansion to a larger site. A central part of our vision is partnering with the academic institutions of the Triangle region to provide evidence-based informal learning experiences. With these partners, we plan to develop educational initiatives, implement rigorous evaluation, and conduct research on how children and families learn best in museums. We have been exploring a variety of models for such an approach. I am pleased to learn from others who have made connections between practice and research a part of the fabric of their institutions.

To date, we have engaged faculty researchers from UNC and NC State University primarily as advisors as we conduct design and educational planning for our new facility. They have also been kind enough to share input on educational materials for parents, exhibits, and other educational resources to ensure that they reflect current knowledge and best practices. We are looking forward to deepening these relationships as we move forward.

**Re: Welcome!**

*by Jamie Bell - Thursday, January 17, 2013, 06:13 PM*

Thanks Cathy, and to everyone for another strand of rich discussion today. A few reflections from me:

It's good to hear from children's museums over the past two days, with example of successful long-standing (Maureen and Jenni), as well as promising relationships with proximal university researchers (Cathy, et al).

Mutual respect and understanding between practitioners and researchers has been theme, with a nice range of models and strategies for fostering it. Giving that relationship-building the right amount off time seems key, as is a willingness to think and act of the box, changing or playing with roles, e.g. Josh's story about getting to that sweet spot where researcher and practitioner realize that their goals are not exclusive of each others' is instructive.

Interesting to learn from Erika and others about working with decision making science



within exhibit development, and wondering if that science can be applied to help us improve the dialogue between these disciplines. Along these lines, I'd like to know more about the "process evaluation" that Sasha is conducting on how practice and research collaborations develop.

Does anyone have other ideas for Kishore about where to look for research that will be useful in the science festival realm? (He mentioned work on "festival tourism".) The "Making Meaning" conferences that have followed both New York Hall of Science World Maker Fairs might be a place where some relevant work has been catalyzed.

Finally, have other folks heard about Design-Based Implementation research? Would anyone be willing to offer a definition?

Looking forward to one more day of discussions tomorrow. Please peruse the other strands- Decision-Making, Broader Impacts and the Difference between research and evaluation one that Kirsten Ellenbogen started today if you are interested.

**Re: Welcome! - and Design-Based Implementation Research**

*by Andee Rubin - Friday, January 18, 2013, 02:14 PM*

I wanted to post separately about Design-Based Implementation Research. The article that best describes this idea is called "Organizing Research and Development at the Intersection of Learning, Implementation, and Design" by Penuel, Fishman, Chang and Sabelli. It appeared in the October 2011 edition of Educational Researcher. According to the article, Design-Based Implementation Research is "design research at the level of educational systems... an expansion of design research, which typically focuses on classrooms, to include development and testing of innovations that foster alignment and coordination of supports for improving what takes place in classrooms." The article describes several projects that illustrate the DBIR approach. I don't know of any examples of this approach being used explicitly in informal settings, although there are certainly many projects whose philosophy is consistent with it.

**Re: Welcome!**

*by gema revuelta - Friday, January 18, 2013, 06:36 AM*

Dear all, Thank you very much to the organizers to have this great initiative and to the rest of participants for sharing their experiences and thoughts.

I'm Gema Revuelta, Deputy Director from Science Communication Observatory, Universitat Pompeu Fabra (SCO-UPF), Barcelona, Spain.

In the framework of the European project PLACES (leader by ECSITE and with the participation of EUSCEA and ERRIN networks), our centre of research has the responsibility to mobilize the main European academic researchers in the field of Science and Society, in order to assess the impact on society of scientific communication initiatives & policies (SCIP). We invited 30

researchers - referees in this area of knowledge- to be part of a Scientific Committee, design a common Toolkit and methodology and, finally, use it in the analysis of 30 cases representing different examples of science centres, science events and science cities, all around Europe. Because PLACES's will was that this Toolkit could be used in the future not only by academic researchers but also for practitioners, apart of opinion from the work done with academics, a series of feedback interviews with representatives from the main three networks participating in our project were carried out.

Final results from those 30 cases studies would not be public until next May, but the document used for this research, that is, "The PLACES TOOLKIT for the Impact Assessment of Science Communication Initiatives and Policies", is already public and can be downloaded from the PLACES project website (<http://www.openplaces.eu/updates/blog/80224>) or from the SCO-UPF website (<http://comunicacioncientifica.wordpress.com/2012/06/07/introducing-the-places-toolkit-for-the-impact-assessment-of-science-communication-initiatives-and-policies/>).

What we have learned from this experience is that cooperation between researchers specialized in science communication initiatives (mainly social scientists working in areas as science education, sociology, science communication, politics of science, etc) and science communication practitioners (working for science museums and exhibitions; for science events and festivals; and for scientific culture political initiatives) not only is possible but also very productive. Maybe there are some particularities of each group of professionals (for instance, academics seemed to prefer longer documents and lists of references while practitioners prefer shorter and practical ones), but it is clear that we can reach a common point, useful for all of us.

**Re: Welcome!**

*by Sandra Toro - Friday, January 18, 2013, 12:05 PM*

My name is Sandy Toro. I am a Program Officer at the Institute of Museum and Library Services, Office of Library Services. (I came to IMLS by way of the AISL Program at NSF, where I was on loan from the University of Wisconsin-Milwaukee's Educational Psychology Department).

I have worked with Leslie R. Herrenkohl, University of Washington, and Heather T. Zimmerman, Penn State University, on the Intersection Project. The project, which was funded by NSF, aimed to bring together informal science education researchers and informal science professionals/practitioners to build capacity and collaboration related to how people learn, teach, use technology, and address issues of access and equity. (I can say a lot more, but I'm trying to keep it simple for now! But here is a link:

<http://informalscience.org/project/show/1747>) The project is still going on as researchers and practitioners who were part of a gathering that convened in Milwaukee, WI, in 2009, are or already have written for a virtual collection of articles for Science Education having to do with the intersection of the learning sciences and informal science education.

Currently, I work with Discretionary Programs at IMLS. Briefly, in terms of informal science, we fund projects that involve STEM teaching and learning at libraries as well as projects that have to do with digital curation and data management, for example of scientific research. The

second type of projects involves scientific researchers working with professionals/practitioners such as librarians and archivists. See <http://www.imls.gov/recipients/grantsearch.aspx> for examples.

Key Lessons? I think that language is definitely a potential barrier to collaboration. For example, researchers and informal educators may share understandings about content and pedagogy, but they may not know how to relate these understandings to each other easily and/or with confidence.

Success? I think that successful collaborations and partnerships occur when each group empowers the other to participate equally, both in terms of physical work or time involved as well as conceptually/theoretically. For example, I do think that informal educators should be empowered to see themselves as knowledge producers in terms of helping to build theory, generate empirical support, and also add to what we know regarding best practices.

**Re: Welcome!**

*by Andee Rubin - Friday, January 18, 2013, 02:04 PM*

Hi Everyone -

My name is Andee Rubin. I work at TERC, a non-profit educational research and development organization in Cambridge, MA. While my academic background is in mathematics and computer science, I've been working in informal educational environments for the last ten years - as a consultant on exhibit and media development (particularly math-related exhibits), a professional developer and, most recently, doing research on professional development.

My current project is very relevant to the forum topic, as it is a collaborative effort of researchers (myself, Tracey Wright of TERC, and John Falk and Lynn Dierking of Oregon State) and practitioners at six zoos and aquaria. ZAARC (Zoo and Aquarium Action Research Collaborative) started about a year ago with a meeting of teams of three educators from each participating zoo or aquarium. Over the past year, each team has done an action research project that involved videotaping visitors as they carried out an animal behavior observation activity called Be An Animal Scientist (originally developed at the New England Aquarium) and analyzing selections from that video. Each team has a mentor who is a member of the research staff. We are in the process of putting together a DVD with each team's written report on their research, including excerpts from the videotapes they collected.

What makes our project unusual is that the practitioners are the ones doing the research on visitors' experiences. The "professional" researchers are studying how to most effectively help practitioners become more reflective. Our final products will include action research case studies collaboratively written by zoo/aquarium educators and their mentor. Our collaboration is supported by 1) yearly meetings of all participants; 2) monthly assignments for each team; 3) monthly phone calls between each team and their mentor and 4) annual visits by each mentor to his/her sites.

I couldn't agree more that mutual respect is the basis for successful collaborations. We've been very clear from the beginning that ZAARC wouldn't be possible without everyone's unique contribution.

**Re: Welcome!**

*by Billy Spitzer - Friday, January 18, 2013, 03:45 PM*

I am at one of the institutions (New England Aquarium) that is working with Andee on the ZAARC project. It has been very interesting and valuable for our education staff to have the opportunity to look more closely and analytically at visitor behavior with animals and exhibits. It raises a whole new set of questions about how learning is taking place, and what they can do to help facilitate learning and engagement.

I agree with Andee that the mutual respect is important (and it is evident in the ZAARC project).

However, one issue that I have observed is that our staff (the "practitioners") tend to have very practical questions that are sometimes different from the more theoretical questions that the "professional researchers" think about. I don't think this is an insurmountable obstacle, but it is an interesting challenge to work with.

"Reflective practice" is a great term because it captures the emphasis on both the reflection and analysis, as well as the application to practice. Perhaps this a good framework for thinking about research/practice collaboration. I'm going to go back and reread my copy of Donald Schon's *The Reflective Practitioner*!

Re: Welcome!

*by Sue Allen - Monday, January 21, 2013, 10:28 PM*

A quick response to Billy's great point that practitioners often have "very practical" questions. I've heard people say this before, and always found it strange that studies of design principles should be dismissed by some researchers as too specific / practical to be true research. (Particularly in exhibit design, where learning is so deeply "situated" in the details of the physical and social environment.)

Anyway, here's a concept from Sandoval that helped me think about it:  
"educational designs as embodied conjecture." *EDUCATIONAL PSYCHOLOGIST*, 39(4), 213–223

"In part, it is a plea for the field of education to resist viewing the development of learning environments, and learning technologies specifically, as simply making things and seeing if they work. Instead, both the very idea of what it means for a design to work and the ways in which its working can be shown rest on theoretical assumptions that design-based research strives to make explicit and testable. Second, this paradigm is aimed at developing theories of practice

rather than developing theory that can be translated later into practice. This aim inherently assumes that learning is situated. More than this, however, is the assumption that specific designs are a lever for studying particular contexts. "

Ok well it's a bit jargony and he's pushing on design-based research in particular, but I love the basic idea - and I think generating and testing explicit design principles is something the Exploratorium exhibit developers and researchers have been trying to do for years. E.g. the Going APE project was a great example. So maybe articulated, testable design principles can serve as bridges between research and practice, useful to both.

Re: Welcome!

by Jamie Bell - Tuesday, January 22, 2013, 09:23 AM\

Hello again All, and thank you for the thoughtful contributions to this "Welcome" discussion. Clearly there are several themes that are ripe for further exploration, and as we wrap up the forum this morning, CAISE will be looking at ways to provide more opportunities for digging deeper and inviting new points of view. Among the areas that seem to have potential are:

- What we in the US can learn from our colleagues in Europe, where there seem to be successful strategies for integrating science communication research with practice (thank you, Gema!)
- How to foster a culture where practitioners see themselves as partners with researchers in producing knowledge. (ZAARC seems to be a good model)
- Reflective practice writ large- a few ISE projects have been implementing professional development projects in this area , e.g. Reflecting on Practice at the Lawrence Hall of Science, and REFLECTS at MOSI, Tampa-[http://www.lawrencehallofscience.org/science\\_out\\_of\\_school/educator\\_tools/reflecting\\_on\\_practice](http://www.lawrencehallofscience.org/science_out_of_school/educator_tools/reflecting_on_practice), <http://www.mosi.org/mosiresearch.aspx>
- Examples of DBIR being implemented in ISE settings? Anybody know of any?
- Is there really such a dichotomy between practical and theoretical questions in our field?
- What can we learn from research on informal learning in the arts? - <http://www.artsedsearch.org/>
- How can we best prioritize what's important to know, build more resources to provide access to "just in time" knowledge, develop and share clear constructs assessments tools and articulate testable design principles?

**Re: Welcome!**

*by Bruce Lewenstein - Sunday, January 20, 2013, 09:35 PM*

Just a quick introduction, since I posted in one of the other threads and realized I'd never said anything here.

I teach science communication at Cornell University, focusing on public communication of science and technology (PCST). I started as a science journalist before becoming a historian of science focusing on science/society issues. I've moved from science journalism to science museums to anything whatsoever having to do with PCST. I've done evaluations of some ISE projects, especially citizen science projects (I'm at Cornell, but not at the Cornell Lab of Ornithology, so I counted as an "outside" evaluator for them).

**Re: Welcome!**

*by Sue Allen - Monday, January 21, 2013, 09:57 PM*

Bruce's post made me realize I hadn't introduced myself either.

I used to be Director of Visitor Research & Evaluation at the Exploratorium (a position now held by the wonderful Josh Gutwill), and then I went to NSF for 3 years, and am now consulting. I've worked with wonderful practitioners and wonderful researchers, but am still struck by the rifts between the two worlds, and - for that matter - between an array of research subspecializations (e.g. there's only 2% overlap between the cited literatures of physics education researchers and chemistry education researchers. Wow.)

Maybe I'm naive but I really think we could use our oh-so-limited resources more effectively if we found better ways to learn from each other, and to prioritize what's really important to know, and to invest in just-in-time learning on the professional level. So I'm always wondering about knowledge-building and knowledge-sharing systems, and how both researchers and practitioners can learn in an era of isolation alongside info-overwhelm. Oh, and I deeply believe in the value of clear constructs and shared assessment tools - I think that's what's propelled sciences like genomics into the flourishing fields they are. (this is a big part of what's behind NSF's now-mandatory data management plans, by the way).

I'm living happily in Maine with my lovely (non-toothpasty) Tom.

**Re: Welcome!**

*by Harvey Seifter - Tuesday, January 22, 2013, 09:23 AM*

I'm Harvey Seifter, founder and director of The Art of Science Learning.

Sorry to join this conversation so late. I come to it with an artist's perspective; my professional background is as a classically trained musician and theater director, and I've spent the past couple of decades working with arts-based learning – the instrumental use of artistic skills, processes and experiences to facilitate learning in non-artistic environments. These have included Fortune 500 corporations, museums, K-12 classrooms, universities, science centers, libraries,

incubators for entrepreneurship, research centers, cultural institutions, government agencies and NGO's.

My work in this field is first and foremost as a practitioner, growing initially from my experience as Executive Director of Orpheus Chamber Orchestra and working with the orchestra's conductor-less process as a model for collaborative management and high performance teamwork. In 2003, after becoming aware of parallel work emerging from theater, jazz, the visual arts and poetry, I decided to help convene a field of practice around the use of arts-based learning in business, and founded Creativity Connection, a program of Americans for the Arts. Creativity Connection gave me the opportunity to collaborate with many of the world's leading practitioners of arts-based learning; inevitably, my observations about arts-based are informed by insights derived from the experiences of these outstanding artist/practitioners, as well as from my own direct experience.

Over the past decade, I've conducted a number of surveys, which found the increasingly widespread use of arts-based learning by American business for the purposes of skills training, organizational development and driving the front end of innovation processes (see [http://www.seifterassociates.com/uploads/4/0/5/9/4059165/artists\\_help\\_empower\\_corporate\\_america.pdf](http://www.seifterassociates.com/uploads/4/0/5/9/4059165/artists_help_empower_corporate_america.pdf)). ;

I've also become increasingly aware of the tremendous gap between what we, as practitioners, "know" experientially about the role of the arts in learning, and what we can prove through research. In 2005, my colleague Ted Buswick and I had the unusual opportunity to edit a special issue of the Journal of Business Strategy entirely devoted to arts-based learning for business. I practically jumped up and down with glee at the opportunity to publish evidence that would make the case for arts-based learning as a means to foster key 21st Century innovation skills, only to discover how little such evidence existed. After much searching, I surfaced and published an NSF-funded experimental study from the 1990's documenting Cooper Union's successful use of dance, theater and music to strengthen the communication skills of engineering students. That study still stands out as one of the few really solid ones in this field.

The following year, Americans for the Arts became involved with the Conference Board in the development of its landmark "Are They Really Ready to Work?" study, which documented the enormous gaps between the creativity, collaboration and communication skills that corporate leaders consider critical to America's economic competitiveness, and level to which those skills were developed in college graduates seeking work with the same companies. [http://www.p21.org/storage/documents/FINAL\\_REPORT\\_PDF09-29-06.pdf](http://www.p21.org/storage/documents/FINAL_REPORT_PDF09-29-06.pdf) That study played a vital role in focusing attention on the potential of the arts to offer

a rich set of learning resources to help close what amounted to an “innovation gap” in America’s present and future STEM workforce.

In response to the profound workforce and economic development implications of this study, I founded The Art of Science Learning in 2008, with the mission of using the arts to advance STEM learning and practice, thereby helping improve how people of all ages learn and practice the sciences, strengthening popular engagement with science, and enhancing the innovative capacity of our present and future STEM workforce. In 2011, with the support of the NSF, we convened some 450 scientists, artists, educators, business leaders, researchers and policymakers in three regional conferences to explore these topics from the perspectives of educational practice, research and workforce development.

Four months ago, we received NSF funding to launch Art of Science Learning's Phase 2, which consists of developing a comprehensive arts-based curriculum for teaching STEM innovation processes to adolescent and adult learners; implementing the curriculum in three year-long, incubators for innovation in STEM learning housed in San Diego's Balboa Park, Chicago's Museum of Science and Industry, and Worcester's EcoTarium; and evaluating the curriculum's effectiveness in generating ISE innovation and strengthening creativity skills in STEM learners. Next year, our research will include an experimental study to test the hypothesis that integrating the arts into STEM-related innovation training results in enhanced creative thinking skills, collaborative behaviors and innovation outputs.

The research working group notes from our 2011 conferences (<http://artofsciencelearning.org/conference-reports/116-education-practice-working-group-notes.html>) give a clear sense of the tremendous gaps between research and practice in this field. The body of practice-based insight into the value of the arts in fostering 21st Century innovation skills and learning in both formal and informal environments (including but not limited to STEM learning) is growing rapidly, accompanied by an equally rapid increase in the application of arts-based learning to innovation processes and the teaching of innovation.

Research, which historically has lagged far behind, is only starting to catch up. Catch up is urgently needed, and I’m very grateful for this initiative!



## **Day 2: Decision-Making in ISE Practice-and-Research**

*by Jamie Bell - Thursday, January 17, 2013, 10:56 AM*

Good day, All and welcome to Day 2 of the CAISE Practice-and-Research forum. I'm Jamie Bell the CAISE Project Director and I'll be moderating today, along with my Co-PIs Sue Ellen McCann and Kirsten Ellenbogen. Thanks to Kevin Crowley and to all who have participated so far for getting us started down some thoughtful, informative and generative paths yesterday. As Kevin mentioned, this CAISE initiative is focused on informal science education (ISE)/informal STEM learning practice and its connections to learning, education, science communication, decision-making and social science writ large.

CAISE has also launched another initiative to explore and support scientists and STEM practitioners who are involved in ISE work of their own, working with ISE institutions, projects, programs and individuals, or seeking to connect or collaborate with ISE work or partners. To post on that topic, please use the "Broader Impacts" discussion thread.

Yesterday's participants offered rich examples of some projects that are developing evolving and successful strategies for integrating practice and research in an interesting variety of ways. Some mentioned work that blurs the line between the disciplines or challenges the distinctions. The issue of disconnected timelines in a project that has both research and development components was raised, among others.

Today we'd like to start by going a little deeper with folks' experiences as practitioners and/or researchers in making decisions, e.g.:

As a practitioner, what key decisions have you made that you know learning/science communication/social science research have already addressed, or could provide valuable findings about? What questions do you have that you have not as yet seen addressed by research?

Or, as a researcher, how have decisions have you made when identifying, generating and framing research questions and methodologies been informed by ISE practice?

Looking forward to our discussion!

## **Re: Day 2: Decision-Making in ISE Practice-and-Research**

*by Chris Myers - Thursday, January 17, 2013, 01:04 PM*

We are co-developing public research and conservation action stations at zoos and aquariums. Research plays a continuing role in informing design, from mundane decisions like: "hmmm, let's not put a station there because it will not allow enough room for families to interact," to fundamental decisions about the structure and wording of our interactives. Our evaluator, Joe Heimlich and the team at the Lifelong Learning Group and Jes Koepfler at UXR have pushed us on several fronts, including intergenerational learning and designing for diversity. As for questions that seem to warrant further attention, we remain curious about how collaborative knowledge creation relates to behavioral and social change. Because of our interests in

sustainability, we are also seeking ideas for how to assess social and environmental impacts in community science contexts, and welcome any info on these or related fronts.

**Re: Day 2: Decision-Making in ISE Practice-and-Research**

*by Jane Acton - Thursday, January 17, 2013, 01:30 PM*

Hi Jamie

You questions are similar to ours so I look forward to any replies you may get. We measure individual well being using for example Emotional Well Being Checklists before and after the intervention but social and ecological measures at a community level would be very interesting indeed

Many thanks

Jane

**Re: Day 2: Decision-Making in ISE Practice-and-Research**

*by Linda Wilson - Thursday, January 17, 2013, 04:26 PM*

You mention 'an intervention'. Is that a therapeutic situation or a leisure one. We're experimenting with the WHO well-being measure. This was used in a study of pre and post zoo visit conditions among elderly people in Japan. I'm not familiar with the Warwick and Edinburgh forms you mention on your profile.

**Re: Day 2: Decision-Making in ISE Practice-and-Research**

*by Sue Allen - Thursday, January 17, 2013, 01:41 PM*

At the Exploratorium's Visitor Research & Eval group we did a series of small embedded research components in larger projects. The choice of research question was heavily influenced by the team, especially the exhibit developers - they helped us find questions that were at the heart of real design dilemmas, but still potentially generalizable. E.g. Do walls around an exhibition enhance or hinder learning? Or... are there really trade-offs between supporting inquiry and explaining a concept? They helped us identify a bunch of design-tensions and their implications for learning.. This was a big change from the question I pursued when I first arrived at the Explo as a post-doc (about facilitating different kinds of inquiry through labels), which was interesting but had less immediate practical value and didn't bubble up from practice. Nobody is excited by that work any more. (well ok, Mom, not counting you).

Another really helpful moment was during the details of experimental design studies - practitioners helped us identify versions of an exhibit or experience that were effectively "straw people" because they weren't realistic options, so we could save resources by dropping them. And practitioners helped us stay real about how different learning outcomes might manifest, keeping us more open-minded on assessment issues. Plus they helped us frame implications in a way that would resonate with other practitioners. Lots of help...

**Re: Day 2: Decision-Making in ISE Practice-and-Research**

*by Sue Allen - Thursday, January 17, 2013, 02:27 PM*

I'm intrigued by two of Jamie's earlier questions:

"As a practitioner, what key decisions have you made that you know learning/science communication/social science research have already addressed, or could provide valuable findings about? What questions do you have that you have not as yet seen addressed by research?"

I'd really like to know more about how practitioners make their decisions, and where they turn for best practices / research / eval / minefields etc. What does that even look like? Is it all personal word-of-mouth, asking someone you know whose experience and insights you value? Or going to exhibitfiles.org? Or searching through a string of online sites with differing expertise? We're a highly experiential culture in ISE, yet we expect that our practitioners will be reading literature like printed books and journal articles - it seems unrealistic. Even with research2practice and the great things CAISE is doing, I wonder if there's a way to have "just-in-time" knowledge for ISE professionals making design decisions? Aside from jargon issues etc, where would we put relevant research so that it's most useful? What form would it take?

On the other question, I wonder if it would help reduce the obstacles if our field had some kind of Craigslist where people could post themselves as researchers or practitioners, with areas of interest, and looking for connection! Or maybe some focused discussion that moves "In Principle, In practice" into the online world for live discussion - e.g. let's do the next ASTC Connect on a topic -- say, building coherence among disparate learning experiences -- and let people figure out a research agenda over 2 days!

**Re: Day 2: Decision-Making in ISE Practice-and-Research**

*by martin weiss - Thursday, January 17, 2013, 03:16 PM*

I am intrigued by your Craig's list idea. For it is a problem if, as an exhibition developer, I need help on a project to whom do I go to if I had not structured the project with a learning researcher on board? Is just in time "learning research information sufficient" for most projects? Would that not be a literature review? Is this what we mean by learning researchers supporting project development?

It seems that the best case scenario is to collaborate with a researcher and have that person function as part of the development team. Another that could work is to have an in house "learning researcher", like an in house evaluator, who would work with a number of project development teams. They would be written into projects and would be responsible for answering the research questions for the development team. Sort of part of what you did at the Exploratorium?

There maybe other models.

**Re: Day 2: Decision-Making in ISE Practice-and-Research**

*by Ari Epstein - Thursday, January 17, 2013, 03:28 PM*

That Craigslist-like tool could be extremely useful, particularly in pulling together thoughtful collaborations far before preposals are due, an issue that has come up at a number of CAISE-facilitated events. In order to make it most effective, it would need to be open to anyone,

without restrictions based on association membership, etc. Certainly one could include such things in one's profile, in such a way that people could conduct filtered searches. Is there any reason something like this can't/shouldn't be done on LinkedIn or a similar existing site?

**Re: Day 2: Decision-Making in ISE Practice-and-Research**

*by Trevor Nesbit - Thursday, January 17, 2013, 04:55 PM*

Hi Sue, Martin, and Ari:

Interesting. So, the two models of having an in house researcher vs. open access to a knowledge community. Not to pit them against each other; they are complimentary and synergistic - in identifying collaborators with specific skills for a development team at the start of a project, for reaching out to the broader community during a project for real time feedback, and to share results (evaluation, products, research etc.) with others at the end of a project.

At CAISE we are currently re-building [informalscience.org](http://informalscience.org) for grand re-launch in May 2013. The [informalscience.org](http://informalscience.org) website, and the related broader [informalcommons.org](http://informalcommons.org) digital catalog of resources including project descriptions, evaluation reports and products, research, exhibit case studies and reviews and reference material, etc., will be integrated. The new [informalscience.org](http://informalscience.org) will also incorporate the current CAISE website, resources such as the PI Guide to Evaluation, and the ISE Evidence Wiki ([iseevidencewiki.org](http://iseevidencewiki.org)).

To Sue's question and Ari's comments on a Craigslist like tool...

"I wonder if there's a way to have "just-in-time" knowledge for ISE professionals making design decisions? Aside from jargon issues etc, where would we put relevant research so that it's most useful? What form would it take?"

That's an interesting question. The new website will also include capabilities to share projects, eval reports, and research. We are adding new networking functionality - a searchable member directory and groups with forum discussions. There is also the capability to assemble wiki articles very quickly with the evidence wiki.

With the tools, information asset, and people assembled on the new [informalscience.org](http://informalscience.org) fast response and craigslist like utility is possible. What's the feedback loop between the field and the website? What does the field need from a collection of resources and tools that describe research? Who chooses what is relevant and when? What metrics inform decision making about what is featured or synthesize?

It strikes me that a number of these question may beg conversation about what a "post publish" or open access peer review process would look like.

And to this and to Martin's point.... does anyone have thoughts on organizational

models for supporting the use and growth of professional online communities and digital libraries?

**Re: Day 2: Decision-Making in ISE Practice-and-Research**

*by Richard Hudson - Friday, January 18, 2013, 12:21 PM*

I personally think that [informal.science.org](http://informal.science.org) (and its "Next Generation" version soon to come) have proven to be an invaluable resource for media organizations who typically do not have staff researchers, but instead build relationships with independent researchers and evaluators.

NSF program officers have been more diligent in the past than recently in requiring grantees to post their summative results, and it would be even more valuable if the same pressure were put on grantees to post formative results, too.

Although there is tremendous value in having this information easily accessible, many practitioners tend to be shy about sharing what they've learned - particularly if they feel it was a mistake - so a cultural shift is needed somehow.

Re: Day 2: Decision-Making in ISE Practice-and-Research

*by Ari Epstein - Friday, January 18, 2013, 12:45 PM*

Absolutely, Richard. Some of the same issues dog STEM research fields too. For example, scientists are extremely reluctant to publish the results of a "failed" experiment, even though, as we all learned in high school, those are a crucial part of the scientific process.

I wonder if there's some way to provide incentive to folks to report "negative" results in our fields.

Re: your point about publishing results of formative evaluation: Would it be sufficient for you if people went into more detail about formative evaluation in their summative reports? Or are you after more real-time reporting?

Re: Day 2: Decision-Making in ISE Practice-and-Research

*by Trevor Nesbit - Friday, January 18, 2013, 11:17 PM*

Richard - This very same issue "many practitioners tend to be shy about sharing what they've learned - particularly if they feel it was a mistake" was raised in the evaluation of case studies contributed to [Exhibitfiles.org](http://Exhibitfiles.org).

**Re: Day 2: Decision-Making in ISE Practice-and-Research**

*by Christine Castle - Monday, January 21, 2013, 08:52 AM*

Thanks for sharing these very exciting CAISE developments. You might also consider developing some method of posting on-going research projects. In the Museum Education Monitor's free blog, FORUM: Research & resources for museum education, I post ongoing and recently completed research and evaluation projects with an eye to helping researchers & practitioners become aware of what is happening now rather than having to wait months/years for the published work to appear.

The MEM is being retired as of Feb. 2014 so I won't be able to continue doing this. Perhaps this kind of model could be continued by CAISE?

**Re: Day 2: Decision-Making in ISE Practice-and-Research**

*by Linda Wilson - Thursday, January 17, 2013, 04:35 PM*

I agree with Martin about the Craigslist idea being intriguing, but disagree (at least a little) on the value of having 'a' learning researcher on staff or on project. What Sue suggests sounds exciting, flexible and quick. There are so many subfields of research and opposing theoretical perspectives, that bringing on a person automatically limits a project. Even 'old folks' like me <grin> are learning to be a little more nimble in gathering information for decision-making.

Especially if using research to help us be a little more experimental, a little less afraid, I'm all for it.

**Re: Day 2: Decision-Making in ISE Practice-and-Research**

*by Anna Lindgren-Streicher - Thursday, January 17, 2013, 05:24 PM*

As an internal researcher & evaluator, sometimes my department's role is to be the learning researcher on a project who can provide that "just in time" information or design a study that relates directly to a project, much like the Exploratorium model. But I do think that Linda brings up an important point about bringing in outside researchers to expose us (both the on-staff researcher and the practitioners involved) to new methods and theoretical perspectives.

For example, we're currently really excited to be partnering with a team of outside researchers who will be integrating collecting physiological data from museum visitors along with more traditional observations & interviews. We don't have the expertise to undertake that type of data collection on our own (not to mention the analysis!), but can share our ISE background to inform the study design, since they usually work in formal education. We're hoping that both sides of the partnership will be able to learn something from working together. While it sometimes can be challenging, working with outside researchers is great for expanding our knowledge and making us think harder about our own approaches and perspectives as on-staff learning researchers.

**Re: Day 2: Decision-Making in ISE Practice-and-Research**

*by Margaret Evans - Thursday, January 17, 2013, 05:27 PM*  
The Spiral Model of decision making....

Hi All, This is a topic close to my heart - as a learning researcher I have been "embedded" in several exhibition development teams, but mostly those focused on questions about which I have some expertise (cognitive development, evolution). This was not an in-house experience (like the Exploratorium), but a grant funded exhibit/learning experience in which exhibit developers, learning researchers, evaluators, and content-area scientists all paid a role. From a research perspective, I found the most rewarding experiences occurred when questions emerged that opened up an entirely new research area – which in turn influenced exhibit development.

Working with Martin Weiss and others at the New York Hall of Science on a children's exhibition on bird-dino evolution we developed what we called a "spiral model" of exhibit development. In this model, there was almost continuous spiraling from early exhibit development decisions, which were impacted by the prior research and formative evaluation, to research project design decisions and studies that yielded new information, which in turn informed exhibit development. (We even presented this model at VSA.)

As a concrete example --the early research and development caused us to abandon our initial dino-bird exhibit plans and introduce instead a narrative or story-line, as the only way to convey the dynamic process of evolution. Narrative introduced a new genre, which complicated matters because to make the subject matter compelling our writers tended to anthropomorphize the subject matter ("Did the dinosaurs WANT feathers?"). As a learning researcher I was constantly harassing the team, warning them against the dangers of this approach, particularly with young children and the topic of evolution (adults, arguably, may understand such language as metaphoric).

But I didn't have much concrete evidence at hand. So with some graduate students we carried out an experimental study in which we randomly assigned different age groups to different language conditions. We found that some kinds of anthropomorphic language (want, but not need) negatively affected the 5-7 year olds' understanding but not that of the older kids. This spawned a whole new research area, which, in turn, influenced the writing of the narrative for the exhibit and a new children's book on this topic.

For one-off informal learning experiences like this, the spiral model of decision making, with learning researchers, evaluators, and exhibit developers continually interacting with each other, proved to be a fruitful approach. In this case, a literature review would not suffice.

## **Re: Day 2: Decision-Making in ISE Practice-and-Research**

*by Jamie Bell - Thursday, January 17, 2013, 09:58 PM*

What a wonderful discussion, All, thank you. Such interesting examples and models and some "juicy questions" posed (with apologies to Sue : )\*

I'm curious if Chris will get some ideas for existing research on the relationship between collaborative knowledge creation and behavior and social change. As for assessing social and environmental impacts, which is a need that Jane expressed also, I'm wondering if you think of that as more of a question for (summative) evaluation?

Sue's characterization of research questions "bubbling up from practice" is at the core of what we have been wondering about in this CAISE initiative. We've all heard the concept that "research is not the only source of knowledge in ISE," which sounds great, but what do we mean by that, i.e. what are examples? Practitioners do informally share information with colleagues in person and on the phone, and more formally at professional conferences. Some also write- I'm thinking of Kathy McLean's books (some with Wendy Pollock) or the Active Prolonged Engagement (APE) project book that was mentioned by Suzanne and Josh in the "Welcome" discussion, where Exploratorium exhibit developers wrote chapters about their processes. What are some examples from the non-museum/science center world?

The Craigslist idea is fascinating. Kind of like an interactive version of VSA's "Find an Evaluator" database? " Having worked as a program developer, I know that there is often the need for "just in time" knowledge. It's partially a function of the timeline mismatch between research and practice that Ari mentioned in the "Welcome" thread. But as Trevor and others point out, it should be thought of as complementary to lit reviews and other resources in the grander scheme of what the practice and research dialogue needs. And this is a timely consideration for CAISE, as Trevor mentioned, as we are deeply into development of the new web infrastructure...

Martin points out how invaluable an in house researcher can be, true, but as is sometimes the case with having a scientist on staff, smaller ISE institutions, projects and programs can't afford to. The notion that going outside your walls for new knowledge/ expertise increases our nimbleness, is a lovely idea, thank you Linda, and Margaret's description of practice informing research questions and visa versa in a "spiral model of decision making' on her evolution project rings true with the best of my experience.



Fittingly, I'm writing this from an AZA director's conference where I sat in on a breakout session this afternoon where it was abundantly clear that zoo and aquarium directors make decisions about practice based on data from research, indeed there were some lively arguments about whose data was better!

\*reference to the "Group Inquiry with Visitors at Exhibits" (GIVE) project at the Exploratorium

**Re: Day 2: Decision-Making in ISE Practice-and-Research**

*by Erik Thogersen - Friday, January 18, 2013, 08:31 PM*

I'm a practitioner (exhibit developer - Exploratorium) who would like to make better use of research in my work.

Realistically I don't do much looking at research in the midst of a design project, I rely on first hand input from colleagues and advisors. Maybe it's because we have in house evaluators, but the answer to a question that we actually want to research is to evaluate the thing we're doing rather than looking for research that is adequately relevant. And I've learned from hard experience to be careful about asking for a formal "study" rather than quick and dirty, as the time goes up so much.

I'm more optimistic about the idea of using research as a idea generator in the early phase of a project.

Something most helpful would be "push notifications" sent when a researcher thinks they've just hit upon an actionable idea that they hope someone will try. Anybody have suggestions on good ways get more in the loop of such ideas?

Maybe this is the "craigslist" idea, or the new iteration of informalscience.org. I do think it would be helpful to have something more informal than browsing abstracts.

**Re: Day 2: Decision-Making in ISE Practice-and-Research**

*by Trevor Nesbit - Friday, January 18, 2013, 11:51 PM*

Hi Erik,

I am working with the team re-developing informalscience.org.

Can you unpack the "push notifications" idea?

What do you think a researcher would be doing when they

"hit upon an actionable idea that they hope someone will try?"

**Re: Day 2: Decision-Making in ISE Practice-and-Research**

*by Erik Thogersen - Monday, January 21, 2013, 11:15 PM*

Hi Trevor,

Good question. My idea behind pushing ideas is to try to get more practitioners engaged with research. I'm positing that there are others like myself who go to informalscience or research2practice every once in a while, but then kind of forget to check back. If we could indicate some areas of interest and then get an email when something comes up, we might be more likely to pick it up. That would require only a few saved search terms.

Something else interesting might be to let those publishing work be able to actively push it, maybe to those choosing to be signed up, if they see their results as being ripe to be put into practice. Maybe I'm just thinking that the suggestions for future work part of a paper could be pulled out and listed separately for those looking for such suggestions.

**Re: Day 2: Decision-Making in ISE Practice-and-Research**

*by Jamie Bell - Tuesday, January 22, 2013, 08:55 AM*

Hello again All, and thank you for the thoughtful contributions to this "decision making" discussion. Clearly there are several themes that are ripe for further exploration, and as we wrap up the forum this morning, CAISE will be looking at ways to provide more opportunities for digging deeper and inviting new points of view. Among the areas that seem to have potential are:

- The parallel between the "spiral model of decision-making" and "agile" processes described.
- Addressing the mismatch in timescales between practice and research with "quick and dirty" studies and other strategies. (perhaps this will be particularly useful in media, when broadcast deadlines require tight turn around)
- How reflective practice of practitioners (recording as they go), as described by Jane in the Good from Wood project benefits the research aspect of the project.
- Incentives for disseminating "negative" results- One of the great potentials that research has, as distinct from evaluation, is that studies are not designed to prove the impact of any particular development strategy, but rather to test hypotheses. As Richard and Ari point out, formative

evaluation is the area most akin to research here, but again, but again a 'negative' result should not be pejorative but rather something to learn from.

- How to develop processes where the integration of practice and research is so intertwined that "no one person could claim credit" for decisions?
- Further exploration of the "push notifications" idea and how that would manifest in a web infrastructure

## **The Relationship(s) Between Practice and Research**

*by Kalie Sacco - Thursday, January 10, 2013, 11:59 AM*

A number of other professions, both inside and outside the realm of education, have grappled with issues related to practitioners and researchers' "differentiated arrangements of inquiry" (Bryk, Gomez and Grunow 2011). As a *field that is about craftsmanship*--i.e., there are few prescribed, formal paths that professionals take to become involved in informal science education--informal science education has unique challenges that can inhibit practitioner-researcher collaboration and understanding.

Practitioners frequently rely on experience and lessons learned from trusted colleagues and have minimal or no easy access to academic publications, and there is often a perceived need for research to be "translated", i.e. made accessible, understandable and relevant to their work in order to add "academic credibility" to projects. Furthermore, the timelines of practitioners' projects don't typically align with those of research studies, and until recently there have been few places where practical and scholarly ISE wisdom can be in dialogue.

Efforts to address these challenges in the ISE field have included: The *In Principle in Practice* conference and resulting publications (2006-2007) organized by the Institute for Learning Innovation, the *Building Capacity and Collaboration at the Intersection of the Learning Sciences and Informal Science Education* initiative based at the University of Washington (2008-2010), and the *Relating Research to Practice in Informal Learning Environments* website developed by the Center for Informal Learning and Schools (CILS) at the Exploratorium and the Learning In Formal and Informal Environments (LIFE) Center at the University of Washington (<http://www.research2practice.info/>). The National Research Council of the National Academies' *Learning Science in Informal Environments* and companion *Surrounded by Science* volumes combined summaries of what is known about learning from ISE research with examples from practice.

Drawing from these and other recent projects, CAISE has identified and synthesized findings that seed the topics and questions for this forum.

## **Re: The Relationship(s) Between Practice and Research**

*by Kevin Crowley - Wednesday, January 16, 2013, 03:29 PM*

People have been great about sharing resources in their posts so far. Thanks! I thought it might make sense to extend Kalie's thread to specifically identify a list of web sites, readings, meetings, and groups that you've found particularly helpful in your research and practice work.

Some of the things we've heard about in the posts so far include:

<http://www.research2practice.info>

<http://informalscience.org>

<http://inisci.org>

[http://iseevidencewiki.org/index.php/Main\\_Page](http://iseevidencewiki.org/index.php/Main_Page)

<http://www.mccastle.com/Public/MEM.aspx>

What else would you recommend to your colleagues? What are some of the most helpful readings in this area?

**Re: The Relationship(s) Between Practice and Research**

*by Erik Thogersen - Friday, January 18, 2013, 12:58 AM*

Thanks for posting this list Kevin.

I'm a practitioner (exhibit developer - Exploratorium) who would like to make better use of research in my work. The last 3 links are new to me.

Realistically I don't do much looking at research in the midst of a design project, i rely on first hand input from colleagues and advisors.

I'm more optimistic about the idea of using research as a idea generator in the early phase of a project.

Something most helpful would be "push notifications" sent when a researcher thinks they've just hit upon an actionable idea that they hope someone will try. Anybody have suggestions on good ways get more in the loop of such ideas?

**Re: The Relationship(s) Between Practice and Research**

*by Ari Epstein - Wednesday, January 16, 2013, 04:42 PM*

I think the timeline issue Kalie identifies is crucial. In a 3-year project, or even a 5-year project, one can reach the point where the research effort just has enough meat to work on, but the rest of the project is ending. And those kinds of timelines certainly don't permit the kind of longitudinal research effort that would be so valuable.

I wonder if there might be a way to rewrite an NSF solicitation in order to allow a small fraction of the project (the portion committed to longitudinal research) to continue beyond the usual 3-5 year period. I'm sure there are budgeting issues that would make it difficult, but it sure would help.

Maybe if there were some analogue to the supplemental proposal--we've got a project going, it's a good candidate for longitudinal assessment, and we'd like to supplement that project with time and funding in order to carry out a longitudinal component.

**Re: The Relationship(s) Between Practice and Research**

*by Sue Allen - Thursday, January 17, 2013, 01:18 PM*

That's a creative idea, Ari, though I doubt the 5-year period is changing any time soon. Meanwhile we can do a few things to make a bit of wiggle room: reserve some research budget and request no-cost extensions, or frame the longitudinal work from a broader research perspective and apply for a research grant (e.g. Jon Miller was repeatedly

funded to extend his LSAY longitudinal work as a resource for the field in addition to the project's own analysis). Or argue it's great pilot data for a new REESE proposal.

## **Practice and Research in ISE media**

*By Ari Epstein – Friday, January 18, 2013, 12:37 PM*

Mass media (e.g. TV, film, print, radio, games, web-based work) comes with an interesting set of uncertainties, many of which might be well addressed through research. Speaking just from my own experience, for example, I find that it is very difficult to gauge the true reach and impact of broadcast radio. Even just the number of listeners is often a real mystery, and it's hard to measure the impact on those particular listeners. We have used focus groups designed to represent what we think the listenership of a program might be, which is a start. But are there folks out there who have other experiences, or perhaps who have some ideas about directions we might go?

### **Re: Practice and research in ISE media**

*By Richard Hudson – Friday, January 18, 2013, 12:48 PM*

In some senses, Ari is talking about an important frontier of ISE media, made all the more urgent with the explosion of opportunities to interact and learn in the online and mobile world. (Do people learn physics from Angry Birds? Who's looking at that question?)

How do we assess an ISE experience that has hundreds of thousands to millions of participants?

I frequently turn to both Pew and Nielsen studies for insights into this challenging "numbers" game, and the research challenges are indeed daunting.

I sense a tendency of the ISE research field to focus on understanding face-to-face experiences, when there is a vast expanse of ISE learning opportunity that is not face-to-face and is becoming increasingly important today. (We have flipped classrooms. Are there flipped museums, too?)

To be continued...

### **Re: Practice and Research in ISE media**

*By Ari Epstein – Friday, January 18, 2013, 1:01 PM*

To follow up on one of your side notes: I don't know about Angry Birds, but just yesterday I saw a very interesting talk by some researchers in the Science Education Department of the Harvard-Smithsonian Center for Astrophysics, in which they used an iPad app to study ways of teaching about scale in astronomy (a very important issue, for reasons we can go into if anyone wants).

The researchers (several of whom, I think, are participating in this forum, and so might be able to give their own perspectives) used a pre-existing astronomy app that can be used in either "orrery mode" (in which, for example, orbital paths are depicted accurately, but the planets themselves are depicted much, much larger than "actual size," so that a picture of a planet is visible even when that planet's entire orbit is also visible) or "true-to-scale mode" (in which planets are sized to match the scale of the overall picture, so that one wouldn't see a picture of the planet without zooming in pretty far onto the orbital path). After a pre-test, they had students use one or the other

mode to complete a "scavenger hunt," and then administered a post-test. Students who had used the true-to-scale mode did better than the other students on questions that had something to do with scale, even if the role of scale in the question was well hidden.

OK, a bit of a digression, but what I'm getting at is that this is an example of a game-like setting in which a lot of STEM learning is going on, in a measurable way. And this work was done just with whatever suitable app the researchers could find. Active, research-driven design of games and other apps is a very rich area, in which I know some people are making great progress. And metrics in those worlds are easier to collect than in broadcast media (the problem for which I'm still trying to find an answer).

**Re: Practice and Research in ISE media**

*By Sue Ellen McCann – Friday, January 18, 2013, 3:16 PM*

Richard and Ari –

I couldn't agree more about researching ISE media and its impact on learning. There is so much we don't know about ISE learning and media whether it is mobile, broadcast, web, game and other media content. Part of the challenge for media producers is valuing research and making it a part of our practice and workflow. We often focus more on the story making and narrative, forgetting the learning opportunity. Research questions need to be a part of the production design from the beginning.

**Re: Practice and Research in ISE media**

*By Sue Ellen McCann – Friday, January 18, 2013, 3:23 PM*

An additional challenge is understanding the language of learning research and phrasing a research question. Perhaps we need a research primer for media producers?

**Re: Practice and Research in ISE media**

*By Ari Epstein – Friday, January 18, 2013 4:48 PM*

Yes, something like that would be very handy!

**Re: Practice and Research in ISE media**

*By Jamie Bell – Tuesday, January 22, 2013 4:36 PM*

Hello again All, and thank you for the thoughtful contributions to this "practice and research in ISE media" discussion. Clearly there are several themes that are ripe for further exploration, and as we wrap up the forum this morning, CAISE will be looking at ways to provide more opportunities for digging deeper and inviting new points of view. Among the areas that seem to have potential are:

- What really strikes me as I read posts from the media folks on all of these research and practice in ISE threads is the paucity of mention of actual research studies that folks can point to. We need more studies like the one that Ari described seeing



on the iPad app at the CFA presentation. Please post any that you know of!!

- As Richard put it, where is all of the work done on non "face to face" interactions?
- Any of the above would make the primer that Sue Ellen suggested might be necessary more relevant to ISE media practitioners.

Thanks again everyone, and looking forward to more

### **What's the difference between evaluation and research?**

*By Kirsten Ellenbogen – Thursday, January 17, 2013, 2:11 PM*

Evaluation, and in particular, the differences and similarities between evaluation and research, are coming up in the discussions. People often ask what the difference is and whether there should be a difference. Or as Lisa P. asked, should evaluation be like research? Answers to this question often involve clarifying that there are different kinds of research, and some kinds look very much like evaluation. But what do you think?

### **Re: What's the difference between evaluation and research?**

*by Sue Ellen McCann - Thursday, January 17, 2013, 03:50 PM*

Kirsten, this is a great question. The line between research and evaluation is very blurred not only for practitioners but for evaluators and researcher as well. Given my limited expertise in both areas, my recent experience was to let the evaluator and researcher talk through their understanding of their separate roles. This worked well for me, but I can imagine it might not in all situations.

### **Re: What's the difference between evaluation and research?**

*By Cathy Maris- Thursday, January 17, 2013, 4:26 PM*

I agree that the lines can be blurry. However, the basic distinction I use to distinguish between the two is that evaluation focuses on understanding how well a specific program or initiative is working or has worked, whereas research answers broader questions that can be generalized to the field as a whole.

### **Re: What's the difference between evaluation and research?**

*by Kirsten Ellenbogen - Friday, January 18, 2013, 09:56 AM*

I agree Cathy - I usually define the differences just as you have. I like the definition from NSF's Cyberlearning RFP too. But I think that definition of research (below) is one that some researchers disagree with.

"Note that research is defined here differently from evaluation. While evaluation efforts typically judge the quality of a particular implementation and the reasons for its outcomes, the research component of Cyberlearning projects must contribute new understandings that endure beyond the implementation being proposed and beyond the particular technology being used. Research questions should be articulated as "why," "to what extent," "how", and/or "under what circumstances" questions. Proposals should make clear the fundamental research question(s) being addressed and the data collection and analysis plans that support that."

### **Re: What's the difference between evaluation and research?**

*by Lisa Peterson - Thursday, January 17, 2013, 07:31 PM*

This is a wonderful thread! Thank you! Our team was discussing this topic during our morning meeting. Here is what we are currently wondering...If an ISE intervention is proposed based on the hypothesis that it will have a certain outcome, and then the project is evaluated to ascertain whether or not it achieved that outcome, then should the summative evaluation only focus on that project, or should it try to inform a larger audience based on the extent to which the hypothesis was confirmed? If the summative evaluation was able to do this in a meaningful way, would that be useful in practice?

**Re: What's the difference between evaluation and research?**

*by Maija Sedzielarz - Thursday, January 17, 2013, 08:06 PM*

Speaking as a practitioner, I am used to reviewing evaluations or research report to glean the useful insights that may apply to my own work. I have requested several evaluation reports regarding programs that are related, but not identical to my project, that provide new ideas and pathways to pursue. So access to summative evaluations can be very useful.

**Re: What's the difference between evaluation and research?**

*by Kirsten Ellenbogen - Friday, January 18, 2013, 09:51 AM*

Can you give a specific example Lisa? I think what you are describing is an example of when evaluation can take on challenges that will inform the broader field. It's hard to see a down side to an evaluation being designed to inform the broader field assuming that some other critical element isn't neglected in order to do that.

It is likely that doing so would improve the project's intellectual merit, so if it is for a proposal, that could be quite positive.

When we have evaluation that is able to reach more broadly to build evidence for the field, at the Science Museum of Minnesota we often call it "research-y" evaluation. Yes, I think that's the technical term. : )

For us it has been a way of getting in a little bit of learning research that is important to the strategic goals of the museum, and informative to the field, even though it is a project that does not have the funding or structure to support a full learning research study. (Which is not to say that learning research is more expensive than evaluation. But doing both evaluation and learning research on a project is often more expensive than just honing in on one.)

I'd love to hear more about what you were working on where the extent to which the hypothesis was confirmed was important for the broader field - sounds interesting!

**Re: What's the difference between evaluation and research?**

*by Trevor Nesbit - Friday, January 18, 2013, 11:51 AM*

Kirsten - research-y evaluation - "yikes!" a new term for our controlled vocabulary! ;)

This whole conversation about the difference between evaluation and research has practical implications on our work at CAISE to re-build informalscience.org and the informal commons digital library.

When folks are looking for resources to provide support or evidence for a project or proposal...

Do you tend to search more for research materials (peer-reviewed articles, dissertations, theses, subjects) or evaluation materials (reports, instruments, design, methods)?

Is it helpful view research and evaluation resources together or separately?

**Re: What's the difference between evaluation and research?**

*by Emi Yoshimura - Friday, January 18, 2013, 03:01 PM*

I find it helpful to view research and evaluation resources together. I'm often working with project teams comprised of folks with diverse backgrounds, areas of expertise, etc., who respond to different types of information. Looking at both research and evaluation resources can give me varied and complimentary ways of responding to a question (I appreciate the mix of style, content type, language. . . ).

(I'd also add that the term "research-y evaluation" feels very true to me in terms of describing much of my work!)

**Re: What's the difference between evaluation and research?**

*by Jamie Bell - Tuesday, January 22, 2013, 04:27 PM*

Hello again All, and thank you for the thoughtful contributions to this "what is the difference between evaluation and research?" discussion. Clearly there are several themes that are ripe for further exploration, and as we wrap up the forum this morning, CAISE will be looking at ways to provide more opportunities for digging deeper and inviting new points of view. Among the areas that seem to have potential are:

- Sue Ellen's surprising statement that she has found that some researchers and evaluators struggle with blurry lines also. Our NSF program officers sent the attached article which sheds some light on the distinction
- The idea that there is a nuanced, fine line between testing hypotheses about strategies or "interventions" that will have particular outcomes based on previous research, or even social science theory, vs testing hypotheses from a gut feeling based on previous practice. Wheres the former might be more purely research, the latter might more appropriately be termed formative evaluation.
- Maija's use of research in early stages of project development harkens to the "decision making" discussion thread, where Erik Thogerson describes the same strategy in his practice.
- Similarly, does the "research-y evaluation" referred to in this thread include the "quick and dirty" type studies Erik described as often useful for practitioners.
- Emi's observation that looking at relevant evaluation and research in concert, again at the early stages of

project development, can inform practice in different ways.

### **Day 3: Do we need a field-wide research agenda?**

*by Kevin Crowley - Friday, January 18, 2013, 09:57 AM*

Thanks for the discussions so far. One of the questions that was actively discussed at the last AISL PI meeting, and that we've heard in lots of other settings since then, was whether we need a coordinated research agenda for Informal Science Learning.

What do you think? Would a shared and public research agenda be helpful? Are there any downsides to a coordinated approach?

What would the most important research questions be from your point of view?

How would an agenda help connect practice and research?

### **Re: Day 3: Do we need a field-wide research agenda?**

*by Mary Nucci - Friday, January 18, 2013, 10:41 AM*

As a former practitioner who now works as a researcher, the idea of a coordinated agenda is extremely valuable. From the researcher point of view, the disciplines that could and should contribute are varied and not always coordinated. Questions to be asked and the methodologies to be used through a coordinated agenda would be richer if we had a group of researchers/practitioners together. I am dealing with this right now in research on giant screen, where I recognize that good, thorough, generalizable research needs to be interdisciplinary.

And going back to the earlier discussion on evaluation vs. research, some of the unanswered questions for these concerns may overlap--a coordinated agenda would support addressing both of these at once.

Of course, some researchers may feel that a coordinated agenda takes away some of the cachet of doing research. That will never change. But a coordinated research agenda that allows researchers to publish their own data while part of a larger effort may alleviate that.

### **Re: Day 3: Do we need a field-wide research agenda?**

*by Trevor Nesbit - Friday, January 18, 2013, 11:21 AM*

Mary, your post struck a chord with me, especially your comment about publishing and the cachet of doing research.

Your comment "allows researchers to publish their own data while part of a larger effort may alleviate" makes a connection here for me to open access to research.

Publishing is a large part of the cachet of doing research. The research is held then by the publishers who restrict access to it to large institutions who can afford subscriptions. Of course, it is well known that this is particularly problematic for our field.

If the field were to focus attention on a coordinated research agenda - that would offer possibilities of status and reward for tackling grand challenges (or cachet, so to speak) - could that be part of what spurs an open access publishing model in venues that are accessible by our field (like [informal.science.org](http://informal.science.org) or [isevidence.wiki.org](http://isevidence.wiki.org)?)

The motivation to publish open access is greater, because a coordinated agenda offers rewards, only if the ISE field can widely access and build upon the results of research and applied research in the field.

**Re: Day 3: Do we need a field-wide research agenda?**

*by Bruce Lewenstein - Friday, January 18, 2013, 02:23 PM*

It seems to me there are three issues here:

- \* Research agenda
- \* Data from that research
- \* Access to results from the research

On the agenda question, I tend to the "let 1000 flowers bloom" school of thought -- part of the joy of this field is the different perspectives that people with different research goals have.

On the data question, I agree with Trevor that moving toward some kind of public repository or open-access data site (tied to "big data," in the current scientific argot) makes sense.

But really I want to comment on the third issue, access to the results. As noted in several threads, one of the big challenges for the practice/research link is that practitioners often don't have access to the libraries and journals where research is published. At the same time, for researchers in academe, there is little professional benefit to publishing in newsletters or grey-literature reports. So how can we overcome these barriers?

One way to improve access is through sites like [informal.science.org](http://informal.science.org), where grey-literature can be shared more widely.

Another approach is the ISE Evidence wiki created by CAISE. I helped create an entry there on public engagement, in which I deliberately posted in a public place a literature review of the sort I might have normally published in a scholarly journal. (I hope I kept it shorter and more comprehensible, but that's another issue. One advantage of the wiki is that other people can help improve it.)

Now, I have tenure, so I have the luxury of not needing to build my CV. But in my annual review with my department chair, I (again deliberately) included the wiki work. And that led my chair to include in the formal review letter that gets passed up to the dean the idea that publishing a public wiki is a form of scholarship to be praised. That's a culture change within academe that has to happen, and those of us in position to affect that change need to take explicit actions to push things along. Maybe now when one of my younger academic colleagues wants to publish a wiki, or a blog, or any other form of research report that is more accessible, the powers-that-be will be more willing to give it credit.

**Re: Day 3: Do we need a field-wide research agenda?**

*by Rachel Hellenga - Friday, January 18, 2013, 03:17 PM*

I agree with Bruce that "access to the results" is a big issue, and finding incentives to increase dissemination would be an excellent line of inquiry. There is a huge gulf between the research-driven work at the pinnacle of the field and the day-to-day practice of organizations all over the country.

At one end of the spectrum I see the SciGirls television show incorporating elements of storytelling and relationship development in a thoughtful and deliberate way to help girls form an identity engineering-capable, and at the other end of the spectrum I get a YMCA summer camp brochure in the mail offering a choice between

--"Twinkle Toes Princess Camp" (princesses age 5-8 enter a world of make believe, read stories, make crafts such as fairy dust and get a tiara for every girl)

--"Science Exploration" camp (children 6-12 will learn about rockets, space, and exploring the amazing scientific world around us--join us if you want to be your own mad scientist)

Is nothing trickling down, even to organizations as well-established as the YMCA? How about building simple circuits to light up those tiaras with LED's? And can we write descriptions of science camps that are a little more girl-friendly?

I see the same issues across many organizations in my area of interest too: some interactive science centers and children's museums are employing highly nuanced approaches to exhibit design based on advances in learning research while others are still placing peep holes too high to reach from a wheel chair or hyphenating a long word and splitting it across two lines in an exhibit label.

Perhaps a realignment of the budgets we allocate toward research vs. dissemination is in order. Or do we need more research into effective ways to disseminate results of existing research?

**Re: Day 3: Do we need a field-wide research agenda?**

*by Erika Shugart - Friday, January 18, 2013, 03:49 PM*

Trevor,

To build off of your post on the need for researches to publish, I think a huge draw back in the ISE field is that practitioners don't have many avenues for peer-reviewed publication unless they are teamed with a researcher. I am interested in exploring what a practitioner journal would look like - peer reviewed case studies perhaps?

**Re: Day 3: Do we need a field-wide research agenda?**

*by Chris Myers - Friday, January 18, 2013, 12:12 PM*



Without going into what the most important research questions would be, I would recommend that at least one of the unifying themes, perhaps the guiding theme, of a common ISL research agenda should be to serve the public good. By this I mean facilitating the broadest possible participation in the shared creation and application of knowledge to improve healthier relations with each other and with the ecosystems on which we depend.

Unlike many other fields of study, much of the ISL domain lies with community-focused institutions that carry a strong public mission. Explicitly linking ISL research to the public good (at least in aggregate) would help ensure research connects with ISE institutions while opening important research questions, particularly at the community level, that the ISE field is particularly well positioned to address.

Re: Day 3: Do we need a field-wide research agenda?

by Margaret Evans - Friday, January 18, 2013, 01:04 PM

To have a coordinated RESEARCH agenda for a field as broad and diverse as Informal Science Learning seems to be a task for Sisyphus. Optimal research agendas draw on coherent theories that generate clear hypotheses, which can then be assessed. We do not have that. Even a clear goal, such as improving the public good, leads to a myriad interpretations of the public good, none of which is sufficiently constrained to yield good testable research questions.

Perhaps our aim should be more modest. We could construe a series of overlapping research agendas, each of which addresses a distinct and critical issue for the field (and all of which address the public good). Ideally they should be based on the theoretical underpinnings of our field. Here is a problem -we do not have many coherent theories. We do have the beginnings of a "practice" approach in NRCs Learning Science in Informal Environments and we should not ignore that volume. Each strand of informal learning (p. 4) offers a (relatively) clear goal, subserved by micro-level theories, which could contribute to a more distributed research agenda. Current theories of motivation, cognition, affordances, embodiment, distributed learning, etc., all play distinct and different roles in each of those strands. For ISE the trick is to consider how these existing theories differentially contribute to the diverse learning experiences offered by ISE, from field trips to structured and unstructured museum experiences, to citizen science, to after-school learning.

A distributed research agenda, one that reflects the diversity and strengths of the field of informal learning, with distinct sub-goals, might be achievable. Articulating that agenda requires input from practitioners and researchers, all of whom have experience in the field.

**Re: Day 3: Do we need a field-wide research agenda?**

by Richard Hudson - Friday, January 18, 2013, 01:06 PM

Kevin - In an age of limited resources, I think this could be a very prudent strategy.

At ASTC in October Kirsten E. and I had an insightful discussion of science identity, which is an important question we consider in the SciGirls project. (See <http://informalscience.org/evaluation/show/297> for an evaluation of changes in self-efficacy in engineering activities as a result of viewing the show.)

Science identity would be a reasonable and high priority question for us all to explore.

And at the same time, we need a more inclusive sense of what "field-wide" means. As I've continued to explore this question of science identity, I've been enjoying John Falk's book "Identity and the Museum Visitor Experience."

As he follows his subjects visits to exhibits, I realize that I could replace "museum exhibit" with "episode of NOVA" in this book and the arguments he makes would apply equally, or at least raise fascinating new questions.

**Re: Day 3: Do we need a field-wide research agenda?**

*by Jamie Bell - Friday, January 18, 2013, 02:02 PM*

All, a couple of resources from past and ongoing projects that have attempted to address research agenda issue, Intersections, which is based at the University of Washington, and In Principle In Practice, which was conducted out of the Institute for Learning Innovation and resulted in a book and white papers:

<http://informalscience.org/project/show/1747>

<http://www.h-net.org/reviews/showrev.php?id=23487>

Sandy Toro shared more about Intersections today in the "Welcome" discussion. Does anyone know about other attempts where useful lessons have been learned?

**Re: Day 3: Do we need a field-wide research agenda?**

*by Rachel Hellenga - Friday, January 18, 2013, 03:34 PM*

In response to Jamie's question about resources on cross-cutting research, this one demonstrates the value of a coordinated approach across many organizations within one discipline (exhibitions). Happens to be a link on the CAISE site: <http://caise.insci.org/news/96/51/Paying-More-Attention-to-Paying-Attention/d,resources-page-item-detail>

It's a summary of Beverly Serrell's tracking and timing research across many different museum exhibitions, and just the sort of thing that can inform future practice. Here's a pithy quote from the doc: "Given the high variability of the exhibitions studied, the patterns that have emerged are robust. Three overarching findings from the database are: the relatively brief duration of museum exhibition visits (an average of 20 minutes), the tendency for smaller exhibitions to be explored more fully by visitors, and a trend for science museums to have underused exhibitions."

Sometimes research is most helpful when it contradicts one's intuition. It's counter-intuitive to plan a complete exhibition around a concept simple enough to be conveyed in under 20 minutes. And yet, no one would try to pack 20 separate complex concepts into a 20-minute classroom activity or television program. The 20-minute rule reminds us to plan a set of experiences which all reinforce each other instead of going off in a dozen tangents. The fact that

Beverly's research cut across so many different types and sizes of exhibitions makes it useful in generating rules of thumb.

**Re: Day 3: Do we need a field-wide research agenda?**

*by Jane Acton - Sunday, January 20, 2013, 07:08 AM*

Great stuff Rachel!

So what happens next to all these discussions? How do we stay connected from over the pond?

**Re: Day 3: Do we need a field-wide research agenda?**

*by Cathy Maris - Friday, January 18, 2013, 02:35 PM*

I appreciate Richard's suggestion of taking an inclusive approach to defining the "field." Ideally, the boundaries of the field would be fluid and defined in relation to the specific research questions at hand. I also agree with Mary that interdisciplinary research is vital.

Some questions are ones that could be addressed in a variety of informal learning settings, including those that do not focus exclusively on science. E.g., In what ways do parents or primary caregivers shape children's identities as lifelong and lifewide learners and what can informal learning institutions do to enhance parents' impact in this arena? While such a question relates to strand 6 of Learning Science in Informal Settings, it is not content-specific and could apply to learning in art museums, history museums, and a range of other settings.

Other questions might be more tightly science-based, such as "Do children who learn science in natural, outdoor environments develop a greater interest in science or a deeper understanding of scientific concepts than children who experience hands-on science learning in indoor settings?" I would argue that research in formal learning settings could bear some relevance to such questions.

I'm not sure how "field-wide research agenda" is being defined, but I do think it would be helpful to develop a common understanding of what some of the most critical unanswered questions are in the field. I also feel that it would be important to disseminate this information widely, especially if it's a priority to collaborate and "pollinate" across disciplines.

**Re: Day 3: Do we need a field-wide research agenda?**

*by John Jacobsen - Sunday, January 20, 2013, 12:16 PM*

The route to a 'field wide research agenda' must start with the long, hard work of building the research infrastructure.

While I agree with Bruce's triad, I humbly suggest flipping the order, as I see that we have a lot of work to do on the research infrastructure before we can afford the luxury of shared research agendas: What reliable, shared data do we already have that might be used as evidence of outcomes, and how do we come to agreement on which of these indicators count as evidence? And, How can we fully populate the existing research portals with seamless searches of both qualitative and quantitative data? Once these two are in place -- and thank you, ASTC, ACM, IMLS, CAISE, UPCLOSE and VSA for your efforts on these two foundational pieces, we might

have a robust research base, and transparent access to aggregated data. Then we can explore using research agendas to guide our explorations.

A logical rejoinder is: "Don't we need the agenda first to guide the formation of this infrastructure?" Perhaps, but this is also tricky question with resolution either years away or not possible/desirable. Research agendas change, while the infrastructure is more permanent. Our field is building this infrastructure, but we still have a long way to go.

But the real issue with a shared research agenda is that we need a diversity of agendas within the ISE field. From the previous comments on this thread, I read Mary needs a research agenda to help understand STEM learning outcomes in giant screen films. Rachel, Richard and Chris need an agenda to research methods of altering behaviors and attitudes in girls. Our team needs a research agenda to study the impact of ISE museums on their communities. STEM learning is a part of this, but so are personal identity, social capital, workforce development, economic impact and other public and private goods produced by the ISE field. The diversity of research agendas may be as huge as the diversity of desired and received outcomes.

Yet, we are communities of practice (museums, broadcast, media, etc) that will benefit from shared research agendas that focus attention toward areas of needed innovation. Perhaps we need many research agendas -- I'll adapt Bruce's phrase: "Let a 1000 agendas bloom." However, what we do need to share at the widest definition of the 'ISE field' are 1) data definitions, 2) a common menu of impact and performance indicators based on that data and/or accepted collection methodologies, and 3) data access portals.

The goal of research agendas for each sector may be important, if difficult and a few years away. Now, all of us need to be part of moving forward on the infrastructure for research, and that means work in the trenches establishing data definitions, a wide selection of indicators and shared collection and dissemination methods.

**Re: Day 3: Do we need a field-wide research agenda?**

*by Jamie Bell - Tuesday, January 22, 2013, 10:59 AM*

Hello again All and thanks for the thoughtful contributions to this "do we need an (ISE)research agenda" discussion. Clearly there are several themes that are ripe for further exploration, and as we wrap up the forum this morning, CAISE will be looking at ways to provide more opportunities for digging deeper and inviting new points of view. Among the areas that seem to have potential are:

- Disentangling the need for agenda(s) from the equally and perhaps more urgent needs for data (and collection) and access
- Motivating researchers to contribute to "grey" literature and changing the culture of academic institutions (or at least centers/departments) to value same.
- Can we create practitioner journals, with peer-reviewed case studies, e.g.?
- Are the LSIE 6 learning strands a starting place for developing a field-wide agenda? Or are there other field-wide critical, unanswered, generalizable questions? Should the "public good" be our overarching organizing principle?
- How can we get a better handle on the huge gaps we see throughout the field where the existing good research has not "trickled down" to practice, even in institutions

where we would expect basic awareness? Do we need a landscape study of "bad" or "unaware" ISE practice?

- Rachel's "20-minute rule" with regard to the necessary and/or available time to get any (content) message across in informal settings- what is the parallel in broadcast media, gaming, and other ISE sectors?
- John's observation that in ISE the process has begun by flipping Bruce's list upside down, i.e. we, CAISE and others are building the infrastructure first. How, or do we even attempt to reconcile the diversity of agendas across our field, as revealed by this discussion?
- Can we all agree that we need data definitions, a wide selection of indicators and shared collections and dissemination methods? (and be careful about the line between research and evaluation here)

Thank you all again, and looking forward to more.

**Broader Impacts: STEM Scientists working with ISE**

*by Kevin Crowley - Wednesday, January 16, 2013, 03:23 PM*

Great discussion, so far. Although we had launched this conversation thinking particularly about bringing practice together with educational and learning research, we've heard some great examples of bringing STEM researchers into the mix as content experts, as part of citizen science projects, and as part of a two-way communication between science and the public.

Let's launch a new strand of conversation for those who want to continue the discussion of collaboration and exchange between STEM researchers and informal STEM practitioners.

I'm particularly interested to hear more from those of you who have been able to establish deeper, long term partnerships that have really changed how you think about practice and, perhaps, how the scientists think about learning and maybe even their science.

**Re: Broader Impacts: STEM Scientists working with ISE**

*by Ben Wiehe - Wednesday, January 16, 2013, 04:20 PM*

On STEM practitioner learning/thinking:

Two highlights from Science Festival Alliance evaluation so far:

1. A majority (65%) of STEM practitioners who exhibited and presented at SFA science festivals reported increased confidence interacting with public audiences as a result.
2. While about half of festival partners [including STEM practitioners] came from organizations with year-round K-12 ISE activities, a far greater percentage (87%) planned to contribute to local ISE efforts after their festival.  
(More can be found here:<http://sciencefestivals.org/news/140.html>)

So we know from the festivals that ISE can get draw scientists out of the field and off of the bench, and when this happens they get practice and confidence which fires them up to get involved year-round.

One more piece:

If I remember the science cafe evaluations from NOVA correctly, 38% of scientists found that speaking at a cafe changed the way they think about their work. ([www.sciencecafes.org](http://www.sciencecafes.org))

What this doesn't touch is changes to how scientists think about their work as a result of ISE interactions. I know this is possible anecdotally...but don't have hard evidence for how often, contributing factors, etc.

**Re: Broader Impacts: STEM Scientists working with ISE**

*by martin weiss - Wednesday, January 16, 2013, 04:30 PM*

I am Senior Scientist at the New York Hall of Science and have developed a number of STEM projects over the years. However, the one I'd like to discuss is a project that I did with a Learning Researcher, Margaret Evans of University of Michigan who is a cognitive psychologist. She and I developed a research and development project about how children come to understand evolution or natural selection. Some of the difficulties we encountered centered on timelines and language. Every science has its own terminology (jargon ?) and

research and project development have very different time scales. Getting used to these was a learning curve for all involved especially the design and development team. We worked in a very iterative manner often stopping some aspects of design and development waiting for some results of research that were ongoing or that had to be added to the research schedule. It is not clear exactly what sort of information you would like to have so I suggest specific questions would be helpful. I had worked with scientists (and I am a scientist) but these were content specialists whose role was to offer suggestions of interpretation of the science of the project and they did not play an integral role in the development of the project nor were they doing active research in the service of the development of the project. What emerged from our collaboration was a project that matched what we said we were going to accomplish (our hypothesis) that we could build an intervention to children's naive or appropriate developmental beliefs about evolution. The process of testing our hypothesis was interesting as my background is in bench science and although I have participated in many evaluation studies this was quite different and I gained insight into how to do these studies and especially the difficulties of doing them in an informal science settings.

A problem I see, unless you are working closely on a single project as I did, is how to get information about learning research that is relevant to the project and how to interpret information that you are not expert in. I wonder if it would be possible to add a learning researcher who would be on staff to the development team as we have evaluators who serve as the voice of the visitor on our development teams. It is not easy to dive into learning research literature in a field one is not familiar with. As Eric mentioned earlier we have learning researchers on staff but they are working their own projects. Some thinking about adding learning researchers to staff, as some museums have scientists, might be advisable but possible? Are there other models that we can hear about?

**Re: Broader Impacts: STEM Scientists working with ISE**

*by Amy Rager - Thursday, January 17, 2013, 10:17 AM*

Martin- thanks for the interesting food for thought. In our case, in Minnesota, being in cooperative extension, the need of finding someone who can read, understand and help synthesize information is what most extension (agents) educators do! Is there a way that Extension can be more engaged and helpful with projects?

This Journal of Extension article discusses the pros and cons of such a venture

<http://www.joe.org/joe/1972spring/1972-1-a5.pdf>

**Re: Broader Impacts: STEM Scientists working with ISE**

*by Jamie Bell - Thursday, January 17, 2013, 10:40 AM*

Thank you, Kevin, for starting this discussion, and to Ben, Martin and Amy for providing models, examples, resources and a challenging issue, around the need for access to and understanding of the expertise of each others' disciplines at key points in project development, and how to achieve that.

CAISE is using "Broader Impacts" as a catch-all phrase for the initiative we are developing to support STEM Principal Investigators and their Directors of Education, Communication and Outreach in working with ISE institutions, programs, projects and people. Some conduct the work themselves using ISE strategies and methodologies and are looking for tools and resources and some are looking to collaborate or partner with professionals in our field.

We have had some initial success with the NSF Centers for Chemical Innovation and the Material Research Science and Engineering Centers in providing evaluation support, identifying ISE partners and supplemental proposal development. We're now working to extend these models to other centers, large facilities, etc.

In the science center world, projects like Portal to the Public (<http://www.pacificsciencecenter.org/Portal-to-the-Public/portal>) and NISENet (<http://www.nisenet.org/community/find-a-scientist>) have been successful in providing professional development and matchmaking in these realms. We would love to know about examples from other ISE sectors (media, gaming, e.g.).

There are also many citizen science projects that come under this banner for us, when their primary objectives are education/learning, and some interesting ones were mentioned in the "Welcome" discussion.....

**Re: Broader Impacts: STEM Scientists working with ISE**

*by Sarah Chicone - Friday, January 18, 2013, 12:24 PM*

And I think it is important to note that we should never underestimate the reach and impact of the projects like Martin describes here.

The outcomes of your project were very interesting to me and my former institution, The Paleontological Research Institution, as we often targeted evolutionary concepts to children. I also use your project and the Charlie and Kiwi's Evolutionary Adventure exhibition as an example in the Exhibition Strategies course I teach for Johns Hopkins.

**Re: Broader Impacts: STEM Scientists working with ISE**

*by Kelly Sturner - Thursday, January 17, 2013, 03:07 PM*

At my institution we coordinate a teacher collaboration program that matches K-12 math and science teachers with scientists and mathematicians. We make no requirements about how these collaborations manifest, but we suggest discussing current issues in science, math, and education, sharing of resources, collaborating on curriculum, and classroom visits as appropriate activities.

This program has had only a few successes, and no long-term successes to date. I would say that the main factor that leads to success is when the participants are in the same geographic location and can interact face-to-face. This seems like a no-brainer, but it has proven difficult to make such matches when the reach is national. We thought we might have success by encouraging communication through technology, but it is still not a favored or comfortable medium for many. Perhaps this will change in the coming years.

I often hear of scientists feeling a renewed passion and interest for their own work after sharing it with others through outreach. But one positive reaction that I was surprised by once that I think was particularly interesting was when a scientist told me about how insightful and useful she found some of the questions she was asked by 4th graders. I've heard a similar sentiment expressed in some of the teacher-scientist partnership literature. Sometimes sharing what you



do with someone that knows little about it -- even as little as a 4th grader -- allows you to get outside of the box, away from your own assumptions, and see what you do in a new light.

**Re: Broader Impacts: STEM Scientists working with ISE**

*by Becki Kipling - Friday, January 18, 2013, 11:13 AM*

I want to echo Kelly' comment about "proximity" of potential professional collaborators across disciplines - this has been the key to the success of Living Lab ([www.livinglab.org](http://www.livinglab.org)) in sustaining relationships - resulting in novel, actionable ideas for both STEM researchers in the program and museum staff who interface with them. Living Lab fosters intense, sustained collaboration between museum educators and academic scientists who've traditionally studied children's learning in the lab setting (not ISE researchers or evaluators, but cognitive scientists, developmental psychologists, social psychologists, neuroscientists, etc.). These scientists conduct research in the children's exhibitions (recruiting participants from the visitor pool) and have daily, on-going contact with early childhood ISE practitioners who are interested in applying the findings to their work with caregivers/families. Scientists learn to break their research down for visiting families, and how to communicate with varied audiences (museum-recruited participants represent a greater diversity - as far as their understanding of/exposure to research - compared to families that might go onto campus to participate in a study).

Just being physically in the same room on a regular basis inspires practitioners and scientists to make connections between their "two worlds." And, it goes both ways: the practitioners have a chance to talk to scientists everyday, and (maybe even more impactful) they have a front seat to the science as it happens, observing child development research as it takes place, observing the reactions of caregivers as they watch their own children in experiments, and observing caregivers conversations with researchers about how they plan to decipher children's responses in an experiment. All of this provides amazing insight into how both parents and scientists view and understand the children we work with in the museum every day.

Educators also get a crash course in scientists' methods (not just results) and sometimes tap elements of those methods as new openings for working with/engaging children and parents during educational interactions in the rest of the exhibition. Some educators have even taken to exploring a child's existing conceptions on a topic we present in facilitated activities, by using questioning strategies or other techniques they see researchers use to peek into a child's processing/current understanding during their studies. Using this kind of strategy, educators can get a "preview" of children's existing understanding and personalize their interaction with that child to build on their previous experiences.

Scientists who've had a sustained relationship with the program indicate that their research questions have been influenced by the conversations they have with both parents and museum staff – they've been inspired to take up new questions for study when caregivers (or staff) ask questions that "stump" them. Methods have been influenced too – conducting experiments in an exciting, real-world setting (rather than in a lab) means scientists have to get creative with their approach, and try some things they might never have considered if they were working entirely in a campus lab. We've

had a lot of "accidental awesome" by inviting scientists in to work with our visitors on a daily basis.

**Re: Broader Impacts: STEM Scientists working with ISE**

*by Jamie Bell - Friday, January 18, 2013, 12:35 PM*

Such an interesting model, Becki, thanks. It might be useful for others here to know about the genesis of the project- was it originally initiated by researchers looking for a 'lab' or a venue to address their broader impacts needs, or did the Museum of Science initiate it to have access to research and researchers that could inform a Playspace-type area?

**Re: Broader Impacts: STEM Scientists working with ISE**

*by Becki Kipling - Friday, January 18, 2013, 02:10 PM*

Jamie - it was a case of "right place, right time" on both sides. The museum was interested in exploring how to share current child development science with visiting caregivers (~51% of our children's exhibition audience are, after all, adults) and wanted to do it in a way that didn't focus on "results", but on the methods scientists use to find out. We imagined it in some ways as "consumer education" related to the marketing new parents receive and wanted to unpack the headlines/product marketing to help parents decipher claims about, for example, "educational toys" (e.g., this was also at the time when Baby Einstein burst on the scene). At about the same time, we got cold calls (from both MIT and Harvard labs) wondering if we'd consider letting them come in and recruit families/run studies at the museum - basically looking for a participant recruitment venue (at first). Neither we or they knew exactly how those interests could come coherently together, so we took a leap and invited them to come in to help us figure out what it could be like. The "broader impacts" aspect became a justification/motivation for both us and our collaborators quite early on in the effort, but was not the original impetus.

**Re: Broader Impacts: STEM Scientists working with ISE**

*by Ari Epstein - Friday, January 18, 2013, 12:41 PM*

Nice! For sure it helps that the STEM researchers involved are essentially studying your audience; very nice connection. Do you think something similar might work for other STEM fields?

**Re: Broader Impacts: STEM Scientists working with ISE**

*by Becki Kipling - Friday, January 18, 2013, 02:26 PM*

Ari, your question has great timing. This fall MOS will open a new major exhibition (the Hall of Human Life), and a key component will be a Living Lab site within that exhibition which will invite human biology researchers (geneticists, anthropologists, others) into the museum to work with visitors in a similar model (scientists will recruit study participants and educate visitors about their on-going work).

It is unclear whether this move into new STEM areas will result in the

same, rich interplay between ISE practitioners and these researchers (the connection between research and practice is not as clear/direct), but we are hopeful. And we'll be monitoring it closely to assess 1) whether this is as effective at engaging visitors/scientists/educators as the original child development focused initiative, and 2) what the "side effects" (impacts) might be for both the scientists who get involved and the educators who will interface with them in the new program. We imagine these might be quite different than the "side effects" we've seen in the children's exhibition model that I described above (and is now expanding to other science centers as well as children's museums).

**Re: Broader Impacts: STEM Scientists working with ISE**

*by Ari Epstein - Friday, January 18, 2013, 04:49 PM*

Neat! I'd love to hear more about this offline at some point.

**Re: Broader Impacts: STEM Scientists working with ISE**

*by Anna Lindgren-Streicher - Thursday, January 17, 2013, 05:12 PM*

Hopping in to talk about a program for which I serve as an evaluator that I mentioned in the Welcome thread - the Living Lab (<http://livinglab.org/>). It started at the Museum of Science, Boston and is now expanding out to other sites thanks to NSF funding. In addition to giving academic researchers a place outside of their lab to conduct studies, scientists are trained to serve as educators about their own work, so their time at the museum hits both their research needs and the "broader impacts" Kevin brought up.

In our evaluation, we've seen that museum practitioners have a greater confidence and likelihood to interpret the science they've been exposed to through the partnership. We've got preliminary evidence that scientists have increased self-efficacy related to science communication. We've heard anecdotal feedback from some of the scientists that have been involved in the program for multiple years that the conversations with and questions from museum educators and visitors have led them to think of new areas of inquiry within their own practice, as well as clarify for them the relevance or importance of their own work. (We're working on collecting more rigorous data on that last point!)

**Re: Broader Impacts: STEM Scientists working with ISE**

*by Jamie Bell - Thursday, January 17, 2013, 11:03 PM*

Amy, thanks for adding some of your own anecdotal observations to Ben's about what seems to be transformational for scientists involved in these communication activities. Martin's description of his own process as a bench scientist coming to understand another discipline is also interesting here. I wonder if Portal to the Public, NISENet or AAAS have data that would shed light on what happens for scientists in what types of educational/communication/outreach situations.

Anna, Living Labs has been instructive for CAISE, beginning with when Becki Kipling presented this unique approach to professional development at our PD convening last February. As was hearing Lisa Feigensen from Johns Hopkins, one of the researchers from your project speak about how her experiences as an academic working in/with a science center was informing her research. Maybe there's something about the role

sharing/exchange (researcher as educator) that Suzanne Perrin wrote about in the "Welcome" thread that makes these collaborations powerful and authentic.

**Re: Broader Impacts: STEM Scientists working with ISE**

*by Elizabeth O'Connell - Friday, January 18, 2013, 08:02 PM*

FrontierScientists works hard to keep long term relationships and take advantage of newer forms of media. The power and the reach of the FS website has changed our perspective of how to reach people.

In a way, we are the disruptive technology, to borrow a phrase from Harvard's Clayton Christensen, because we are not an established school or a science museum. But we are regular, relevant, agile and willing be there for the scientists.

The scientists see that. One comment from a scientist was "I can get my paper published by a prestigious periodical but it's a flash. Whereas if I get a video on FS, it's there for a while and easy and free to access."

The public persona of science and the scientist should be appealing to the public if informal science education is the goal. Sometimes wrapping the message in too much academia or forced to a timeline that is the trailing edge of the leading edge will lose the audience.

It's a tricky business, you have to work using well established basics but embrace and allow disruptive technologies.

**Re: Broader Impacts: STEM Scientists working with ISE**

*by Jamie Bell - Tuesday, January 22, 2013, 10:18 AM*

Hello again All and thanks for the thoughtful contributions to this "broader impacts" discussion. This was a thread that we hadn't anticipated would come up here, but since it was relevant to another CAISE initiative, we made this place for it.

Clearly there are several themes that are ripe for further exploration, and as we wrap up the forum this morning, CAISE will be looking at ways to provide more opportunities for digging deeper and inviting new points of view. Among the areas that seem to have potential are:

- What are other examples where the needs of scientists and informal science education institutions, projects and people come together synergistically as they have in the Museum of Science's Living Labs project? Opportunities to make (STEM) research methodology transparent seems like a selling point for ISE folks wanting to engage scientists to help achieve their engagement/education/outreach goals, while providing rich experiences for ISE audiences.
- What is the potential for other "disruptive technologies," like the one that FrontierScientists provides, for an out of the box IS-type strategy to engage public(s) with the ongoing work of scientists? <http://frontierscientists.com/>

Thank you all again, and looking forward to more.

