CAISE Convening November 19-20 Front-End Report

Introduction

The analysis contained in this report is a result of work conducted in October 2013 by Julie Risien and John Falk of the Center for Research on Lifelong STEM Learning located at Oregon State University. This undertaking should not be considered research, but an exercise intended to provide insights that may enhance the outcomes of the *CAISE Broader Impacts and Informal Science Education Year 7 Convening*.

Methods

A series of 21 face-to-face and phone interviews were conducted with volunteer researchers in Science, Technology, Engineering, and Mathematics (STEM) disciplines and with current or recent NSF support – all were referred by individuals involved with this CAISE BI initiative. This "sample of convenience" is described below.

Primary affiliation for all but one of the 21 participant was an academic department within an institution of higher education. Participants were geographically distributed throughout the U.S. with 10 residing in the Pacific Northwest including 6 from Oregon State University, 2 in the Southwest, one in the Midwest, and 8 in Eastern U.S.

Participants broadly represented the STEM disciplines with researchers from Physics, Chemistry, Biology, Ecology, Earth and Atmospheric Sciences, Agricultural Sciences, Environmental Sciences, Oceanography, Neuroscience, and Engineering.

Participants engaged in a variety of broader impacts (BI) activities associated with informal science education (ISE) such as working with museums and science centers, public outreach (e.g. science pubs), news and informational media (print, video, radio), diversity initiatives, afterschool and school supplemental programs, citizen science, stakeholder workshops, web and digital learning interfaces, engaging community partners or policy makers in the research process.

Approximately half of the researchers interviewed could be considered seasoned investigators in the later third of their careers. The rest were young investigators or investigators in their early-mid career. Participants valued anonymity and generally spoke very freely about their perceptions and practices.

The interview protocol was developed and approved prior to interviews and adapted as needed to solicit clear and relevant answers. Stated interview questions in this report refer to the way a question was asked most frequently.

Interview transcripts were broken into several sections: 1) Perceptions about BIs; 2) Planning and Processes; 3) Resources and Supports; and 4) Marketing and Communication. A qualitative analysis was conducted on each section of transcripts to glean the below subsections included in the report.

- Overall assessment of the section topic including a description of questions used.

- Dominant themes, those stated by 4 or more participants in response to a particular question or set of questions.
- Repeated themes, those stated by 2 or 3 participants (unless otherwise stated)
- Other themes or interesting quotes not necessarily repeated but potentially insightful (unless otherwise stated).
- Key language used by participants is embedded in theme statements presented as amalgamated participant quotes (with exception of Section 4 - Marketing). Care was taken to use language true to the transcripts. An additional discussion on language is included at the end of this report.

Section 1 - Perceptions about BI

Participants were asked to rank themselves and their colleagues on a BI continuum with a scale of one to ten where:

- A rank of one indicates, "I/my colleagues don't really understand the value of BIs. I/they wish BIs were not a factor in receiving research funding."
- A rank of 10 indicates, "I am/my colleagues are big believer(s) in the importance of BIs and always work to integrate BIs into my/their research and like to be deeply involved in the work personally or in partnership with others."

Figure 1 shows the distribution of ranks for both the self-assessment (Self) and the colleague assessment (Col). It is important to note that participants collectively tended towards the BI champion side of the spectrum. Colleagues were more difficult to assess because of the many possible scales one could interpret colleagues. Many participants provided 2 or 3 different designations for colleague groups and provided answers for each. Figure 1 is weighted to reflect this.
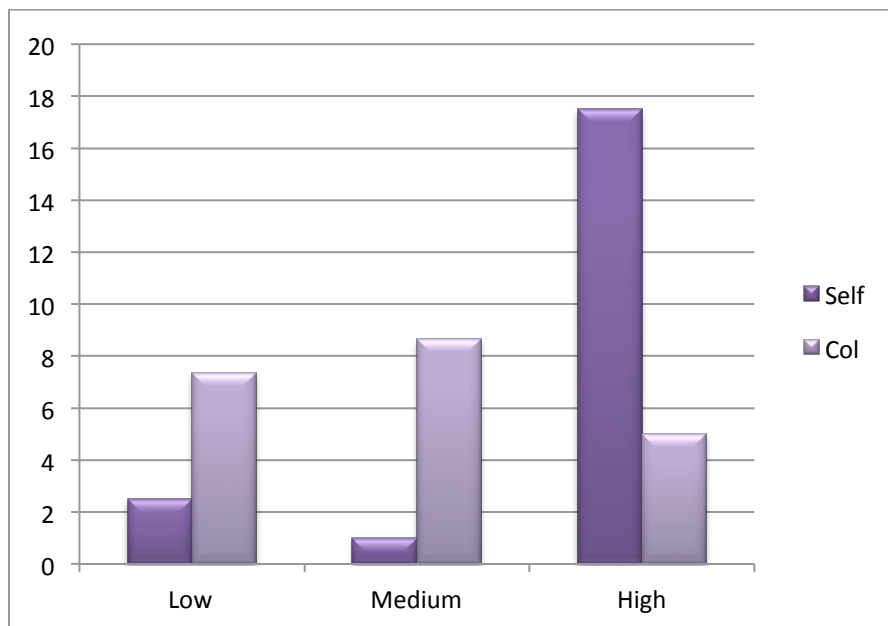

Figure 1 - X = section of the continuum and Y = number of selections

Dominant Themes – Self Assessment
1. BI and outreach are part of my personal mission, it is why I chose to become a scientist and if there is no clear impact I am probably not interested in doing the work. I enjoy doing outreach and working with kids/students/the public/partners; I've learned so much from working with educators and working to help the public understand science. I also see a place for "pure" science and think it is very important, but I am not interested in that.
2. I rank myself very high on BI/outreach, it is important, but only for projects in which such activities make sense and are natural. Many types of proposals and research should not be required to include BI or outreach; it just doesn't make sense for some types of work.

Repeated Themes – Self Assessment
1. I am a big believer in BI/outreach in concept, but in practice I am mediocre at outreach.
2. Outreach and other BI can be a burden and there is no reward at my institution.
3. Some BIs are unplanned, organic, and happen long after the science is completed.
4. It is difficult to know what is meant by BIs, it might mean something different to me than to NSF and something different still to my department chair or dean.

Dominant Themes - Colleague Assessment
1. Perceptions are changing over time. Young faculty members present a real opportunity; they are enthusiastic and looking to be more competitive. Older or "old school" faculty are also retiring, a few are changing their perceptions and beginning to place more value on outreach, but that is rare.
2. There is a perception that NSF has gone too far and should not require BI for all proposals. Even colleagues that enjoy BI don't feel it should be required for every proposal. Some even propose BI that they do not intend to complete or they do BI that is not useful, some of it could actually have a negative effect on the public's perception of science.
3. Perceptions are all over the map, those that tend to have an applied nature to their work generally see BI as more favorable. Those who focus on theoretical or esoteric work are not really interested in BIs.

Section 2 – Planning and Process
To assess process, specifically planning, participants were asked two questions these questions did not occur consecutively.

Question 1: We are interested in *your* description of your initial thought process when you conceptualize and design the BIs elements of your proposal. In other words, how do you come up with a plan of action?

Question 2: How do you plan on addressing the BIs requirement in your next proposal?

For reluctant participants the interviewer used a selection of follow-up questions that include:
- Do you find partners?
- What do you think about first, what is your first step and why?
- Do you think about outcomes or audience?
- How do you choose a strategy (or instrument, or mechanism)?

Some participants were asked to describe the planning process for a research project, and then asked to outline their process for BI. Overall a lot of energy was spent encouraging participants to unpack their process to provide insights. Still many were reluctant or stated that they don't really plan BI work. Figure 2 below shows the distribution of participant's responses. The three categories are described in more detail below.

- **don't plan** - I don't plan BIs they happen organically or sometimes accidentally.
- **semi-planned** - My BIs are semi-planned. I think it through, but not very much, I usually rely on colleagues or partners that I have worked with before.
- **pre-plan** - I pre-plan BIs in a stepwise fashion and tailor the work for each project and audience.
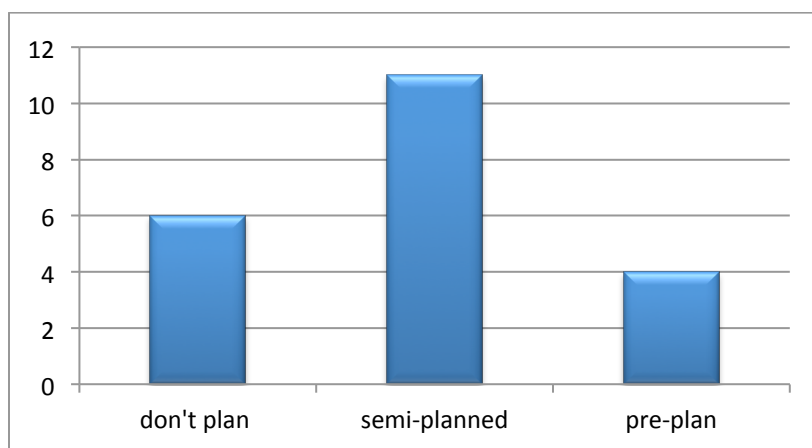

Figure 2
X = Type of planning for BI
Y = number of participants

Dominant Themes – Planning and Process

1. My BI (or outreach) work is part of my personal mission, I plan each project to meet my overall objective to help students or the public understand the work of scientists, the role of science in solving everyday problems, or basic scientific principles. I enjoy this work and I am satisfied knowing I am giving back [to society]. I feel I have a role in recruiting the next generation into STEM careers and diversity in science is particularly important to me.
2. I use my personal network. I don't really plan, I just call the people I know and we talk about what we want to do. If I do plan it out, I work with colleagues or friends that I am comfortable with because I believe we have a good chance of succeeding together.
3. Some science lends itself naturally to BI work. In those cases, the science comes first and the BI or outreach work follows easily. For some work, BIs are not natural. In those cases I end up scaling up for outreach; nobody is interested in what I do – it's too technical, but people care about earthquakes/climate change/farming/etc. which is sort of related to my work. I don't really think BIs should be required for all types of proposals.
4. BIs is an after-thought. It's the last thing to plan, the last thing to do, and the first thing to get dropped if there is not enough time or money. That's just the way it is. The science comes first.

5. Working with established partners who really know outreach or programs is a great help when you can make it work.
6. I do all the outreach work myself. I mean there really isn't any plan, there's no money for partners, so I just do it. Some of it I would do anyways.
7. Outreach work and other BIs are extremely time-intensive for the researcher, it's easy to get yourself in over your head, and that's a real problem if it distracts from the science.

Repeated Themes – Planning and Process
1. It's hard to maintain BI programs and outreach projects over time; it seems we keep reinventing the wheel.
2. When a BI is forced the outcome is not good; in fact, it can have the opposite effect of turning people off of science instead of inspiring them.
3. My focus for BIs is getting my research results into the hands of decision-makers and even involving them in the process, that's why I do this [science] so I can effect change.
4. My work is very locally and regionally relevant, so plugging into larger scale BIs efforts is a challenge.
5. My students do most of the BIs; they often plan it and almost always do the actual outreach. It's good training for them.
6. The human connection and face-to-face interaction is really important. You cannot have an impact without it.
7. A field work component is great for BIs, but the logistics can be very hard and liability is an issue. Often field work-based BI just doesn't work out.
8. I'm reluctant to put any budget towards BIs; I don't think my colleagues like to do it either. It will just be the first thing to get cut and I will have to do it myself anyways.
9. Many partner organizations ask for unreasonable sums to be involved in your BIs work, so I don't like to use them.

Section 3 - Resources and Supports

The fourth question in the protocol asked investigators to identify the specific resources and supports they use when planning and executing BIs work. Investigators were also asked, "are there resources or supports you would use to help with your BI work if only you knew about them or had access to them?" Resources and supports were clarified when needed as including people, programs, organizations such as professional groups or NGOs, places such as museums or science centers, information, expertise, students, networks, partners, or facilities and equipment.

Dominant Themes – Resources and Supports Used
1. I use my personal and professional network as my primary resource; there are people I always call to brainstorm and come up with ideas. There are people I like to partner with, I know them and I enjoy working with them (wife, sister, colleague, old friend, local educator, local community groups, teachers, people I meet in my community).
2. I use online tools such as databases of people, databases to share my work, www.compadre.org , social media, tumbler, project websites, backyard brains, and YouTube .

3. I use resources at my university such as science communications programs, the press office, video/media lab, STEM Center, student programs, extension, our campus leadership institute, pre-college programs, STEM learning researchers, outreach professionals, and STEM colleagues.
4. I rely on my personal bank account to pay for materials, supplies, travel, and to provide food at meetings related to my BIs and outreach work.
5. I work with museums and science centers. I like doing this, but sometimes it doesn't work out, the costs can be high and sometimes they do not have enough people or time to work with me. Also the project timelines often don't match up with the timeline of my grant.
6. I work with programs external to my university such as afterschool programs, citizen science groups, stakeholder workshop and engagement programs, and TOSA (teachers on special assignment). These are usually local or regional.

Repeated Themes – Resources and Supports Used
1. I work with my PBS television and/or local public radio station. They usually call me, but I will call them if I have something really interesting that I think will get the public excited about science and how it can affect them.
2. I sometimes use professional organizations that I belong to or my university administrators belong to. These can be good for learning about BIs work or connecting with outreach professionals (Ecological Society of America, American Association of Physics Teachers, Council of Colleges for Arts and Science, etc.).

Other Themes – Resources and Supports Used
1. Partnerships with the art community – painters, poets, other visual artists.
2. Webinars are not really useful
3. I use newsletters to get and give information.
4. Student travel funds and fellowships can be really useful.

Dominant Themes – Resources and Supports Desired
1. I would love it if there were a compendium of strategies for doing outreach. A sort of cohesive summary of the literature, the pros, cons and evidence for each approach. It would be nice to have elevated case studies that tell me the story and highlight the key points. I'd also like to know the cost and benefits for different outreach approaches; sometimes the cost outweighs the benefit. This type of resource could be organized by discipline (environmental science, chemistry, ocean sciences, climate science), geographic region, by type of resource or strategy (e.g. visualizations, curriculums, communicating with the public, art and language arts) or type of partner (e.g. museums, schools, the media).
2. It would be nice if there were money to conduct outreach. It costs to go to community meetings, to feed people, to drive there. It costs to make banners to let the public know about involvement of my university or NSF, to create pamphlets, and videos. No one is going to put that in their NSF budget, and my dean won't pay for that kind of thing.
3. Connections with the media, I would love a spot on a radio show, or to know how to get in touch with book publishers.
4. No, I can't think of any resources I wish for. We just make do with what we already have.

Repeated Themes – Resources and Supports Desired
1. A staff member at my university to connect me with BIs opportunities, I don't have time and I don't know what is good. I could really use someone who knows everyone in the region doing this kind of thing.
2. An entity or organization to sustain my BIs work after the grant is over. We put in so much effort to gain traction, then the grant is over and we can't afford to spend our time to sustain it. It would be great if there was some way to keep products up to date and relevant. Otherwise it's a waste of money and energy invested.
5. I wish my institution and my department valued this kind of work, but there is no reward for it and in fact it can be a big distraction prior to tenure.
6. Boiler plate language that I can paste into my proposal. I need to know what it costs too.

Other Themes – Resources and Supports Desired
1. I could really use help with graphics and visualization of our data. We are not very good at making graphics that the general public can understand.
2. Connections with minority-serving institutions.
3. Help with patent/publishing conflicts.
4. Regionally-based expertise in federal agencies like the National Parks Service.
5. A picture is really worth a thousand words, I say little cameras for everyone. We need to record ourselves doing science; we need to let our youth know what it is to be a scientist.

Section 4 - Marketing
The fifth question in our protocol addressed marketing directly. We asked investigators to, "help us think about effective and creative ways the informal science education community might be able to reach the science community. How could we let people know there are supports and resources available to help with their BIs needs?" Often the question was framed by stating, "Suppose there were a menu of resources and supports to help you with BIs, what would be a good way for us to let you (or the research community) know that it exists?"

Dominate Themes - Marketing
NSF - Nearly half of the participant specifically cited NSF as a reliable and credible source of information and identified program officers as a recognizable source from which to receive information directly.

Recommended vehicles/venues to market the availability of BIs resources:
- communications directly from program officers
- proposal guidelines
- solicitations for proposals
- proposal submission forms (Fastlane)
- NSF website

Recommended actions
- verbal acknowledgement from program officers (on the phone at project meetings or other gatherings such as professional meetings and conferences)
- endorse trainings or workshops that occur at professional meetings or are delivered by certain organizations
- deliver trainings or workshops at professional meetings
- provide a BI resource guide on the NSF website
- specifically address BI resources in panel review comments, even for unfunded proposals

Conferences and professional meetings – several participants cited conferences or professional meetings as a valid venue for marketing. Others cautioned against these venues citing the overwhelming nature of many meetings and a low likelihood of reaching investigators not already invested in ISE. Sessions and workshops focused on "outreach" were viewed as tending to "preach to the choir". Specific positive recommendations include poster sessions, take ten minutes of scheduled time during workshops focused on a science topic, use message boards, and collaborate with conference organizers to include information in conference emails. The importance of hallways conversations and lighthearted social events were also noted.

University-based efforts – several participants recommended marketing through their home institutions. The most frequent recommendation was to provide information during departmental faculty meetings, through the research office, and through individual grant programs and managers within departments. University-based workshops and webinars were also recommended.

Other Themes - Marketing
The below recommendations each reflect ideas shared by one to 3 participants.

- Create engaging stories and elevated case studies of successful ISE BIs that provide the context and highlight key points. Get these stories in the press and ultimately picked up by online news aggregators popular in the science community.
- Use professional society newsletters and websites, professional magazines and peer-reviewed journals to advertise resources and share success stories.
- Use listservs of existing organizations with an active following.
- Use online communities or existing portals and clearinghouses.
- Use established organizations like AAAS, COSEE, and AGU.
- Provide real assistance to investigators in drafting BIs language in proposals.
- Participants specifically advised against large-scale unfocused webinars and unsolicited emails as they are viewed as spam.

Key Language Notes

Although informal science education and it's broad nature was described in the invitation and the preamble to the interview, the term "informal science education", "informal education" or "ISE" were used by only a very few of the participants; each had successful partnerships with museums and/or science centers.

The terms "outreach" and "broader impacts" were used synonymously by most participants during interviews. In fact, "outreach" was used by the many participants as a catch all for any activities outside of the traditional academic job description and all activities that are not specifically research and take place away from one's university. "Reaching out" was used less frequently but similarly to outreach and specifically when speaking of the public audience in a generic sense. "Outreach" was most frequently used as a proxy for ISE, but it was also used to talk about K-12 classrooms, sharing science outside of one's own department, university or sub discipline. It was less frequently used to describe publishing in peer-reviewed journals and presenting and professional meetings.

"Communicating science" was also used and used in context of public lectures, mews media, print, and websites.