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SENCER-ISE Conference: An Evaluation

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TABLE OF CONTENTS

SUMMARY AND DISCUSSION	iii
INTRODUCTION	I
Methodology	1
Data Analysis and Reporting Method.....	1
PRINCIPAL FINDINGS	3
Introduction.....	3
Comparing Practices of Informal and Formal Science Education	3
Obstacles and Potential Strategies for Collaboration	5
Using Civic Engagement as a Platform for Science Learning.....	7
Skills and Resources of Each Sector	9
New Learning and Perspectives.....	10
Collaborations Resulting from the Conference.....	11
APPENDIX	I3

SUMMARY AND DISCUSSION

INTRODUCTION

This report presents findings of an evaluation of the SENCER-ISE Conference, a National Science Foundation- and Noyce Foundation-funded project facilitated by the National Center for Science and Civic Engagement (NCSCCE). The goal of the conference was to bring together professionals from the informal and formal (college and university) science education sectors to discuss civic engagement in science and initiate potential collaborations between the two science education sectors. Randi Korn & Associates, Inc. (RK&A) conducted this evaluation to explore participants' conference experiences, ideas, and collaborations resulting from the conference. The conference took place in March 2011, and data for this study were collected in May and June 2011.

The findings presented here are among the most salient. Please read the body of the report for a more comprehensive presentation of findings.

SUMMARY AND DISCUSSION

The SENCER-ISE conference was an important first step in creating connections between the informal science education (ISE) and the formal (college and university) education communities. ISE participants included museums, science centers, and science media, while higher formal education was represented by members of Science Education for New Civic Engagements and Responsibilities (SENCER), a consortium of faculty members and others from over 300 colleges and universities who use civic-issue engagement as a platform for science education. Findings demonstrate that new learning and perspectives resulted from conference participation; about three-quarters of interviewees said the conference had created an awareness of the value of the other sector, empathy for the challenges the other sector encounters, and/or concretized potential opportunities for collaboration between the two sectors. And, the remaining one-quarter of interviewees said the conference had confirmed and reinvigorated an existing belief that collaboration among the two sectors is a valuable endeavor. Since creating awareness is a valuable first step, these findings are encouraging.

Another goal of the conference was to build potential collaborations between the formal and informal science education communities. In this, the conference also made some initial in-roads. Findings show that the conference sparked new collaborative ideas for about one-half of interviewees and honed existing ideas for another one-half of interviewees. Yet, when asked to discuss the progress they had made in implementing these ideas, many interviewees had only personally reflected on their ideas, initiated contact (with no response), or had initial conversations with potential stakeholders. Interviewees cited various barriers, including time and other commitments, institutional transitions, and geographic distance. What these findings suggest is that the conference successfully sparked ideas and built momentum, however, sustaining that momentum has been a challenge given day-to-day responsibilities of ISE and SENCER professionals. This challenge is not uncommon, and findings suggest priority next steps and potential strategies for continuing to build conversations and momentum for collaboration between the two sectors, as discussed below.

Suggestions and strategies arose from interviewees, and to these, we add our own thoughts and insights. First, findings suggest a continued need to build awareness of the value of using civic engagement as a platform to advance science understanding, including what each sector brings to a potential collaboration that would help achieve this end. About one-half of interviewees said that capturing the

interest of potential stakeholders (i.e., faculty, students, museums, and the general public) continues to be a challenge of using civic engagement as an entry point into science experiences, as some stakeholders (e.g., faculty, museum staff, students, etc.) are initially wary of either civic engagement or science. For example, interviewees spoke of some formal educators' hesitancy to use civic engagement as a platform since doing so requires an understanding of the value to students and a level of comfort reimagining how content is taught. Likewise, interviewees (primarily from the informal science education sector) spoke of institutions' hesitancy to use civic engagement as a platform since the issues can sometimes skew political. Interviewees discussed, at length, the value of using civic engagement as a platform—engaging those uninterested in science through something of relevance to them and building critical-thinking and process skills necessary in many fields. Continuing to communicate this value outside the scope of the SENCER-ISE conference is important. To this end, one interviewee suggested inviting board members and professionals from each sector to actively participate in the work of the other sector (e.g., strategic planning initiatives, advisory boards, etc.). Building on this idea, we suggest that professionals from each sector might be asked to co-author articles in the peer-reviewed journals of the other sector and invited to speak or present at the conferences of the other sector. As an example, a preliminary project report, coauthored by the SENCER-ISE project director and the SENCER coordinator, was published in the Summer 2011 online journal, *Science & Civic Engagement: An International Journal* and can be found at http://www.seceij.net/seceij/summer11/friedman_sencer.html.

Second, because findings suggest that maintaining the momentum of the conference may pose a challenge to participants, other platforms for collaboration might need to be considered. Interviewees suggested maintaining communication online and hosting regional conferences to address the barrier of geographic distance. For example, one interviewee suggested building on the “Passport to Networking” document by creating a Web interface (similar to Facebook or LinkedIn) that would allow participants to post information that would strategically help other users match their skills and needs with potential partners. This same interviewee also suggested distributing an electronic newsletter or other communication that continually updates participants about existing and new partnerships that have been forged between SENCER and ISE, effectively building momentum and inspiration for others. The project has followed up on this suggestion and established a LinkedIn group. They also have developed another networking site at www.sencer-ise.net, which will contain an updateable version of “Passport to Networking.” Hosting regional conferences or groups within the SENCER-ISE community also can help address the barrier of geographic distance and continue the momentum that was initiated at the conference.

Encouragingly, findings show that there is much consensus between the two sectors when considering how best to collaborate around civic engagement in science, as most responses to interview questions represented equal numbers of those from ISE and SENCER; and initial collaborative steps have been taken by some interviewees. As such, findings demonstrate that the SENCER-ISE conference successfully achieved its two main goals of bringing ISE and SENCER professionals together to discuss civic engagement in science and inspiring ideas for collaboration between them. The challenge now is to help participants continue and build on the relationships and momentum that were started at the conference. The above suggestions for continuing and sustaining conversations and collaboration between these two sectors are just starting points. We hope readers will mine the report for other suggestions that address perceived obstacles and opportunities for collaboration between the two sectors, as interviewees had many ideas to contribute.

INTRODUCTION

This report presents findings of an evaluation of the SENCER-ISE Conference, a National Science Foundation- and Noyce Foundation-funded project facilitated by the National Center for Science and Civic Engagement (NCSCE). This evaluation sought to:

- ◆ Identify practices in formal and informal science education that support each other's models and approaches to science learning.
- ◆ Clarify how ISE and formal education's infrastructures and ways of teaching science can each be adapted to support a meaningful collaboration.
- ◆ Identify obstacles (and strategies for overcoming them) that may deter ISE partners from making use of SENCER approaches to science teaching/learning or from partnering with SENCER institutions, and vice versa.
- ◆ Identify obstacles and opportunities associated with using civic engagement and civic responsibility as the platform for science teaching/learning.
- ◆ Identify some skills and resources each sector has that can be shared to support SENCER's model/approach to science learning.
- ◆ Identify partnerships between informal and formal education entities that were initiated as a result of participating in the conference, including any actions taken or intentions to submit a proposal for a SENCER-ISE partnership or collaboration.
- ◆ Identify newly gained perspectives and learning that resulted from participating in the conference.

METHODOLOGY

In-depth interviews were conducted to explore conference participants' thoughts and ideas with respect to the evaluation objectives above. In-depth interviews encourage and motivate interviewees to describe their experiences, express their opinions, and share with the interviewer the meaning they constructed from an experience. The interview guide was intentionally open-ended to allow interviewees the freedom to discuss what they felt was meaningful (see the Appendix for the interview guide). Throughout the interviewing process, the interviewer might have asked a probing question to obtain more detail; these probing questions are in parentheses when quotations are presented in the body of the report.

NCSCE provided RK&A with a list of conference attendees, including names and contact information, and RK&A randomly selected 20 interviewees—10 who work in the informal science education sector and 10 who work in the formal science education sector (i.e., SENCER). The interviewer contacted participants by e-mail to schedule interviews via telephone. One originally selected attendee could not be reached after three attempts to schedule an interview; therefore, RK&A randomly selected another conference attendee to participate in an interview. Interviews were audio-recorded with interviewees' permission and transcribed to facilitate analysis. Interviews were conducted in May/June 2011.

DATA ANALYSIS AND REPORTING METHOD

Interviewees' responses to interview questions were analyzed qualitatively, meaning that the evaluator studied the data for meaningful patterns and, as patterns and trends emerged, grouped similar responses.

Trends and themes within the data are presented in thematic sections, and, within each section, findings are reported in descending order starting with the most-frequently occurring. The terms “most”, “many,” “some,” “several,” and “a few” indicate the approximate number of interviewees. “Most” refers to all interviewees save a couple, “many” refers to about two-thirds of interviewees, “some” refers to about one-half of interviewees, “several” refers to about five to six interviewees, and “a few” refers to about three interviewees. Where appropriate, we present more precise proportions (e.g., two-thirds, one-half, etc.).

Qualitative methods typically produce a wealth of data from a smaller number of people. While in-depth interviews may increase readers’ understanding of people, they reduce the possibility of forming generalizations. Because data sets are small, findings should be weighed against what the reader knows and believes to be true based on his/her own expertise, as each perspective has equal, but different, value. Additionally, more value should be given to comments made by “most” participants versus those made by “a few” participants; however, the reader should still consider the comments made by “a few” participants when thinking about findings, as one person may offer valuable insight.

This report uses verbatim quotations from interviews (edited for clarity) to give the reader the flavor of interviewees’ thoughts and opinions and to illustrate their ideas as fully as possible. Most identifying information (organization names, individual roles, etc.) has been removed from quotations or aggregated in descriptions to preserve interviewees’ anonymity; however, following quotations, we indicate whether an interviewee represents ISE or SENCER. Within quotations, the interviewer’s comments appear in parentheses.

Findings are organized around the following six areas:

SECTIONS OF THE REPORT:

1. Comparing Practices of Informal and Formal Science Education
2. Obstacles and Potential Strategies for Collaboration
3. Using Civic Engagement as a Platform for Science Learning
4. Skills and Resources of Each Sector
5. New Learning and Perspectives
6. Collaborations Resulting from the Conference

PRINCIPAL FINDINGS

INTRODUCTION

RK&A conducted 20 telephone interviews with SENCER-ISE conference participants. One-half of participants work in the informal science education sector, and the other one-half work in the formal science education sector. Interviewees were randomly selected from among a list of all conference attendees. All interviewees responded to all questions.

COMPARING PRACTICES OF INFORMAL AND FORMAL SCIENCE EDUCATION

Interviewees discussed both similarities and differences that exist between the practices and approaches of the informal and formal science education sectors when facilitating civic engagement in science.

SIMILARITIES IN PRACTICE

When asked to describe any similarities between the practices in the informal and formal science education (i.e., SENCER) sectors, interviewees' responses varied widely. For each result below, interviewees were equally distributed between SENCER and ISE. About one-half said that the sectors share a broader goal of promoting an interest in science and a philosophy of using relevance (e.g., civic or community issues) as an entry point into science experiences (see the first two quotations below). Several said that the two sectors share a similar audience (i.e., those not on a science career path, including the general public and non-science majors) (see the third quotation). A few discussed broad similarities between the two sectors, such as both convene people in a physical space, have a public mission, etc. A couple of SENCER interviewees said that both sectors emphasize experiential, hands-on learning. The remaining few interviewees did not feel there are many similarities or only discussed differences.

If you don't respect the knowledge of the individuals that you're engaging with, then it [what you're communicating] becomes an academic or didactic feeding of information. And, while the informal side has a history of [creating] those fun engagements, there's still [a] focus on facts as opposed to what you are interested in. . . . And, I definitely got the sense listening to colleagues on the formal side that they too recognize that being relevant and being of interest to the individuals that they're connecting with is very important. [ISE]

I think the goal for both formal and informal science education is to increase the participation [of] people in science, whether it's science majors or the science literacy situation. (When you say science literacy, what are you thinking of?) I'm going to use the SENCER model where one of the things that comes out of SENCER [is] that citizens can look at a complex scientific problem that's being talked about in the newspaper, a movie, or on television and make informed judgments about what's going on. [SENCER]

I think that SENCER in particular is not so much focused on the students who are on a science career [track], but other students. And, in a way, there's some similarity between that and the fact that, in science museums, we're doing science for the general public. And, of course, a lot of the general public who come are the very science interested, but there's a sense of 'science is for everybody' that both of our institutions are addressing. [ISE]

DIFFERENCES IN PRACTICE

RK&A asked interviewees to describe any differences between the practices of the informal and formal science education (i.e., SENCER) sectors; for each result below, interviewees were equally distributed between SENCER and ISE. Most interviewees discussed practices/approaches that address differences in audience and institutional structure. For instance, interviewees said that informal science institutions develop experiences and programming that appeal to a broad range of ages, interests, and motivations because they do not necessarily have a captive audience with repeated exposure that is motivated (or required) to learn more in-depth about science (see the first two quotations below). On the other hand, interviewees said that the formal education sector might use more traditional facilitation methods (i.e., lectures) along with experiential methods that go more in-depth because their audience is captive, more homogeneous (i.e., young adults, interested in getting a higher education degree), and engages for longer, repeated periods of time (whether required or not) (see the first two quotations). A few also said that informal science institutions seem more open in the content they present and the results they expect since they do not have the same curricular requirements as formal education institutions (see the third quotation). A couple responses were idiosyncratic (e.g., the formal sector tends to receive more funding because of how they are valued in society).

I got the sense [that] our physical environments do tend to describe us. So the SENCER folks have that physical environment of a college campus, and therefore the type of engagement that you get still has [more of a lecture feel]. . . . Our physical environment describes us as more opportunistic, in terms of people making the choice to come to us. I definitely got a sense [from] the SENCER folks [that] people [students] have to take some courses. . . . But, people [our visitors], there's no gun up to their head unless it's a school kid coming [with a] class. We're very much more on the leisure activity side of this. [ISE]

I think in a classroom formal setting, you've got an hour, a two-hour lab, and you've got them over 15 weeks, or if you're K-12, you've got them for nine months whereas in an informal environment, you might have people for five minutes, so I think while visuals and readings are important in a classroom, in an informal setting like a nature center, it's the graphic display board that's trying to make a hit home to whoever is reading it. So I think that's where our methods are different. I can take students out in the field over the course of ten weeks and we can measure change. People aren't showing up at field stations or nature centers for ten straight weeks to [participate in a] study so [it's about] how [you] engage them in a short bird walk around a facility for an hour. [SENCER]

I think that the informal people are very sophisticated in [applying] a wider range of approaches in some sense. (And did you get that sense from the conference?) From talking with people about what they had done and what they had worked on, I thought they [the informal science sector] were a little bit more out of the box than the university people. (Can you elaborate on what you mean by that?) I was just surprised at how they [ISE] took even political issues and [discussed] the science component [of] those issues. An example would be the Israeli woman doing a science exhibition on war. That's not something the biology or environmental studies programs at most universities [would do]. . . . They'll do it maybe on the graduate level, possibly in a reading course or a special topics course where somebody's really just studying that. And that's really unfortunate because most people are not going to become scientists; they're going to become voters. [SENCER]

OBSTACLES AND POTENTIAL STRATEGIES FOR COLLABORATION

Interviewees described most of the differences between the two sectors (mentioned in the previous section) as potential challenges that could be turned into opportunities with the right approach. Table 1 (next page) illustrates the obstacles along with the opportunities and/or strategies that interviewees mentioned for collaboration between the two sectors (these ideas range from broad to specific depending on the interviewees' context).

TABLE I**OBSTACLES AND STRATEGIES FOR COLLABORATION BETWEEN INFORMAL AND FORMAL SCIENCE EDUCATION**

PERCEIVED OBSTACLE	SUGGESTED OPPORTUNITY/STRATEGY
Formal science education partners operate on a curricular timeline and ISE partners do not (SENCER/ISE)	<ul style="list-style-type: none"> ◆ Capitalize on students' time spent outside the classroom (e.g., internships) (SENCER/ISE) ◆ Engage newer faculty in partnerships early on (those most willing to compromise) (SENCER) ◆ Acknowledge and articulate any misalignment in partners' timelines during the planning process (SENCER/ISE)
Formal science education partners prioritize publishing research more than ISE partners (SENCER/ISE)	<ul style="list-style-type: none"> ◆ Build professors' and students' capacity to utilize existing Citizen Science data and infrastructures (ISE) ◆ Ensure that partnerships include components that allow each sector to capitalize on each organization's priorities, as they differ (e.g., publishing research could be an intended outcome to accommodate SENCER participants, and valuing audience impact and relevance could be integrated into program design to accommodate ISE participants) (SENCER/ISE) ◆ ISE institutions could consider partnering with formal education institutions that emphasize teaching over research (SENCER)
Formal science education's audience (undergraduate students) has more honed science knowledge, interests, and motivations than the audience of ISE partners (general public) (SENCER/ISE)	<ul style="list-style-type: none"> ◆ Faculty could adapt the resources (e.g., collections) in informal science education institutions to teach their students (with the help of ISE staff) (SENCER) ◆ ISE institutions could offer the students of SENCER partners professional development opportunities (e.g., how to facilitate science experiences for the general public) (SENCER/ISE) ◆ SENCER partners could offer content expertise to ISE institutions that do not have subject-matter specialists on staff (SENCER/ISE)
Both sectors encounter logistical obstacles, such as physical location (SENCER/ISE)	<ul style="list-style-type: none"> ◆ Address logistical considerations (such as the cost and rules associated with transporting students) at the beginning of a partnership and/or during the planning stages of a grant (SENCER/ISE) ◆ Utilize new media to encourage collaboration between those at different sites and the community (e.g., geo-tagging) (ISE) ◆ Consider the broader constraints of the institution when two individuals (one from each organization) are primarily responsible for forming a partnership (ISE)
Formal science education partners have a more captive, repeat audience than ISE partners (SENCER/ISE)	<ul style="list-style-type: none"> ◆ SENCER partners could learn from ISE partners how to capture an audience's attention through personal relevance and interest (SENCER/ISE) ◆ ISE partners could learn from SENCER partners how to engage a young adult audience (SENCER/ISE)
Each sector thought the other could risk presenting controversial content that the other may not be able to present (SENCER/ISE)	<ul style="list-style-type: none"> ◆ Those afforded institutional protection could partner with those who may not be able to present controversial content to audiences (SENCER/ISE)
Formal science education and ISE partners may have different goals when engaging their audiences with science (e.g., gaining specific science knowledge) (SENCER/ISE)	<ul style="list-style-type: none"> ◆ Clearly articulate and acknowledge each partner's goals during the planning process (SENCER/ISE) ◆ Board and/or administration from each sector could actively participate in the work of the other sector (e.g., during strategic planning initiatives, conferences) (ISE)

USING CIVIC ENGAGEMENT AS A PLATFORM FOR SCIENCE LEARNING

Interviewees discussed the obstacles and opportunities for using civic engagement to advance science understanding or learning.

OBSTACLES

When asked to describe any obstacles to using civic engagement to advance science understanding, interviewees' responses varied widely. About one-half (equal proportions from SENCER and ISE) said that capturing the interest of potential stakeholders (i.e., faculty, students, general public) sometimes can be challenging, as some are initially wary of either science or civic engagement (see the first quotation below). Expanding on this idea, several interviewees (equal proportions from SENCER and ISE) said that teaching science using civic engagement as the platform is more time-intensive and complex than teaching straight content (and, therefore, one must be motivated and comfortable enough to do so) (see the second quotation); and, potential stakeholders (e.g., faculty) question whether science content can be covered in the same depth (see the third quotation).

Several (primarily those from ISE) interviewees said that issues of civic engagement are sometimes politically charged and therefore pose a challenge of being controversial or risky to present (see the fourth quotation). Several (equal proportions from SENCER and ISE) discussed logistical challenges, including those associated with participation in activities off-campus, rigidity of the academic timeline, and the quick pace at which one has to respond to current issues of civic engagement. A few SENCER interviewees also named sustaining long-term partnerships with the appropriate stakeholders as a challenge (see the fifth quotation).

In doing community engagement work, it's hard to assume that the community has science education goals in mind. So the people who are coming to these programs from a community perspective are likely coming for a wide range of reasons which might include learning more about science, but they very well might not. And that doesn't mean that there aren't going to be science education outcomes, but if a program is set up that articulates to the community that it is a science education program, it might actually constrain participation as opposed to a program that could be meeting community needs and interests. [ISE]

The biggest obstacle is finding faculty that are willing to do it. . . . I was talking with somebody, and she wanted to know more about [using] civic engagement, and she said, 'do you have a set curriculum or binder that I could look at?' I said, 'no, there isn't any set curriculum.' [That is] both the strong and weak point; it really depends on faculty being able to take their subject matter and translate it into a civic engagement kind of problem which means that they're going to have to research the science in the problem and then design what they would normally cover inside of that. . . . It's an issue, and it's not an issue. It's not an issue because it really allows the faculty member to have the freedom to design the course around what they do, but it does require more work than [they] normally have. . . . It partially depends on how interested the faculty is in putting something together that is of interest to them and the students. [SENCER]

Sometimes the science is quite complex. So, you want to engage people around climate change, but it's really hard to see evidence of that in any kind of time scale that makes sense. . . . So, I think some of the science that we want people to be engaged in is subtle and complicated, and it doesn't work well in sound bites. I think it's really hard for informal institutions to work in those areas because you don't necessarily have enough of someone's attention to give them all the background they need, and even in a university course, it's one course and you can't learn

everything you would need to learn to really understand it. So, you're stuck trying to determine the most important thing, which means you're leaving out the other most important thing. [ISE]

Something that came up in the workshop that raised some concern was about a project [that] tries to do something to influence the outcome of the elections, and so there are certain types of civic engagement that get very political. It was always unclear to me that if the Museum were to take a particular stand on a variety of political issues, which political position would prevail? It is not clear what problems we would get into if we saw that some people within the institution became strongly attached to a particular civic outcome, and others were strongly attached to a different direction. What would happen when the common cause we gathered around, public science education, suddenly turns into a big split around some kind of political decision, and what would that mean within the organization? [ISE]

To make these off-campus educational opportunities really work, you need opportunities where you can do it regularly enough so you have continuity with whoever you're [working with] so that you're not restarting the process. If you're teaching the course every other year, some of the officials who signed all your permits two years ago may not be in place anymore, so you're restarting the process it seems at times. (And have you encountered that specifically?) A little and yet, I've gotten used to doing it so it's not as big of an issue for me. But, I would think for other faculty making a commitment to doing it, they'd say 'why should I do this? Why should I take on these additional pieces of the process to make this work effectively?' [SENCER]

OPPORTUNITIES

RK&A asked interviewees to describe any opportunities afforded by using civic engagement to advance science understanding; for each result below, interviewees were equally distributed between SENCER and ISE. About three-quarters of interviewees said that civic engagement is valuable because it engages faculty, science and non-science majors, and the general public in science (see the first quotation below). A couple of these interviewees specified that it is a valuable tool for engaging minority audiences in STEM. About one-half also said that using civic engagement is valuable for building critical-thinking and process skills necessary in science (and many other fields) (see the second quotation). A few interviewees said that using civic engagement is useful for demonstrating the value of higher education and informal science organizations to potential funders, government officials and the general public (see the third quotation).

I think that there's a great strength of reaching people who might not otherwise think of themselves as science-interested or science-capable. . . . So, the people that don't necessarily get excited about science but might be very concerned about issues within their community, whether that's asthma and health related issues, food safety, or water quality. If they're concerned citizens, and science is a tool that they can use to address their needs and interests, there's the potential to really enhance [their] skills in a subversive way, to provide people with a service that they might not seek out for themselves. [ISE]

I think the commitment to undergraduate research at my institution helps the transition from a traditional content-driven science curriculum to more [of] what we call a SENCERized experience. The argument that's often made in support of SENCER [is that] it's not about the content, it's about the process and context. While you may be, in some cases, sacrificing the quantity of content, what you are gaining is a much better understanding of the individual content items and the connection between the content items by using the thread of civic engagement. [SENCER]

The opportunities are many. One is having our government, particularly city level government, understand that we can be a neutral player and actually add to the discourse by creating opportunities in a way that a city can't always. . . . Realizing that a science center can play a broader role in the community rather than just be [an] attraction, [that it can] be a contributor [to] or an enabler of a specific discussion or action around some aspect of civic engagement, is also really important. [ISE]

SKILLS AND RESOURCES OF EACH SECTOR

Interviewees were asked to describe the skills and/or resources that formal and informal science education partners each bring to a potential collaboration with one another.

INFORMAL SCIENCE EDUCATION PARTNERS

When asked what skills and resources the informal science education sector brings to a potential collaboration, about three-quarters of interviewees (equal proportions from SENCER and ISE) said that informal science educators possess the knowledge and skills to engage a broad audience in science and communicate science content to that audience (see the first quotation below). Several interviewees (equal proportions from SENCER and ISE) said the informal science education sector also provides opportunities for university and college students to explore science careers and do research in an informal setting (see the second quotation); and several others (primarily those from ISE) said that the informal science education sector may provide established connections with the community (see the third quotation). A couple each (equal proportions from SENCER and ISE) said the informal science education sector provides collections and access to physical spaces with hands-on science exhibits. The remaining responses were idiosyncratic (i.e., funding sources and defined outcomes that are not primarily content-based).

I think that they [informal science educators] have a lot more experience in public messaging and communicating science to non-science experts. I think some of the SENCER community has that as well, but some of the SENCER community are classic university professors who are doing their research and working with their students. I think that it's a special skill to be able to communicate complex information to the public, and I think science centers have that. [ISE]

I think it allows students to do projects [that are] meaningful instead of a term paper. . . . I think [there are] a lot of possibilities with informal science, and if [there is a] strong partnership between them, they [students] could have a continuing research project. . . . I think it also exposes students to a wide variety of possibilities in terms of career choices. . . . I think [there are students that] might consider a science career but don't want to be shut up in a laboratory all day long. I think that's the nice thing about informal science interactions; [they] let people see there are other kinds of science careers that are out there available. [SENCER]

I suppose that a lot of science museum organizations often have contacts and connections with many types of organizations within the community. . . . We seek funding from corporate sponsors as well as government agencies, and we have the public come through our doors, which doesn't usually happen at universities. We [also] have students from K-12 come through our doors; we interact with the media partly to promote our own programs, but partly because the media turns to us when a science issue comes up. So, there [are] segments of the community that science museums interact with in ways that might help a project. [ISE]

FORMAL SCIENCE EDUCATION PARTNERS

When asked what skills and resources the formal science education sector brings to a potential collaboration, about three-quarters of interviewees (primarily those from SENCER) said that formal science educators and researchers possess specialized content expertise and an understanding of how to interact with and facilitate science experiences for a young adult audience (see the first quotation below). About one-third (equal proportions from SENCER and ISE) also said that the formal science education sector provides informal science education with a young adult audience who can knowledgeably interact with the general public (see the second quotation). Several (primarily those from ISE) said that the formal science education sector can provide knowledge of the scientific process and the rigor involved in scientific research (see the third quotation). The remaining responses were idiosyncratic (i.e., provide data analysis tools not available in informal science education organizations, opportunities for the general public to be exposed to a college environment, and protection from politically charged issues).

I think that formal science educators are probably better poised to know about specific fields and what's happening in those fields. One of the problems with informal science education [is] if they spend a lot of money to develop something, it's going to be out of date in a couple of years, and they may not have the resources to actually know why it's out of date because they're not on top of [current knowledge]. Formal science educators can be quite narrow in their field, but they can also be quite up-to-date on what's going on and suggest ways of modifying exhibits or programs to make them more relevant, accurate, and up-to-date. [SENCER]

We have this event that's part of our informal science education network, and the event has a few talks in it, but mostly it's tabletop demonstrations of phenomena. . . . It takes a whole bunch of people standing in front of the demonstrations to help people understand what's going on. . . . And, it's useful to have somebody who's knowledgeable about the subject matter and maybe even working in the field so the students become a great resource because of their knowledge about the subject matter, and, at the same time, they're learning themselves how to do a better job of communicating with the public. [ISE]

(What might formal education bring to a potential partnership with informal science?) Some of it is related to the formality of evaluation and research. . . . If there is a research component to a SENCER-based organization, that's their mandate. Our mandate is not to do research on ourselves. When we can, it's great, but it's not our primary [mandate]. When we can link and partner with a mandated research organization, I think there's a benefit to both. (And what do you see the benefit as?) We all learn more. It's not just anecdotal evidence. It's someone with the time, skills, abilities and a mandate to do a good study. [ISE]

NEW LEARNING AND PERSPECTIVES

RK&A asked whether interviewees' perspective of the other sector (either formal or informal science) had changed or evolved as a result of the conference; for each result below, interviewees were equally distributed between SENCER and ISE. About three-quarters of interviewees said it had created a new awareness of the value of the other sector in general, empathy for the challenges and/or barriers that the other sector encounters, and/or clarified/concretized the potential opportunities for collaboration between the two sectors (see the first two quotations below). The remaining several interviewees said the conference confirmed and reinvigorated an existing belief that collaboration between the two sectors is a valuable endeavor (see the third quotation).

I've had some interaction with this community [informal science] before, but I think the conference let me interact with a lot more informal science educators looking at a variety of different problems and understanding what they are looking for out of the formal science system. (And what sense did you get of what they're looking for from you?) I think one of the things they're looking for [is] more than just bringing your students out for a day trip. . . . I think what they're looking for are long-range commitments where the students would actually be working on problems that [are] of interest to the informal side. [SENCER]

I think [I have a] better understanding and certainly greater empathy of what the faculty teaching science to non-science students are dealing with. Honestly, [I] hadn't really thought about them as a community. I certainly understand them as a community now, maybe not fully, but I've got a better grasp [that] there's an entity of people who have got a lot of similarities to what we do. [ISE]

I think the conference confirmed all along that there is a need for formal and informal science educators to get together to learn from each other and figure out how we can address multiple audiences so that a nature center display can inspire an eighth grader to ask his own questions and get interested in science, and from those methods, he comes to college and majors in conservation biology because of this experience. There's a whole body of literature around significant life experiences in children, so we have to provide kids these opportunities. [SENCER]

COLLABORATIONS RESULTING FROM THE CONFERENCE

RK&A asked interviewees to describe any collaboration that has resulted from the conference; for each result below, interviewees were equally distributed between SENCER and ISE. About one-half of interviewees discussed an existing partnership or idea that was honed through conversations with other participants at the conference (see the first quotation below). Another almost one-half discussed new formal-informal partnership ideas that were sparked as a result of the conference (a few are new partnerships with K-12 schools) (see the second quotation). A few ISE interviewees also discussed potential partnership ideas between informal science education organizations that resulted from their conference experience (see the third quotation), and a couple said they did not gain any new ideas for collaboration from their conference experience.

In one of the breakout groups that I was in, there were folks from [a formal science organization] who are part of a project on communicating climate change and who are conspiring <said in jest> with one of our employees here at the Museum about a workshop that will be coming up at the end of June. And that particular project idea is one that became part of the conversation on the last day when we were working on a particular project idea. And the SENCER and ISE components of my breakout group fed upon each other and developed more ideas about how this whole thing would work. I have no idea if anybody's following up on that particular possible connection. [ISE]

I came back with 13 people that are in different parts of the country, [and] I e-mailed their contact information and descriptions out of this [Passport to Networking] booklet which is wonderful. I just scanned the person's page and sent it off to the [various] directors saying, 'this is somebody that I met, this is what they're doing, and they're interested in talking to you.' I don't know how many of those have gone further, but I did get e-mails back from [some]

directors saying that they were really excited and hoping to make contact with these people. [ISE]

I had a lot of new ideas but they were mainly with other informal institutions. . . . One was a great conversation with the exhibits guy from [a science museum]. . . . We actually did follow up and traded e-mails. [We talked about] creating a traveling exhibit that would take a lot of time and research to work on. It was on [the] issue [of mental health], one of those big issues that people fight about and haven't really done a good exhibit on because it was too complicated. But, if someone actually thought through it and had good partners, it would be a nice contribution to the community. [ISE]

Those interviewees who described collaborations were in various stages of implementing these ideas; for each result below (except where indicated), interviewees were equally distributed between SENCER and ISE. About one-half had exchanged contact information with other conference participants and/or initiated some conversation around the idea post-conference (mostly initial contact through e-mail, although a few had conducted in-person meetings). About one-quarter had reflected on the idea, but have not taken any initial steps or initiated conversations with others. A few SENCER interviewees have begun moving forward with the collaboration (although all of these were existing collaborations).

BARRIERS ENCOUNTERED

Interviewees who had not begun conversations or planning around their ideas were asked to describe any barriers that have impeded them from taking next steps; for each result below, interviewees were equally distributed between SENCER and ISE. A few said lack of time and other commitments have hampered their ability to move forward; a couple said the geographic distance between organizations is a challenge (see the quotation below); and, a couple cited organizational transitions as a barrier. Other idiosyncratic responses included that their organization operates on a national rather than a local level, lack of funding, and technological glitches.

I came up with I think 12 individuals, five [from] other science centers, and seven from formal education, and basically started to conceptualize what we might learn from each other or how we might work together. I put [these ideas] in a paragraph and sent them off. I got two responses out of the 12. There was one individual at the conference who was heavily into [a certain science subject matter] and the interpretation of [that subject] for the public, and we have an exhibit that [also deals with that subject]. I saw, even though there are 3,000 miles between the two institutions, that there might be an opportunity. I guess the message [is] that the distance may be the greatest barrier unless a specific opportunity comes up. [ISE]

INTERVIEW GUIDE

Preamble: I will be asking you a series of questions about the SENCER-ISE conference, particularly the idea of forging connections between informal science education and the SENCER program. I will be seeking your opinions and perspectives as well as asking questions about any actions that have been taken or plan to be taken as a result of the conference. RK&A will be preparing a written report. To facilitate analysis of the data, I would like to audio-record our conversation. Your comments will be confidential and not associated with your name. May I use an audio-recorder?

1. One goal of the conference is that formal science education and informal science education to compare their approaches to further civic engagement around STEM content. Based on your experience at the conference, what are some practices and models that formal and informal share to facilitate civic engagement in science? In other words, what practices, if any, are similar between the two sectors?

2. What differences, if any, do you see between the practices of the two sectors?

(If differences are mentioned): Which are obstacles for collaboration across these sectors? Which are opportunities for collaboration?

Among the obstacles, which ones might be flexible or adaptable so informal and formal science education can grow a meaningful collaboration? (Probe for clarification)

What specific strategies do you suggest for overcoming obstacles?

3. Issues of civic engagement and civic responsibility are the platform for introducing people to science and encouraging science understanding—whether in the university or science museum or other informal learning organization.

What might be the obstacles and/or opportunities in using civic engagement and civic responsibility as the platform for advancing science understanding? Can you first address the obstacles?

How about the opportunities?

4. Each sector has skills and resources that support STEM science learning through civic engagement initiatives. What skills or resources might an informal science organization bring to a potential SENCER or other higher education partnership?

What skills and resources might a formal higher education learning institution bring to a potential partnership with informal science education organizations?

5. Based on your conference experience and interactions after the conference, in what ways, if at all, has your perspective of (informal science education / formal science education) changed or evolved? (Probe for clarification)

6. My last question is about another goal of the conference—to map possible collaborations between formal and informal science educators in an effort to transform each community's approach to STEM education.

Can you talk about any steps you have taken that speak to that goal? For example, have you initiated any partnerships, or do you have any intention to pursue a partnership or collaboration for science education programming using civic engagement?

(If steps have been taken): Can you talk more about your project?

(If steps have not been taken): Can you talk about why you have not pursued a collaboration?

I do not have any further questions. Do you have any questions for me? Thank you so much for your time.