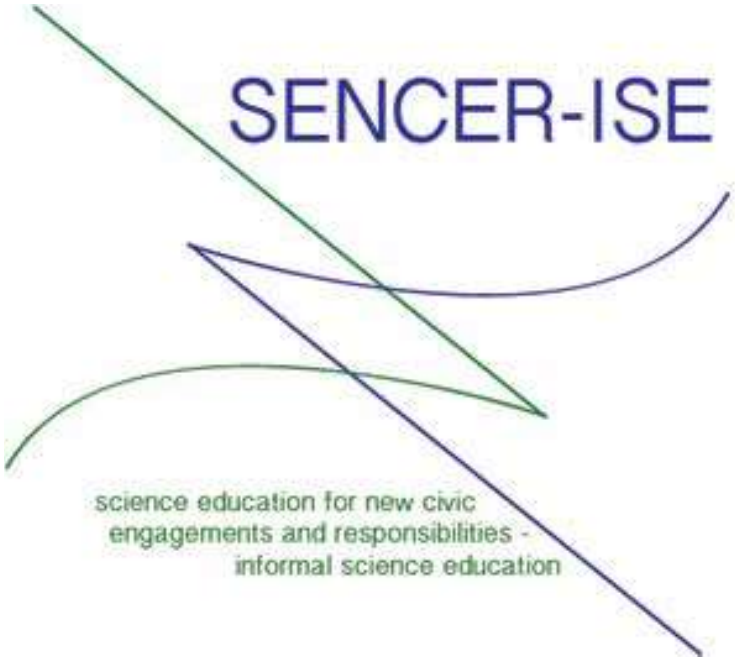
IMPACT PLANNING – EVALUATION – AUDIENCE RESEARCH



SUMMATIVE EVALUATION:
SENCER-ISE Project

Prepared for the
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TABLE OF CONTENTS

SUMMARY AND DISCUSSION

The National Center for Science and Civic Engagement (NCSCE) contracted Randi Korn & Associates, Inc. (RK&A) to conduct a summative evaluation of its SENCER-ISE project partnerships. SENCER-ISE is an initiative that brings partners from higher education (HE) together with partners from informal science education (ISE) to create projects that engage audiences in science using the lens of civic engagement. SENCER funded 10 partnerships over three years—six through the National Science Foundation (DRL #1237463) and four through the Noyce Foundation. The summary on the next page highlights key findings by study objective, of which there are four. The discussion that follows the summary expands on those key findings.

SUMMARY BY OBJECTIVE

OBJECTIVE 1: HE AND ISE PROFESSIONALS INCREASED THEIR UNDERSTANDING OF EACH OTHER'S EXPERTISE

- Several interviewees spoke about their partner's extensive knowledge and skills. HE interviewees spoke about their ISE partner's science communication skills, and ISE interviewees spoke about their HE partner's research knowledge.
- A few interviewees said they gained a greater understanding of the structure of higher education or informal science organizations, including the barriers or constraints their partners face.

OBJECTIVE 2: HE AND ISE PROFESSIONALS APPRECIATE THE VALUE OF EACH OTHER'S WORK & EXPERTISE

- Many interviewees said they would not have been able to accomplish project goals without their partner's access to and knowledge of working with a particular audience, such as undergraduates or K-12 teachers and students.
- Several interviewees (mostly from ISE) said they gained knowledge about the research their HE partners are conducting and an appreciation for how research can legitimize and support the work that they do.
- Several interviewees spoke about their partner's organizational context and resources as a strength (e.g., ISE praised their HE partners' access to analytic resources; HE praised their ISE partners' access to a real-world context).

OBJECTIVE 3: HE AND ISE PROFESSIONALS UNDERSTAND ELEMENTS OF DURABLE PARTNERSHIPS

INTENTIONAL GOALS THAT ALIGN WITH EACH PARTNER'S ORGANIZATIONAL MISSION

- Many interviewees said that partners need to share common goals and have a passion for the project. For instance, many partners shared a common passion for environmental protection and advocacy.

CLEAR ARTICULATION OF EACH PARTNER'S ROLES AND RESPONSIBILITIES

- Several interviewees talked about the importance of strategic planning at the outset of a partnership. Interviewees discussed clearly defining roles, responsibilities, and expectations.
- Interviewees discussed defining these roles and responsibilities so they leverage the strengths of each partner.

PATIENCE AND FLEXIBILITY TO ALTER ROLES AND RESPONSIBILITIES AS CONDITIONS CHANGE

- Several interviewees talked about being open to change or course correction if a project or partnership is not achieving its original goals.

- Interviewees tended to speak about flexibility as a personality trait (whether someone is flexible and open-minded). However, interviewees also talked about the importance of reflection in determining whether changes are needed.

CONSISTENT AND CLEAR COMMUNICATION

- Many interviewees said that establishing clear and consistent communication is paramount to a successful partnership.
- Some spoke about communication as a personality trait (i.e., whether someone is a naturally good communicator); others spoke about the importance of establishing mechanisms for clear communication (phone and in-person conversations instead of e-mail) as well as a consistent timeline (weekly, monthly, etc.).

OTHER IMPORTANT ELEMENTS

- Many interviewees underscored the importance of personal relationships when establishing a successful partnership, including a foundation of shared passions and complementary working styles.
- Several interviewees mentioned resources but specifically *adequate* resources to allow each partner to contribute the necessary amount of time to result in a successful project.
- A few said partnerships need time to work out kinks and see results. These interviewees also discussed the importance of funders recognizing that time (at least a few years) is necessary to create a successful project.

OBJECTIVE 4: OTHER HE/ISE PROFESSIONALS VALUE THE PARTNERSHIP

- Several interviewees talked about other faculty or students who became interested in collaborating with the ISE partner or in the SENCER model for their course.
- A few interviewees said their project collaboration brought them recognition or credibility from other departments or individuals. In one case, this recognition brought additional funding.

OBJECTIVE 1: UNDERSTANDING EACH OTHER'S EXPERTISE

A primary emphasis of interviewees' discussion of their HE or ISE partner centered around attitudes, appreciating their partner's expertise (see objective 2 below). However, some interviewees discussed how they increased knowledge of their partner's expertise. Several interviewees spoke about their partner's extensive knowledge and skills. HE interviewees spoke about their ISE partner's science communication skills, and ISE interviewees spoke about their HE partner's research knowledge. For instance, one HE partner spoke extensively about how his approach to PowerPoint presentations has changed significantly due to the ISE partner's presentation to his students about effective science communication. And, one ISE partner spoke about how she learned a lot about early childhood development from her HE partner who does extensive research in that area. She also spoke about how it legitimized her work designing interpretation and programming for young children and their families.

OBJECTIVE 2: APPRECIATING EACH OTHER'S EXPERTISE

As noted above, the primary emphasis of interviewees discussion of their HE or ISE partner revolved around an appreciation of their partner's strengths, both personal and professional. In other words, many interviewees already knew of their HE or ISE partner's area of expertise and the SENCER-ISE grant provided another opportunity for them to utilize this expertise, resulting in a deepened appreciation for what their HE or ISE partner could bring to a partnership. Many interviewees said they would not have been able to accomplish project goals without their partner's access to a particular audience, such as undergraduates or K-12 teachers and students. For instance, several ISE partners noted that their organizations have not worked successfully with the undergraduate audience in the past. They explained that their HE partners provided them with access to that audience, and the SENCER-ISE grant provided a meaningful lens through which to work with them—civic engagement.

Further, several interviewees (mostly from ISE) said they gained knowledge about the research their HE partners are conducting and an appreciation for how research can legitimize and support the work that they do. Two ISE partners (both of whom are educators) expanded on this idea to note that they gained respect from colleagues in their organization because their SENCER-ISE project integrated cutting-edge research from an HE organization.

OBJECTIVE 3: FACTORS OF DURABLE PARTNERSHIPS

Overall, partners perceive their partnerships and the resulting projects as successful. Even though a handful of partnerships experienced staff turnover, most of the partnerships persevered (or are persevering) on to the end of the grant. Partners indicated high interest in working with their partner again, either on the current or a different project (mean is 6.7), and about one-half of partners described concrete plans to do so. Those who do not have concrete plans to work

again with their partner cited lack of additional funding (rather than lack of interest) as the primary reason.

Based on partners' SENCER-ISE experience, partners identified several factors that are necessary for creating a durable partnership; some factors are within the control of a funder like SENCER and others are not. These factors include, in order of most- to least-frequently mentioned:

1. COMMON GOALS AND PASSIONS

Many interviewees said that partners need to share common goals and have a passion for the project. In the case of the SENCER-ISE partnerships, many partners shared a common passion for environmental protection and advocacy. Interviewees frequently spoke about their partner's passion for a particular audience, subject matter, etc., as a strength that contributed to the success of the partnership. Many partners also shared an appreciation for using civic engagement as a strategy to engage audiences in science. Structuring the SENCER-ISE grant around civic engagement may have contributed to bringing like-minded partners together.

2. CLEAR AND CONSISTENT COMMUNICATION

Many interviewees said that establishing clear and consistent communication is paramount to a successful partnership. While some spoke about communication as a personality trait (i.e., whether someone is a naturally good communicator), others spoke about the importance of establishing mechanisms for clear communication (phone and in-person conversations instead of e-mail) as well as a consistent timeline (weekly, monthly, etc.). Perhaps not surprising given the frequently-cited challenge of time, questionnaire findings show that partners primarily used e-mail communications followed by telephone conversations and in-person meetings, though they rated their in-person meetings as most effective (mean = 6.8 on the questionnaire).

3. PERSONAL CHEMISTRY

Many interviewees found that connecting with their SENCER-ISE partner on a personal level through shared passions and complementary working styles resulted in a successful and potentially sustainable partnership. So, while many discussed having a mutual respect for one another's professional skills and expertise, what sometimes seemed more important was the personal relationship that developed between partners based on common interests and personal chemistry. Whether two partners have personal chemistry is ultimately outside of SENCER's control; however, what is in SENCER's control is ensuring that proposed partners have a solid history of working together prior to offering the partnership a grant.

4. PLANNING

Several interviewees talked about the importance of strategic planning at the outset of a partnership. Interviewees discussed clearly defining roles, responsibilities, and expectations. Similarly, interviewees discussed defining roles and responsibilities so that they leverage the strengths of each partner. From the formative evaluation, we know that having time—

structured and unstructured—to plan at the SENCER Summer Institute was helpful to partners; several even wanted more *unstructured* time to plan given their hectic job schedules.

5. REFLECTIVE PRACTICE

Several interviewees talked about being open to change or course correction if a project or partnership is not achieving its original goals. Interviewees tended to speak about this as a personality trait (whether someone is flexible and open-minded). Interviewees also talked about the importance of reflection in determining whether changes are needed. For many, reflection was achieved over time, discussion with their partner, and a shared commitment to their project. However, findings also suggest that the structure of the SENCER-ISE grant contributed to opportunities for reflective practice. Although not explicitly stated, several interviewees discussed learning from challenges in the first year and actively addressing them (or planning to address them) in the second and third years, suggesting the three-year timeline is beneficial. A few interviewees also said the structure of the grant (regular check-ins and reporting) helped them reflect on challenges and persist towards identifying solutions to challenges.

6. RESOURCES

Several interviewees mentioned resources but specifically having *adequate* resources to allow each partner to contribute the necessary amount of time to result in a successful project. A few interviewees said the SENCER-ISE grant funding helped address challenges related to capacity or legitimized their time away from other institutional activities. When it comes to the sustainability of partnerships, available resources seem to play a significant role regardless of partners' commitment to the project or one another. One-half of partnerships did not have concrete plans to sustain the existing SENCER-ISE project partnership, and this was primarily due to available funds. However, many had plans to continue their HE-ISE relationship in a capacity unrelated to SENCER-ISE.

OBJECTIVE 4: OTHERS VALUE THE PARTNERSHIP

Objective 4 is difficult to achieve because it involves affecting HE and ISE professionals outside those participating as principal investigators on the SENCER-ISE grant. Understandably, many partners are still working on implementing and assessing their SENCER-ISE project and, given all their other roles and responsibilities, have not had the chance to disseminate the value of their partnership and project. However, several interviewees talked about other faculty or students who became interested in collaborating with the ISE partner or in the SENCER model for their course. Most of this interest happened organically, through word-of-mouth or informal conversations, not necessarily through a formal effort to do so. Still, this effect cannot be discounted. For instance, one HE partner is now collaborating with another department in the ISE organization to develop effective early childhood exhibits. Further, a few interviewees said their project collaboration brought them recognition or credibility from other departments or individuals (see the example in objective 2 related to research legitimizing the work of educators).

STUDY BACKGROUND

The National Center for Science and Civic Engagement (NCSCE) contracted Randi Korn & Associates, Inc. (RK&A) to conduct a summative evaluation of its SENCER-ISE project partnerships. SENCER-ISE is an initiative that brings partners from higher education (HE) together with partners from informal science education (ISE) to create projects that engage audiences in science using the lens of civic engagement. SENCER funded 10 partnerships over three years—six through the National Science Foundation (DRL #1237463) and four through the Noyce Foundation. Previously, RK&A conducted a formative evaluation of the partnerships, exploring the successes and challenges of the infrastructure SENCER created to support partnerships (RK&A, 2014). The summative evaluation explores achievement of project outcomes and lessons learned from the project partnerships. RK&A collected data from partners using in-depth interviews and an online standardized questionnaire.

Specifically, the summative evaluation explores whether HE and ISE professionals[1]:

- Increased their understanding of each other's field of expertise, either HE or ISE.
- Appreciate the value of each other's work and expertise, either HE or ISE.
- Increased their understanding of what creates a durable partnership, including:
  - Needing intentional goals that align with the mission of each partner's organization that cannot be met without the combined strengths of the other partner.
  - Clear articulation of each partner's roles and responsibilities, ideally through a written agreement that outlines each partner's time and resource commitments.
  - Patience and flexibility so partners can alter their roles and responsibilities as the conditions of the partnership change.
  - Maintaining clear communication about each partner's organizational culture and goals, including discussing potential challenges that may limit the success of the partnership.

[1] While these are the evaluation objectives, one can easily see what the project aspired to achieve in how the objectives are expressed. As such, the evaluation objectives can also serve as a list of the project's outcomes.

- Consistent and clear communication and decision-making between partners.

- The summative evaluation also explores whether HE and ISE professionals not directly related to the project realize the value of the formal/informal education collaboration.

METHODOLOGY

RK&A used a mixed-methods approach to explore the above objectives—in-depth interviews and standardized questionnaires. The value of using a mixed-methods approach is that different data collection strategies offer different vantage points and levels in which to understand partners' experiences.

IN-DEPTH INTERVIEWS

In-depth, qualitative interviews are open-ended and encourage interviewees to express their opinions, understandings, and meanings they construct. They are valuable because they allow partners to express themselves using language and words of their choosing (as opposed to the language of the evaluator or researcher). Additionally, the interviewer is able to ask probing or clarifying questions to better understand partners' experiences.

RK&A conducted 18 interviews with project partners; four partners were unavailable. SENCER provided RK&A with a list of project partners and their contact information. RK&A e-mailed each partner individually and scheduled telephone interviews. Partners were asked a series of questions about their experiences with the SENCER-ISE project collaboration (see the interview guide in Appendix A). All interviews were audio recorded with partners' permission and transcribed to facilitate analysis.

The interviews produced descriptive data that were analyzed qualitatively, meaning that the evaluator studied the data for meaningful patterns and, as patterns and trends emerged, grouped similar responses. Where possible, partners' verbatim language (edited for clarity) is included to exemplify trends. Within quotations, the evaluator's comments appear in parentheses.

STANDARDIZED QUESTIONNAIRE

Questionnaires are useful because they collect standardized information from respondents. In a previous evaluation of the SENCER-ISE conference, which initially brought HE and ISE professionals together to discuss science engagement, RK&A designed a set of statements about HE and ISE professionals' perceptions of the best environments in which to learn science. The questionnaire included those statements in addition to other multiple-choice and rating-scale questions about partners' collaboration experiences (see Appendix B). The questionnaire was administered through SurveyMonkey©, an online survey platform. RK&A emailed an online survey link to all project partners; partners completed the questionnaire before (pre-questionnaire) and towards the end of their collaboration experience (post-questionnaire).

Questionnaire data were analyzed quantitatively using SPSS 20 for Windows, a statistical package for personal computers. Quantitative data from questionnaires are reported in graphs with explanatory text. The objectives of the study, as well as our professional experience, were used to inform the analyses, which include descriptive and inferential methods.

DESCRIPTIVE

Frequency distributions were calculated for all categorical variables (e.g., organization type). Summary statistics, including the mean (average) and standard deviation (spread of scores: "±" in tables), were calculated for variables measured at an interval level (e.g., rating scales).

INFERENTIAL

Inferential statistics were used to examine differences by variables. A 0.05 level of significance was employed to preclude findings of little practical significance.[2] To examine the relationship between two categorical variables, cross-tabulation tables were computed to show the joint frequency distribution of the variables, and the chi-square statistic (X^2) was used to test the significance of the relationship.

To test for differences in the mean *ratings* of two or more groups (pre- and post-questionnaire results; HE and ISE professionals), an analysis of variance (ANOVA) was performed and the F-statistic was used to test the significance of the difference.

[2] When the level of significance is set to $p = 0.05$, any finding that exists at a probability (p-value) ≤ 0.05 is "significant." When a finding (such as a relationship between two variables) has a p-value of 0.05, there is a 95 percent probability that the finding exists; that is, in 95 out of 100 cases, the finding is correct. Conversely, there is a 1 percent probability that the finding would not exist; in other words, in 5 out of 100 cases, the finding appears by chance.

INTERVIEW FINDINGS

DISTINCT CHARACTERISTICS OF SENCER-ISE PARTNERSHIPS

Interviewees identified two primary ways that their SENCER-ISE partnership was distinct from other partnerships they have had.

(1) SENCER-ISE formalized HE-ISE partnerships: Many interviewees discussed the ways in which the SENCER-ISE grant opportunity formalized an existing or desired relationship between a higher education institution and an informal science organization. Specifically, interviewees said the partnership was more structured than other partnerships in terms of outcomes and the planning process they underwent to achieve their project goals; for example, they attended regularly scheduled meetings and had formalized roles.

FORMALIZED THE PARTNERSHIP

"I think we're being more intentional and persistent in terms of finding opportunities to support each other's work . . . it's probably what we've done other places but [with] a greater focus or being more explicit in terms of outcomes." [HE partner]

(2) SENCER-ISE established long-term relationships: A few interviewees also discussed the partnership as less about having an individual project and more about establishing a long-term relationship between the two types of organizations—higher education and informal science.

LONG-TERM RELATIONSHIPS

"I've done partnerships, in the past, with various faculty and universities. I think the difference with this one is we're viewing it not as project-specific. In other words, when we start out with the concept planning piece, that's project-specific: we're looking for advice on the science content and what we do with the exhibit, and are we accurate, and where is it going? Then, the concept plan gets finished, it goes into production, we develop an exhibit, and it hits the floor. . . . But, what we recognized differently was that, because the field of [genomics] is rapidly evolving, we needed a continual relationship with the research community, and [the SENCER-ISE grant] provided that mechanism." [ISE partner]

SUCCESSFUL ASPECTS OF PROJECT COLLABORATIONS

Three key successes rose to the top for project partners.

(1) Built project audiences' knowledge and skills: One-half of interviewees discussed the most successful aspect of their project collaboration as achieving desired results for their audiences. For example, interviewees said undergraduate students gained essential skills in real-world collaboration, effective science communication, and environmental advocacy.

(2) Established successful partnerships: Several interviewees discussed the most successful aspect of their project collaboration as the partnership itself. Specifically, interviewees spoke about the relationships they built with their partners and how well their goals and passions aligned to create a successful project that has the potential to be sustainable.

(3) Offered a civic engagement platform: Several interviewees said the most successful aspect of the project collaboration was that it used civic engagement as the platform to engage audiences in science. Interviewees spoke to the power of connecting real-world issues to science content and the scientific research process. For example, several interviewees said audiences' engagement was heightened by the opportunity to communicate the applicability of their research findings to community stakeholders, many of whom took action based on their results.

AUDIENCE IMPACT

STUDENTS' SKILLS

"The students rose to the challenge, and it was really impressive. They're really excited now that they're as good as they are [at communicating climate science]. [They] stood out [as] really noteworthy at the festival compared to the other presenters. [Their presentations] were well a notch above, so they realize now how good they are and how they learned it. So they even say, 'We need to do more of this at the college and spread it around to more students.' And, the people in the audience loved it, partly [because of] the inspiration of seeing young people become so articulate, well informed, and engaged in the community. It brought in members from a wide cross-section of where we live and got them involved in the festival but also in the presentations and the material and got people talking about climate change in these groups." [HE partner]

STUDENTS' CAREERS

"Another [successful] aspect of this project is that students come over here and observe the naturalists on the trail so it's exposure to informal science education as a career path, and I think that has been really valuable for the students." [ISE partner]

SENCER'S ROLE

Interviewees named three main ways that SENCER contributed to the successes named above.

(1) Legitimized the partnership: While several partners had existing relationships, many said the SENCER-ISE grant legitimized the partnership in a way that led to its success. Specifically, the grant empowered partners to take time away from other responsibilities by providing necessary funds. Interviewees also said the SENCER brand helped legitimize the partnership to internal (leadership) and external (additional funders) stakeholders.

(2) Provided the civic engagement platform: Many interviewees praised the SENCER model of using civic engagement as the platform for engaging audiences in science. For most, this concept was introduced through the grant but also at the SENCER Summer Institute.

(3) Facilitated project learning: A few interviewees credited the reporting requirements of the grant for facilitating their own project reflection, which has led to project improvement over the life of the grant.

CIVIC ENGAGEMENT PLATFORM

"From just looking at the other projects and learning about the other projects in my cohort, it seems like [our] project was true to what SENCER's philosophy is, the way SENCER first started. We're not going to keep science in a bubble or a laboratory, but we're going to actually apply it. I never knew that SENCER existed so when I was writing the grant, and then we went to the workshop before the project really kicked off to learn more about the philosophy, and the history behind it, and how it's been used to add another dimension to college courses, that was cool, and that's what made this class so successful, that idea, that philosophy." [ISE partner]

CHALLENGING ASPECTS OF PROJECT COLLABORATIONS

Interviewees named several challenges, some within and others outside of SENCER's control.

(1) Time management: Many interviewees brought up the challenge of time management and juggling their many job responsibilities in addition to the SENCER-ISE project. Some of their job responsibilities included other partnerships and grants.

(2) Organizational differences: Several interviewees brought up the differences between the cultures and structure of higher education and informal science organizations. While some couched these differences as challenges that significantly affected their project collaboration, others acknowledged them as known challenges that were easily overcome. For instance, some interviewees talked about differing attitudes towards teaching and learning that had (or still need) to be overcome. Others talked about logistical challenges such as misaligned academic and informal science education schedules that were challenging but ultimately overcome without much difficulty.

ORGANIZATIONAL DIFFERENCES

"I think one of the challenges is the timing of reporting and pulling information together. The college is on a school year, and a school doesn't exactly coincide with the timing of having to do surveys and training volunteers. This past year was especially difficult because the college had a lot of snow days, so the whole preparation of presentations was delayed." [ISE partner]

(3) Partnership sustainability: A few interviewees discussed the difficulties associated with sustaining the partnership long term. And, while a handful of partnerships had staff turnover, this was not the primary reason for this challenge. Instead, these interviewees cited reasons such as the availability of additional funding, buy-in from leadership or other stakeholders in their institutions, and time. In fact, strong relationships between partners were forged amid staff turnover, and new staff kept many of these partnerships afloat.

(4) Accessibility of resources: A few interviewees discussed the lack of accessible resources, such as evaluation assessment tools to evaluate their project, as a challenge.

(5) Grant responsibilities: As with the formative evaluation, a few interviewees, again, discussed the amount of reporting back to the SENCER-ISE office and other requirements required for the grant as challenging.

(6) Audience challenges: A few interviewees talked about challenges associated with specific audiences such as teachers or students. For instance, interviewees said that the administrative red tape associated with K-12 teachers can pose logistical challenges for a project if the primary audience is K-12 teachers and their students.

SENCER'S ROLE

While most interviewees said they worked through their project challenges independently or with their partner, a few named ways that SENCER helped them. As clarification, many interviewees said they did not actively seek out help from SENCER because they perceived their challenges as normal to any partnership and could work through them on their own.

(1) Grant structure: Although not explicitly stated, several interviewees discussed learning from challenges in the first year and actively addressing them (or planning to address them) in the second and third years, suggesting the three-year timeline is beneficial. A few interviewees also said the structure of the grant (regular check-ins and reporting) helped them reflect on challenges and persist towards identifying a solution.

(2) Funding: A few interviewees said the grant funding helped address challenges related to capacity or legitimized their time away from other institutional activities.

(3) Assessment tools: A few interviewees said SENCER provided them with resources or assessment tools they could use to evaluate their project.

ASSESSMENT TOOLS

"SENCER helped with—I don't remember which call it was, but there was one where they provided information—because we were asking about assessment. I think I asked, specifically, and I think others had, as well. . . . So that helped put us on the trail of what other rubrics are out there, that have been created through other universities or similar projects that might be helpful for us to modify or use." [ISE partner]

LEARNING FROM THE PARTNERSHIP

Interviewees described several ways they learned from the project partnership.

(1) Demonstrated effective strategies for engaging audiences in science: While not top-of-mind for all interviewees, RK&A probed about whether interviewees gained perspective about how to engage audiences in science. Many said the power of civic engagement was reinforced or concretely demonstrated through their projects as a strategy for engaging audiences. Interviewees also discussed this idea in terms of increasing the relevancy of a program's format and environment to audiences as well as the importance of experiential learning and/or direct experience.

(2) Bolstered understanding new audiences: Several interviewees said they were exposed to new audiences, such as undergraduate students, teachers, and/or youth. Through this exposure, interviewees said they gained an appreciation for the capabilities of these audiences and how to effectively work with them. For instance, interviewees were pleasantly surprised by the work ethic and interest of undergraduate students as well as the passion of school teachers.

(3) Gained knowledge of research: Several interviewees (mostly from ISE) said they gained knowledge about the research their HE partners are conducting and an appreciation for how research can legitimize and support the work that they do.

RELEVANCE AND ENVIRONMENT

"I think that one of the things that I certainly learned from this process is that we've talked for years [about] teens need[ing] something to matter and not doing an experiment for the sake of doing an experiment. And seeing the students get excited when their results either match or don't match the previous cohort's results was really cool. We've been pretty strict about having our audiences in our parks versus out in the neighborhoods or the city . . . [but] we didn't really do that with this [project]. We did a bird species richness and abundance study in two [city] neighborhoods and a comparison of lower socioeconomic status neighborhoods versus higher." [ISE partner]

(4) Gained understanding HE or ISE organizations: A few interviewees said they gained a greater understanding of the structure of higher education or informal science organizations, including the barriers or constraints they face. For instance, interviewees spoke about learning the best strategies for creating buy-in among leadership and the availability of organizational resources.

CIVIC ENGAGEMENT AS A STRATEGY

"[Students] really appreciated the opportunity to apply what they were learning immediately and as a part of the class to doing something about it, in the world and in their own particular community that they grew up in or very close to it. And I think that's really the heart of what SENCER strives for in a lot of ways. I think of the name of SENCER [as having contributed to] the way I interpreted it, science education for civic engagement and responsibility." [HE partner]

PARTNERS' PERCEIVED STRENGTHS

While RK&A probed interviewees to talk about their partner's strengths towards the end of the interview, interviewees discussed these strengths of their own accord much earlier in the interview process.

(1) Possess desirable personal characteristics and a complementary working style: Many interviewees discussed the strong relationship they built with their partner. While some interviewees had an existing, positive relationship, others built strong relationships with their partners throughout the process. Much of what interviewees had to say about their partners was about desirable personal characteristics and working styles. For instance, interviewees praised their partner's passion, open-mindedness, creativity, communication skills, and work ethic.

BUILDING RELATIONSHIPS

"I think one [strength] is her passion for education, not only of her students, which I think is very true, but she also has a passion and commitment to the education of young children and their families. . . . We've become very good friends as a result of this process. If you spend enough time with somebody, you either become friends or you don't. . . . She's just been an easy person to work with, interesting and fun and all the things that you might want in a friend." [ISE partner]

(2) Have access to audiences: Many interviewees also said that they would not have been able to accomplish project goals without their partner's access to and knowledge of working with a particular audience, such as undergraduates or K-12 teachers and students.

(3) Have an established context and resources: Several interviewees spoke about their partner's organizational context and resources as a strength. For instance, interviewees from ISE praised their HE partners' access to analytic resources and established curricular context. Likewise, interviewees from HE praised their ISE partners' access to a real-world context in which to apply their curriculum, including well-established programming.

ACCESS TO AUDIENCES

"[It] was the perfect collaboration because they enabled the K-12 audience to participate by providing the transportation and bringing them down to the shorelines. [Our partner] went with all these school groups and coordinated all that stuff, and we focused on the science of it, and then bringing it into our classrooms and then trying to exchange ideas there. That was one of their strengths, knowing how to coordinate with those K-12 partners. They do it better than I could have." [HE partner]

(4) Possess knowledge and expertise: Several interviewees also spoke about their partner's extensive knowledge and skills. Interviewees from HE often spoke about their ISE partner's science communication skills, and interviewees from ISE often spoke about their HE partner's extensive research knowledge. For example, one interviewee talked extensively about how his partner taught him how to create and deliver an effective and compelling PowerPoint presentation.

CHARACTERISTICS OF SUCCESSFUL PARTNERSHIPS

Based on their SENCER-ISE partnership experience, interviewees spoke about several characteristics that define successful partnerships.

(1) Common goals and passions: Many interviewees said that partners need to share common goals and have a passion for the project. For instance, many partners shared a common passion for environmental protection and advocacy.

(2) Clear and consistent communication: Many interviewees said that establishing clear and consistent communication is also paramount to a successful partnership. While some spoke about this as a personality trait (i.e., whether someone is a naturally good communicator), others spoke about the importance of establishing mechanisms for clear communication (phone and in-person conversations instead of e-mail) as well as a consistent timeline (weekly, monthly, etc.).

CONSISTENT COMMUNICATION

"I think communication is critical, figuring out a way of having a formal, 'We're going to put this on our schedule for once a week for an hour,' and if we have nothing to talk about, great. We'll just touch base and say, 'There's nothing.' Just to have that formality so it doesn't slide." [ISE partner]

(3) Personal chemistry: Many interviewees underscored the importance of personal relationships when establishing a successful partnership. Many found that connecting with their SENCER-ISE partner on a personal level through shared passions and complementary working styles resulted in a successful and potentially sustainable partnership.

(4) Planning: Several interviewees talked about the importance of strategic planning at the outset of a partnership. Interviewees discussed clearly defining roles, responsibilities and expectations. Similarly, interviewees discussed defining these roles and responsibilities so that they leverage the strengths of each partner.

(5) Flexibility: Several interviewees talked about being open to change or course correction if a project or partnership is not achieving its original goals. Interviewees tended to speak about this as a personality trait (whether someone is flexible and open-minded). However, interviewees also talked about the importance of reflection in determining whether changes are needed.

PLANNING ROLES

"I think respecting each other's area of expertise and making it really clear where in the program, where in the schedule each individual's going to have a leadership role or a responsibility or a deliverable because what we thought that looked like is different than what it looks like in reality." [HE partner]

(6) Resources: Several interviewees mentioned resources but specifically *adequate* resources to allow each partner to contribute the necessary amount of time to result in a successful project.

(7) Time: A few interviewees said that partnerships need time to work out kinks and see results. These interviewees also discussed the importance of funders (like SENCER) recognizing that time (at least a few years) is necessary to create a successful project.

(8) Organizational support: Two interviewees discussed the importance of establishing partnerships at the organizational (rather than individual) level, and, along with that, gaining leadership's support for the partnership.

SUSTAINABILITY OF PARTNERSHIPS

Interviewees spoke about sustainability on three different levels—continuation of their SENCER-ISE project, collaborating on non-SENCER-ISE projects with the same partner, and new partnerships with another HE or ISE organization.

(1) Continuation of SENCER-ISE project: About one-half of the project partnerships have plans to continue the current SENCER-ISE project. The partnerships that plan to continue have found or have leads on additional funding sources.

(2) Collaboration on non-SENCER-ISE projects: Most partners had concrete ideas about how they could continue working with their partner on non-SENCER-ISE projects. Some of these projects are already underway, while others are in the idea stage. The projects range from collaborating with their partner on developing museum exhibitions to additional undergraduate courses that utilize a civic engagement model to additional education or career-related opportunities for undergraduate students (e.g., internships).

NON-SENCER-ISE COLLABORATIONS

"In the case of [my partner], he's the head naturalist interpreter so they have displays that have to do with the [area we live in], natural history, and climate change, and that's my specialty. So I'm going to be helping update some of the displays, and we're also going to try to set up a TED Talk event next year, so I'll be helping them do that."
[HE partner]

(3) New partnerships with HE or ISE organizations: Many interviewees spoke about partnerships with HE or ISE that already existed or exist in tandem with the SENCER-ISE project. Several interviewees spoke about new HE or ISE partnerships, including the incorporation of a new ISE partner in another undergraduate course and/or collaborating with researchers for another ISE program or exhibition.

ORGANIZATIONAL EFFECTS OF PARTNERSHIPS

About one-half of interviewees discussed some effect of their partnership on their organization.

(1) Interest from additional stakeholders or audiences: Several of these interviewees talked about other faculty or students who became interested in collaborating with the ISE partner or in the SENCER model for their course. For instance, faculty from one college participated in a community outreach event organized by students, and a partner who is a researcher is now collaborating with another department at the ISE organization to design an exhibition space.

(2) Recognition from organizational stakeholders: A few of these interviewees said their project collaboration brought them recognition or credibility from other departments or individuals. In one case, this recognition brought additional funding.

(3) Approach to other partnerships: Two interviewees also said their SENCER-ISE partnership affected their organization's approach to partnerships with HE or ISE partners. For example, one interviewee said their organization recognized the value of using an ISE partner to promote a civic engagement platform.

INTEREST FROM OTHERS

"The excitement grew in certain circles . . . students from environmental studies who need to take chemistry courses sometimes are reluctant because it's not necessarily their strength, and so they were asking to take the accelerated course because of the toxicology lab, and then understood that they would have to ramp up and work hard to keep up with course material. . . . So, they [were] choosing to step up because of the content [connections]. So, I think in that way, [the project] had a very good impact on the [college] environment." [HE partner]

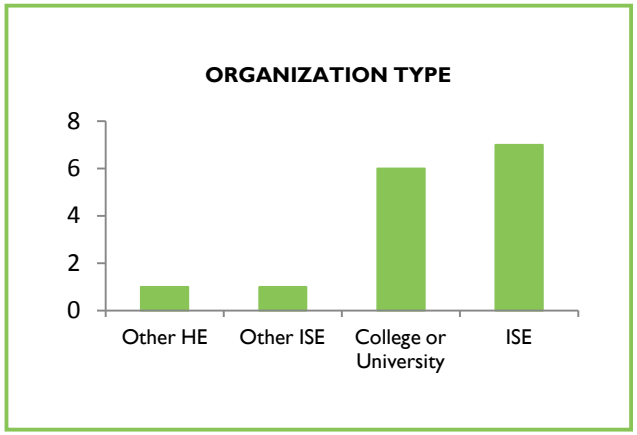
QUESTIONNAIRE FINDINGS

INTRODUCTION

Individuals in SENCER-ISE project partnerships completed a standardized questionnaire before participating in the SENCER-ISE project (pre) and towards the end of completing the project (post). Twenty partners completed the pre-questionnaire and 15 partners completed the post-questionnaire. Findings in this section are from the post-questionnaire; comparisons are made to pre-questionnaire responses where relevant. There are no significant differences between the responses of HE and ISE professionals.

DESCRIPTION OF RESPONDENTS

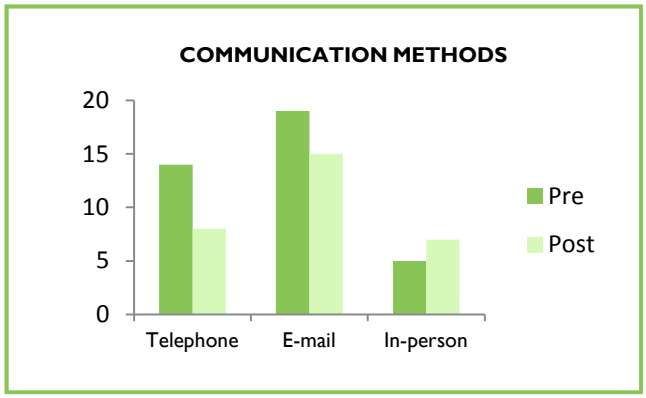
About one-half of respondents work in ISE organizations and the other one-half work in HE organizations. All respondents indicated that they worked with the other sector prior to the SENCER-ISE partnership.



COMMUNICATION METHODS

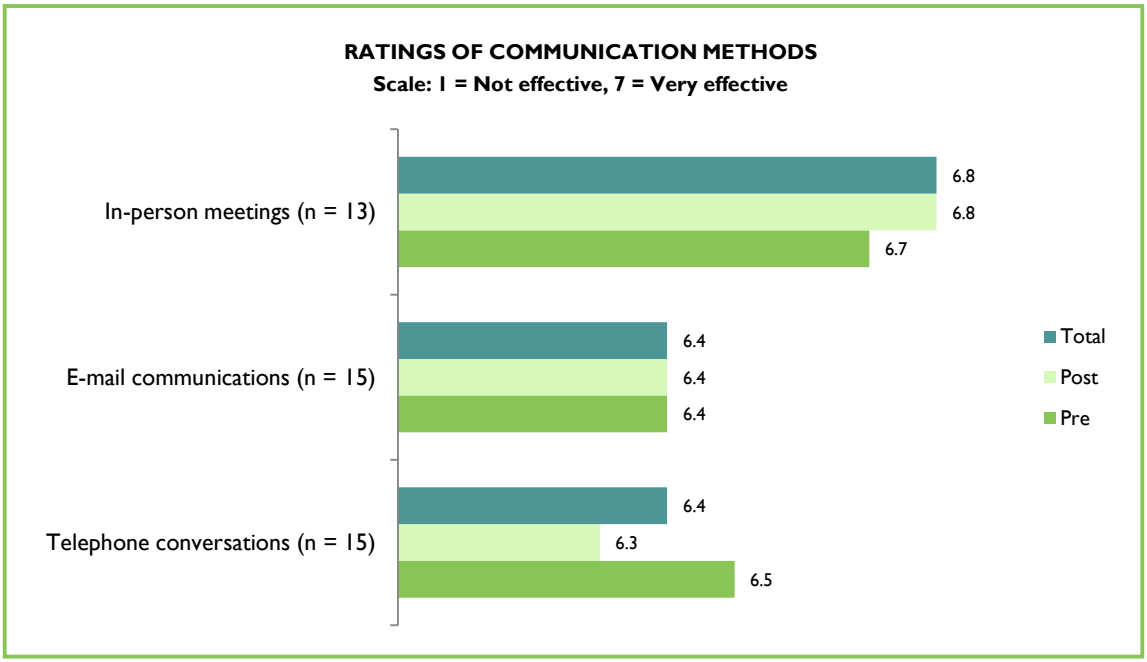
MOST FREQUENTLY USED

Respondents indicated the two most common methods of communication they used to discuss their project with their partner. E-mail communications (n = 15) and telephone conversations (n = 7) were the most frequently used methods. There are no significant differences between pre- and post-responses.



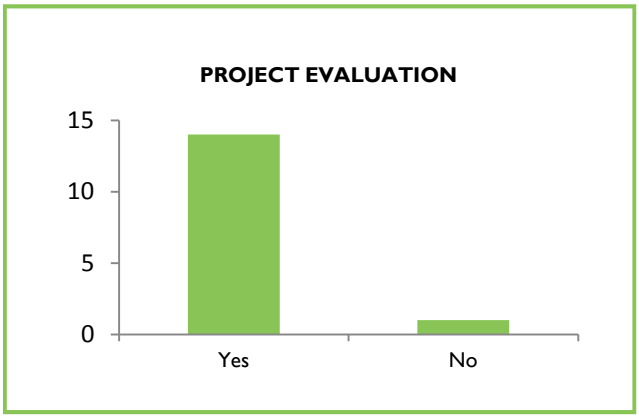
RATINGS OF COMMUNICATION METHODS USED

Respondents rated the communication methods they used on a scale from 1, "Not effective," to 7, "Very effective." Respondents rated in-person meetings as the most effective way of communicating with their partner (mean is 6.8). Respondents also rated e-mail communications and telephone conversations as effective for communicating with their partner (mean is 6.4 and 6.3, respectively). Too few respondents rated the other forms of communication, and those who did rated them as ineffective (mean is 2.0 or lower). There are no significant differences between pre- and post-responses.



PROJECT EVALUATION

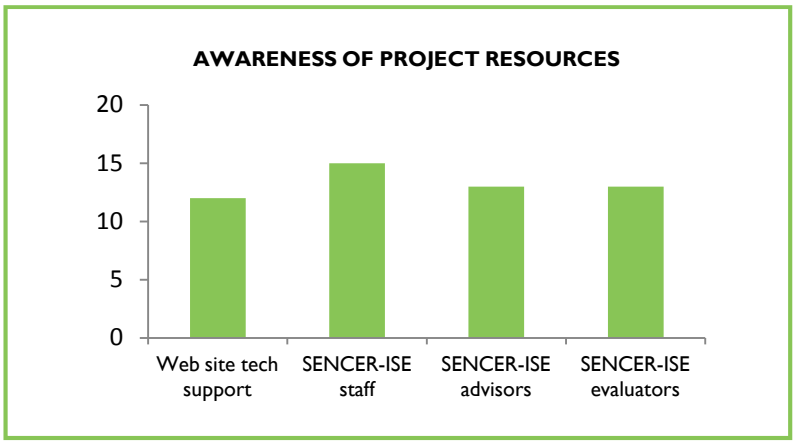
All respondents except one indicated that they are currently conducting or have conducted an evaluation of their SENCER-ISE project.



SENCER-ISE PROJECT RESOURCES

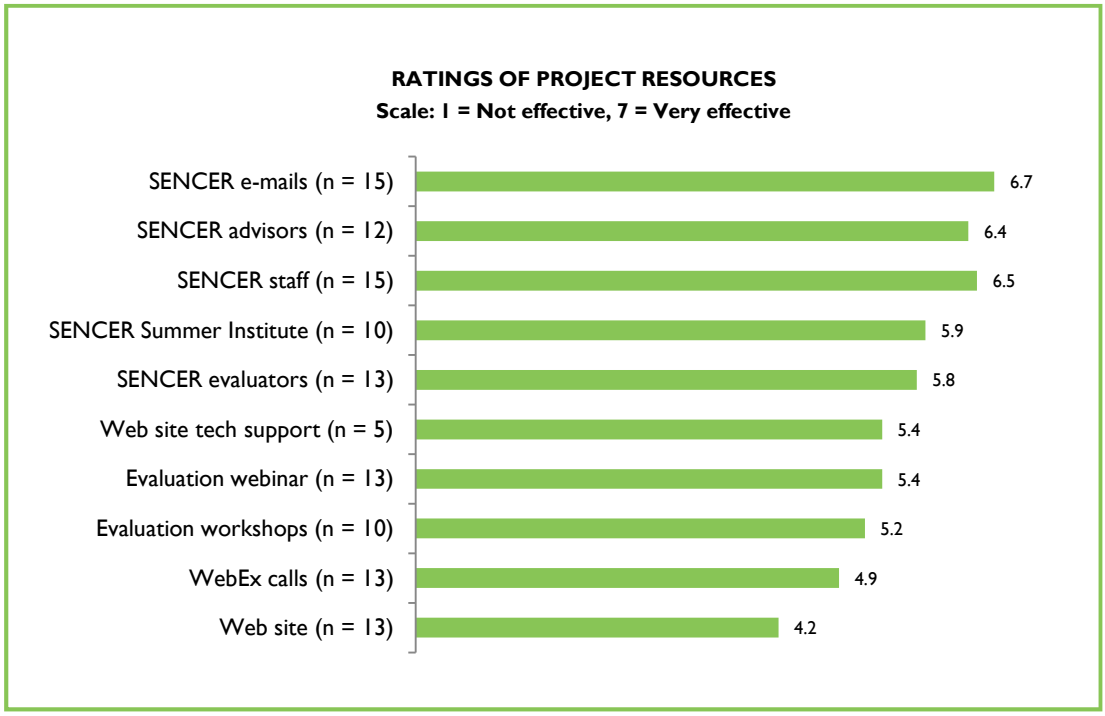
AWARENESS

Respondents indicated their awareness of four resources that SENCER made available to project partners. Most respondents indicated that they were aware of all resources.



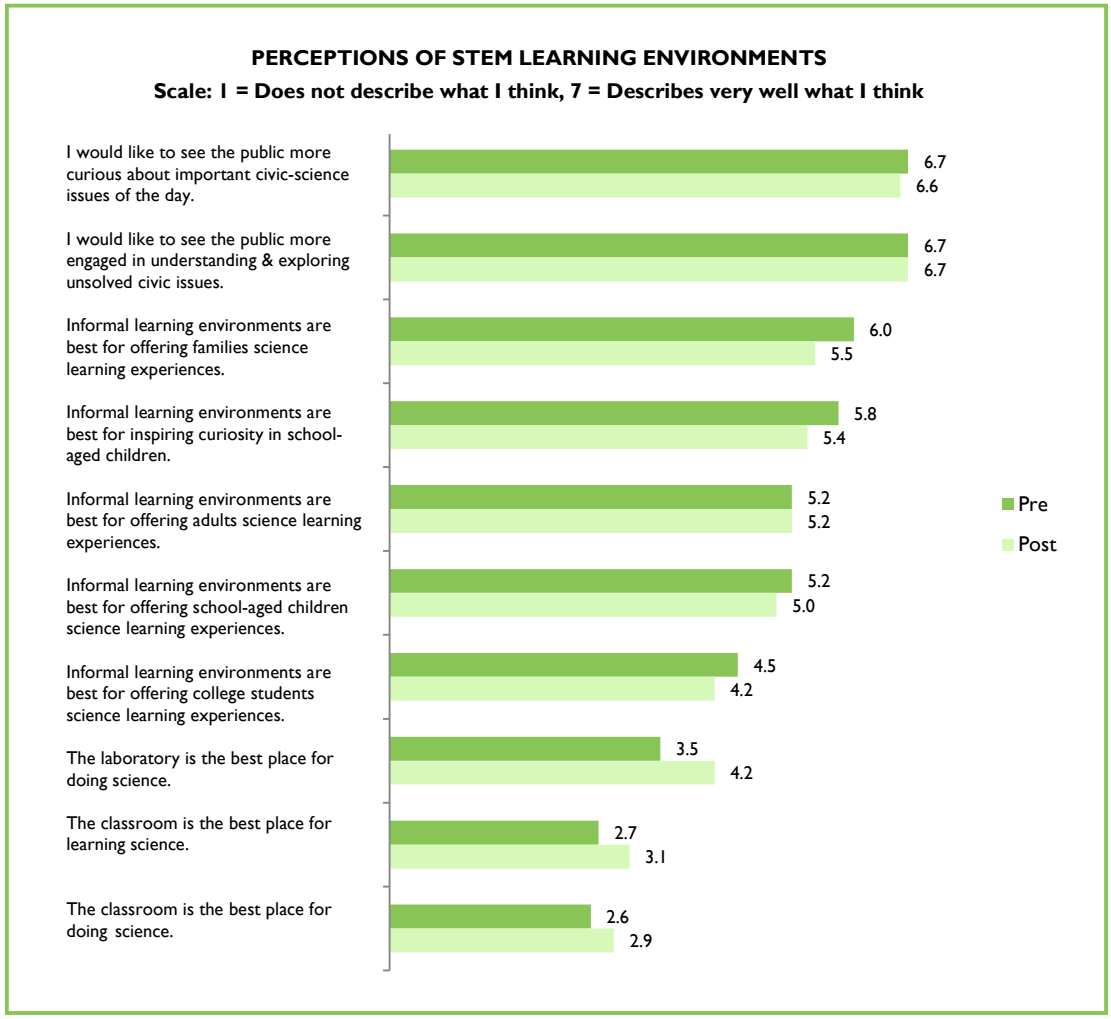
EFFECTIVENESS OF RESOURCES

Respondents rated the effectiveness of each resource they used on the same 7-point scale: 1, "Not effective," to 7, "Very effective." Respondents rated the e-mail communications from SENCER-ISE staff and communications with SENCER-ISE project advisors as most effective (mean is 6.7 and 6.4, respectively). Respondents rated the SENCER-ISE project web site and WebEx video conference calls as least effective (mean is 4.2 and 4.9, respectively).



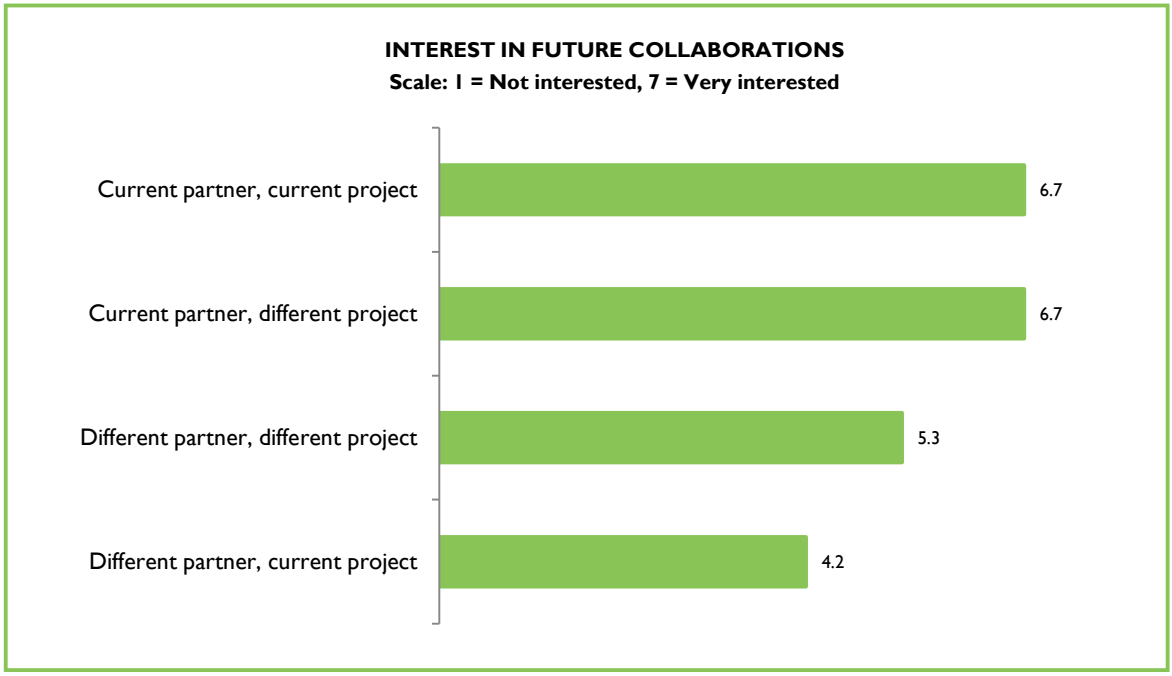
PERCEPTIONS OF STEM LEARNING ENVIRONMENTS

On the pre- and post-questionnaire, respondents rated a set of statements about the best environments for learning science on a scale from 1, "Does not describe what I think," to 7, "Describes very well what I think." The highest rated statement was "I would like to see the public more curious about important civic-science issues of the day." The lowest rated statement was "The classroom is the best place for doing science." There are no significant differences between pre- and post-responses.



INTEREST IN FUTURE COLLABORATIONS

Respondents rated their interest in future collaborations with their SENCER-ISE partner or other partners in HE or ISE on the scale 1, "Not interested," to 7, "Very interested." Respondents were most interested in collaborating with their current SENCER-ISE partner on the current SENCER-ISE project or a different project.


INTEREST IN FUTURE COLLABORATIONS
Scale: 1 = Not interested, 7 = Very interested
Current partner, current project
6.7
Current partner, different project
6.7
Different partner, different project
5.3
Different partner, current project
4.2

APPENDIX

APPENDIX A: TELEPHONE INTERVIEW GUIDE

Thank you for taking the time to speak with me about your experience with the SENCER-ISE project. As the grant has come to an end, my questions will be holistic in nature—that is, I will ask about your individual collaboration as well as the infrastructure provided by SENCER to support this collaboration.

To ensure accuracy, I will be audio-recording this conversation; however, your comments are confidential. Your honesty is appreciated and your name will not be associated with any of your comments. Is it okay if I audio-record?

[Once agreement is reached] Remember, I do not work for SENCER and all that you say, positive or negative, is helpful.

Press record and announce ID#:

1. Can you describe your SENCER-ISE project?

   [Probe about project goals, audiences, and content/scope]

2. How, if at all, is (or was) this partnership different than other partnerships you've had?

3. What was the most successful aspect of your project collaboration? Why is that?

   What, if anything, did SENCER-ISE provide that resulted in this success?

   What other aspects of your project were successful?

   [Probe: Which, if any, outcomes may not have been achieved if you had not partnered with a higher education (or informal learning) partner?]

4. What was the most challenging aspect of your project collaboration? Why is that?

   What, if anything, did SENCER-ISE provide that helped you address this challenge?

   What, if anything, could SENCER-ISE have provided to help you address this challenge?

5. What did you learn from collaborating with someone from higher education (or informal learning)?

What, if anything, did you learn about how to engage audiences (either the general public or undergraduates) in science?

[Probe about content knowledge, skills, such as teaching strategies, etc.]

Probe for each: Can you reflect on what you think may have helped you learn that?

6. What strengths did your SENCER-ISE partner bring to the collaboration? Can you tell me more about that (why do you consider that a strength)?

   [Probe about content knowledge, skills, such as teaching strategies, other methods for engaging audiences, etc.]

7. Based on your SENCER-ISE collaboration experience, what would you say is necessary to build a successful partnership?

   How did that help you and your partner create a successful partnership?

8. What plans, if any, do you and your partner have to continue your SENCER-ISE project collaboration? [If yes] Can you tell me more about that?

   How about plans for continuing to work together as a partnership on other non-SENCER-ISE projects? [If yes] Can you tell me more about that?

   Do you have plans for any new collaborations with (university/college faculty OR science center/museum staff and/or other informal science organizations)?

   [If yes] Can you tell me more about that?

9. In what ways, if any, has your partnership affected your organization (i.e., involved others in your organization, become part of the fabric of your organization)? Can you tell me more (or provide an example)?

   Do you have plans to (further) integrate your project into the organization (any plans for sustainability beyond this grant)?

   Is there anything else about the SENCER-ISE project that you would like to mention?

APPENDIX B: POST-QUESTIONNAIRE

1. **What is your affiliation?**
   - ☐ University/college professor → **1a. Not including the SENCER-ISE project collaboration, have you collaborated with staff from a science museum/center or other ISE organization since beginning this project?** ☐ Yes ☐ No
   - ☐ Science museum/center staff → **1b. Not including the SENCER-ISE project collaboration, have you collaborated with faculty or staff from a university or college since beginning this project?** ☐ Yes ☐ No
   - ☐ Other ISE organization → **1c. Not including the SENCER-ISE project collaboration, have you collaborated with faculty or staff from a university or college since beginning this project?** ☐ Yes ☐ No
   - ☐ Other: _____ → **1d. Not including the SENCER-ISE project collaboration, have you collaborated with staff from a science museum/center or other ISE organization since beginning this project?** ☐ Yes ☐ No

2. **About how many years have you been working in your profession?** _____

3. **Please select the <u>two</u> communication methods you used <u>most often</u> when collaborating with your SENCER-ISE partner during this project.**
   - ☐ Telephone conversations
   - ☐ E-mail communications
   - ☐ In-person meetings
   - ☐ Facebook
   - ☐ Linked In
   - ☐ SENCER-ISE project web site
   - ☐ Online project manager (e.g., Basecamp)
   - ☐ Other: _____

4. **On the scale below (1 "Not effective" to 7 "Very effective"), please rate the effectiveness of each communication method for collaborating with your SENCER-ISE partner.**

	Not effective (1)						Very effective (7)	
a. Telephone conversations	1	2	3	4	5	6	7	n/a
b. E-mail communications	1	2	3	4	5	6	7	n/a
c. In-person meetings	1	2	3	4	5	6	7	n/a
d. Facebook	1	2	3	4	5	6	7	n/a
e. SENCER-ISE project web site	1	2	3	4	5	6	7	n/a
f. LinkedIn	1	2	3	4	5	6	7	n/a
g. Online project manager (e.g., Basecamp)	1	2	3	4	5	6	7	n/a
h. Other (go to Question 4a)	1	2	3	4	5	6	7	n/a

4a. If you rated "other" above, please describe the method of communication below.

5. **Did you complete (or are you currently completing) an evaluation of your SENCER-ISE project?**
   - ☐ Yes
   - ☐ No

6. **Below are resources and services provided by SENCER-ISE staff to support your SENCER-ISE project collaborations. <u>For each item</u>, please mark "No" if you are unaware of the item and "Yes" if you are aware of the item.**

RESOURCE/SERVICE	AWARE? No / Yes
Technical support for using the SENCER-ISE web site	❒No ❒Yes
Access to SENCER-ISE staff	❒No ❒Yes
Access to SENCER-ISE project advisors	❒No ❒Yes
Access to SENCER-ISE project evaluators	❒No ❒Yes

7. **On the scale below (1 "Not effective" to 7 "Very effective"), please rate the effectiveness of each resource or service you used or participated in. Select "n/a" for any that you did not use or participate in.**

	Not effective (1)						Very effective (7)	
a. SENCER-ISE project web site	1	2	3	4	5	6	7	n/a
b. Technical support for using the SENCER-ISE web site	1	2	3	4	5	6	7	n/a
c. E-mail communications from SENCER-ISE staff	1	2	3	4	5	6	7	n/a
d. Evaluation webinar	1	2	3	4	5	6	7	n/a
e. SENCER Summer Institute	1	2	3	4	5	6	7	n/a
f. In-person evaluation sessions (at SENCER Summer Institute or in Jersey City)	1	2	3	4	5	6	7	n/a
g. Communications with SENCER-ISE staff	1	2	3	4	5	6	7	n/a
h. Communications with SENCER-ISE project advisors	1	2	3	4	5	6	7	n/a
i. Communications with SENCER-ISE project evaluators	1	2	3	4	5	6	7	n/a
i. WebEx video conference calls	1	2	3	4	5	6	7	n/a

8. **On the scale below (1 "Does not describe what I think" to 7 "Describes very well what I think"), please rate each item.**

	Does not describe what I think (1)						Describes very well what I think (7)
a. I would like to see the public more curious about important civic-science issues of the day.	1	2	3	4	5	6	7
b. I would like to see the public more engaged in understanding and exploring unsolved civic issues.	1	2	3	4	5	6	7
c. The classroom is the best place for learning science.	1	2	3	4	5	6	7
d. The classroom is the best place for doing science.	1	2	3	4	5	6	7
e. The laboratory is the best place for doing science.	1	2	3	4	5	6	7
f. Informal learning environments (e.g., media and web-based; place-based such as museums, parks, zoos) are best for inspiring curiosity in school-aged children.	1	2	3	4	5	6	7
g. Informal learning environments (e.g., media and web-based; place-based such as museums, parks, zoos) are best for offering school-aged children science learning experiences.	1	2	3	4	5	6	7
h. Informal learning environments (e.g., media and web-based; place-based such as museums, parks, zoos) are best for offering families science learning experiences.	1	2	3	4	5	6	7
i. Informal learning environments (e.g., media and web-based; place-based such as museums, parks, zoos) are best for offering college students science learning experiences	1	2	3	4	5	6	7
j. Informal learning environments (e.g., media and web-based; place-based such as museums, parks, zoos) are best for offering adults science learning experiences.	1	2	3	4	5	6	7

9. **On the scale below (1 "Not interested" to 7 "Very interested"), please rate your interest in pursuing the following collaborations.**

	Not interested (1)						Very interested (7)
a. Continuing to collaborate with my SENCER-ISE partner on this project.	1	2	3	4	5	6	7
b. Collaborating with my SENCER-ISE partner on another project.	1	2	3	4	5	6	7
c. Collaborating with a different partner on this project.	1	2	3	4	5	6	7
d. Collaborating with a different partner on another project.	1	2	3	4	5	6	7