

Framework for Evaluating Impacts of Informal Science Education Projects

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CHAPTER 9 EVALUATING COLLABORATIONS

Randi Korn

This chapter is about evaluating the collaborative component of your ISE project. In the funding world, collaboration is garnering interest and support, especially NSF's ISE program. At one time collaboration was viewed as a good idea; today many believe collaboration is imperative (Gajda, 2004). NSF's ISE program lists collaboration as one of the key elements to be reviewed in considering funding requests. Noted business guru Frances Hesselbein of the Peter F. Drucker Foundation wrote that ". . . businesses and non-profits in today's interconnected world will neither thrive nor survive with visions confined within the walls of their own organizations" (Hesselbein, 2000). This sentiment is also expressed in *Evaluating Collaboratives: Reaching the Potential*, a book worthy of review by those engaging in and evaluating collaborative efforts (Taylor-Powell et al., 1998). Authors note:

". . . in order to obtain the legitimacy, power, authority, and knowledge required to tackle any major public issue, organizations, institutions, and citizens must join forces . . . Organizations that share objectives must also partly share resources and authority . . . to achieve their collective goals" (Taylor-Powell et al., 1998, p. 14).

Funders believe that when individual entities collaborate, they pool resources (dollars and intellectual assets) and achieve greater good than if they were to each work independently. At one time the collaborative nature of a project was in the background and few paid attention to how the collaboration was functioning; now collaboration is in the forefront, almost at center stage, a requirement and a condition for ISE project design.

COLLABORATION AND EVALUATION

The NSF solicitations indicate, as do those of other funding organizations in the private and government sectors, that highly functioning collaborations strengthen, extend, and deepen project impact. In general, evaluating the collaborative element of a project has the potential to inform the ISE field of how collaborative relationships function. From the perspective of an individual project, an external evaluator can study the inner workings of the collaboration to identify and measure the project's impact on the field. This book is meant to help PIs, evaluators, and proposal writers think about and ultimately articulate their project in terms of impact. This chapter discusses collaboration as a means to an end—that is, this chapter assumes that the collaborative aspect of your project is the key innovative element critical to the success of the project. This chapter will help PIs frame the unique nature of their project's collaborative relationship in terms of impacts, as outlined in Chapter 3. It will also help readers think about their collaborative partners and how the power of their collective intellects, skills, and resources can further their project's impact.

Due to their very nature, organizational collaboration affects professionals who are participating in the collaboration—often furthering their development as informal science education professionals and furthering practice (Inverness, 2005). Some collaborations may be conceived to further informal science education professionals exclusively, such as developing a Web site for professional use; other collaborations may involve creating a product for public audiences, such as an exhibition, but the unique collaboration of the partners involved is the primary innovative feature of the project. While the examples here may not explicitly relate to your ISE project, they should allow you to extrapolate how you might frame the collaborative impacts for your project. This chapter will be useful to PIs who are:

- Collaborating with organizations they have never worked with before;
- Managing a project where collaboration is the key innovative feature;
- Participating in a collaboration to conduct applied research that will further informal science education professional practice.

COLLABORATION: A NEW WORK STRUCTURE

There are many reasons why organizations choose to collaborate. Many do so because the grant guidelines require collaboration for the reasons stated above. However an ISE project will be more successful if collaborators realize that working together will afford them unique opportunities that will help them develop a superior project. A best-case scenario is that collaboration among organizations forms because collaborators share a goal and realize the product will be strengthened if they pool their individual and organizational assets, including intellectual resources, skills, financial resources, and organizational support and knowledge.

Collaboration also offers the prospect of change—a change in an organization’s capacity or a change in participants’ perspectives. For example, a few years ago NSF funded an exhibition project that was a collaboration between a science museum and an academic association, including scholars from the academic association who were serving as advisors to contribute their scholarly expertise. At the outset of the project, advisors discussed their expectations for the exhibition; their debates insinuated that the exhibition would include only text panels of their written words. Over time the advisors realized that text, though important, was but one element of many that would constitute the exhibition. The notion of a museum creating *experiences* was a new concept to them. Their understanding and perspective of what a museum exhibition can offer changed through their experience with this project, demonstrating that collaborations sometimes generate surprising results. Some outcomes are not preconceived; instead they are discovered along the way or become evident during the evaluation process. By conducting a summative evaluation that focuses on the collaborative process, the impact of the collaboration will be revealed through measures that identify the quality and amount of change, including the unexpected impacts that the collaboration has brought forth.

Collaborations create complex work environments and therefore require an evaluation strategy that responds to their complexity. When evaluating collaborations, some evaluators strongly recommend that evaluators select a guiding framework to avoid becoming overwhelmed with all the possible interrelationships. There are many frameworks available, but the one most frequently cited is *collaboration theory* (Frey et al., 2006; Gajda, 2004). Collaboration theory models are discussed in two references: Frey et al., 2006 and Taylor-Powell et al., 1998. Collectively, these models identify seven stages of collaboration as follows: coexistence, communication, cooperation, coordination, coalition, collaboration, and coadunation (Frey et al., 2006). These stages are important to consider, if only to help PIs realize that all teams pass through lower levels of collaboration before they reach productive group behavior.

Evaluation practice, like other fields of practice, is evolving. In the past when evaluators were asked to evaluate collaborations, they adapted elements from *process evaluation* (Nightingale and Rossman, 2006). Technically, a process evaluation examines a project's operating environment and the relationship between program providers and program recipients (Institute for Law and Justice, 1997). The funding community, with its emphasis on organizational collaboration, has prompted evaluators to rethink process evaluation and clarify what it should examine, as the relationship between program providers and program recipients is only one small part of a multi-organizational collaborative program. In order to study relationships among individuals who work in culturally distinct organizations involved in large, complicated collaborations, process evaluation now focuses on the human and organizational dimensions of the project and allows the evaluator to examine organizational and personal interactions, the integration of practice across organizations, the integration of organizational culture across organizations, relationship changes, and system changes (Gajda, 2004).

The evaluator may study the collaborative process from different perspectives—independently and interdependently (Nightingale and Rossman, 2006)—because as the number of collaborators increases, the number of possible relationships and affects of those relationships on organizations also increases. The evaluator could choose to look at each collaborating organization independently, citing the outcomes of the project on that one organization—without reference to the elements that may have caused the outcomes (e.g., the relationship that was forged with another collaborating organization). Similarly, the evaluator could examine the entire collaborating *network*, demonstrating how the interdependence of the organizations offered many outcomes—each one dependent and building on the other.

The evaluator may also study the organic nature of the collaboration over the life of the project. Accordingly, the evaluator will identify data collection times and sources that will provide information throughout the collaboration and devise measurement tools to capture the continuum of collaboration over time. For example, the evaluator may design a series of questions that ask respondents to rate various collaborative behaviors and activities on 7-point scales. If the evaluator wanted to measure how collaborative team members are interacting, the question might look like this:

Please rate your experience in today’s meeting on the following scales based on your honest opinion of your experience today. (Circle *ONE* number on *EACH* scale below.)

I was not invited to participate in problem solving activities today.	1	2	3	4	5	6	7	My opinion was frequently sought when the team was problem solving today.
I did not contribute to the conversations today.	1	2	3	4	5	6	7	I contributed to the conversations today.
Today’s activities did not include knowledge sharing.	1	2	3	4	5	6	7	Today’s activities included knowledge sharing.

The evaluator might administer such questions twice annually over the life of the project. Ideally, over time, respondents’ ratings would change, indicating a strengthening collaborative relationship.

FRAMING IMPACTS: COLLABORATION EVALUATION

During the planning phase of a project, PIs probably discuss their expectations for and potential impact of their project, but they may not have considered expectations for and impact of the *collaboration*. Preferably, *early in the project’s life*, PIs must respond to questions about their expectations for the collaboration to prepare for the summative evaluation for two reasons:

- Measuring impact suggests there has been a change and baseline measures are helpful for comparison; and,
- If the project team seeks baseline measures, the evaluator should collect data at the beginning of the project’s life—even if the evaluator’s role is to conduct a summative evaluation.

Measuring impact requires that an evaluator participate throughout the project’s life—even if the evaluator is only studying the collaborative element of the project (although many ISE projects have one project evaluator responsible for conducting all evaluations associated with the project). Evaluators often ask many questions to seek clarity about the project because thorough and deep understanding helps them do their work. Questions are provided below to illustrate what an evaluator might ask (note the alignment between the impact categories presented in Chapter 1 and questions 1 and 2 below). Answers to these questions help shape the framework the evaluator will use to determine the evaluation design and data collection instruments. How PIs respond will help the evaluator understand the intent behind the collaboration. Question # 3 and its sub questions are different; they focus on procedural issues—*how* you will achieve what you want to achieve. In process evaluation, evaluators are interested in the procedural structure you will impose among collaborators because they use it to identify data collection opportunities across the span of the project.

1. What **organizational** changes do collaborating organizations hope to stimulate through this collaboration? How will you know if you have been successful?
 - What is each collaborating organization's goal for pursuing the collaboration?
 - What are the differences and similarities among the goals of collaborating organizations?
 - What practices/resources (intellectual, in particular) will each organization offer?
 - What *knowledge* do collaborating organizations hope to develop through this collaboration?
 - What *skills* do collaborating organizations hope to develop through this collaboration?
 - What *attitudes* and *behaviors* do collaborating organizations hope to change and/or develop through this collaboration?

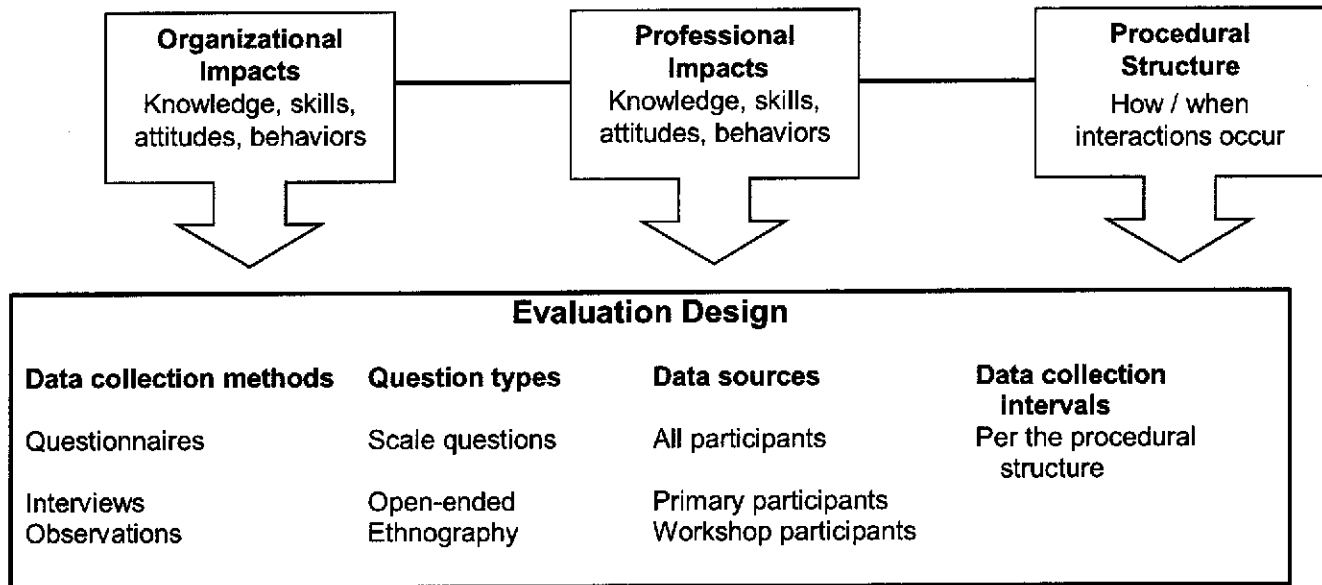
2. What do collaborating informal science education **professionals** hope to gain from the collaboration?
 - What *knowledge* do collaborating professionals hope to develop through this collaboration?
 - What *skills* do collaborating professionals hope to develop through this collaboration?
 - What *attitudes* and *behaviors* do collaborating professionals hope to change and/or develop through this collaboration?

3. What is the **procedural structure** of the collaboration—**how** will collaboration happen?
 - What processes will you use to facilitate collaboration?
 - What strategy will you use to align collaborating organizations' expectations?
 - What strategy will you use to align collaborating professionals' expectations?
 - What communication strategies will you use to facilitate in-person collaboration?
 - What communication strategies will you use to facilitate remote collaboration?
 - How will you address organizational and personnel challenges if they emerge?

Discussing these questions will help PIs in three ways: 1) if PIs work through them at the outset of the project, they will reach clarity on important issues that will affect the success of the collaboration; 2) clarifying expectations leads to clarity of purpose and vision; and 3) the questions represent three simultaneously-operating frameworks in collaborations—the organizational, the individual, and the procedural. The evaluator can use these three frameworks to think through the evaluation design, as the evaluation design will take into account intended impacts from organizational and individual perspectives and the procedural structure of the collaboration. For example, how will this collaboration affect organizational knowledge or behaviors? How will this collaboration change professionals' knowledge, attitudes, or skills? What procedural structure will PIs impose to stimulate, facilitate, and nurture collaboration and the intended impacts? What is the schedule for work sessions, professional development

activities, telephone communications, Intranet development, etc.? The evaluation design also includes identifying data collection opportunities (as per the procedural structure), data collection tools, specific questions, and data sources (e.g., the leadership of collaborating organizations; participating professionals, etc.). See Figure 9-1 for a graphical representation.

Figure 9-1. Relationship between the Structure of a Collaboration and Evaluation Design



ALIGNMENT BETWEEN PROJECT IMPLEMENTATION AND EVALUATION DESIGN

To effectively measure the impact of the collaborative aspect of a project, PIs and the evaluator each have distinct but highly interdependent responsibilities. Ideally,

PIs should:

- Create procedures and processes that allow collaboration (both in person and remotely) and respect the dynamic, evolving nature of collaboration;
- Reach consensus among all collaborators on impacts for each organization and participating professionals (using the questions presented earlier as a deliberation framework);
- Identify milestones of achievement throughout the collaboration and indicate how you will reach each milestone so the project stays on track; and,
- Acknowledge that conflict is a natural result of collaborative behavior and identify strategies to manage conflict for positive change (evaluation can serve as a tool for learning about and working through conflict).

Ideally, the evaluator should:

- Thoroughly understand impact statements and collaborators' meanings of them;
- Design evaluation instruments to:
 - capture transitions in the collaborative process (collect data at intervals over time coinciding with the collaborative procedural structure);
 - invite open conversation about the collaborative experiences (periodically conduct one-on-one interviews with staff throughout all participating organizations and facilitate group discussions);
 - measure change—if change is a desired project outcome (administer a standardized measurement device to track change numerically over time);
 - document the collaborative process (analyze meeting notes and observations);
- Implement data collection strategies throughout the collaborative process, following the procedural structure of the collaboration;
- Use actual milestone achievements to realign data collection activities; and,
- Offer assistance to PIs when complex situations arise, as the evaluator is on the edge of the project and can facilitate meetings during incongruous times.

As implied above, impact statements are extremely important to evaluators, as they influence the data collection tools and their questions. Also implied is the importance of the procedural framework, as it determines the data collection schedule and from whom and how the data will be collected.

Selecting Data Collection Methods

Chapter 4 lists the range of data collection methods available to evaluators and identifies their pros and cons. When evaluators select which data collection strategies they will use, decisions are based on a number of variables including impact statements (what is the best way to measure what needs to be measured); the product and process (e.g., exhibition, media, collaboration); data sources (e.g., who is receiving the deliverables—the public [specifically—adults, children, families] or professionals); data type required to capture achievement of impacts (quantitative data, qualitative data, both types of data); duration of project; procedural framework; and number of data collection periods. Many evaluators use several methods, mixing qualitative and quantitative strategies in an effort to capture the full impact of a project.

FRAMING IMPACT: LEARNING FROM COLLABORATIVE PROJECTS

Identifying expectations for a project and selecting organizations that can assist in achieving expectations, while furthering the practice of *all* collaborating organizations and professionals is a difficult and complicated endeavor. However, when success occurs, it is useful to examine the variables that contributed to that success. Three ISE projects are summarized below to exemplify the importance of articulating intended impacts early in a project's life and the relationship between impacts and evaluation. All three examples involve museums, and indeed museums have been highly active in forming collaborations for the past several decades, especially as traveling exhibition development became so costly that consortia projects were needed to reduce the cost per institution participating.

1. A collaboration between a history museum and a science museum to develop an exhibition

A research center in a history museum sought to develop an interactive exhibition about creativity, invention, and play. The exhibition would include history exhibits as well as interactive exhibits to promote inventive and creative play. While staff could have worked with its exhibition designers, they decided to look outside the museum to further their practice in developing and prototyping interactive exhibitions—new territory for this particular history museum. They chose to collaborate with a science museum that was expert in developing and testing interactive science exhibitions. Historians and educators from one museum worked with exhibition developers from the other museum, each providing a skill set the other did not have. Together they created an extraordinary exhibition that achieved the majority of its projected visitor experience goals. Table 9-1 describes two intended impacts from the collaboration.

Table 9-1. Collaboration Impact of Example 1

Impact	Impact Category	Professional Audience Objective	Evidence
Museum integrates prototyping into its institutional culture	Knowledge	Exhibition developers describe the kinds of questions one asks during formative evaluation.	In a post-workshop debriefing, all staff participated in mock formative evaluation session, demonstrating the kinds of questions one asks during formative evaluation so their colleagues could realize the instruction qualities of formative evaluation.
	Attitude	Exhibition developers describe how formative evaluation helped them improve the exhibits they were testing.	Observations indicated that exhibition developers participated fully in the week-long evaluation workshop, observing and interviewing visitors as part of their participation, debriefing at the end of each day, and changing exhibits based on evaluation findings.

Summary of Impact Categories

- **Impact of the collaboration:** Staff in the research center at the history museum demonstrated to their museum colleagues how formative evaluation can work to the museum's advantage (change in staff members' attitude towards formative evaluation).
- **Data collection methods:** Reporting-back sessions to museum staff (not involved in the project) after formative evaluation, followed by an in-depth roundtable discussion to field questions about formative evaluation.

2. A collaboration between a scientific research society and a science center to develop an exhibition

Research scientists have much to offer the public but rarely have an opportunity to present their knowledge in a public venue. Science museums, on the other hand, have a dedicated audience of people interested in the work of scientists but often do not have scientists on staff to participate in the development of exhibitions or programs. The research society, with scientist members around the U. S., submitted an NSF proposal to collaborate with a science center to design and travel an exhibition: the scientists would provide the content for the exhibition as well as member scientists to volunteer in science centers that would host the exhibition; in turn, the science center would develop and design the exhibition and test interactives. Table 9-2 describes intended impacts for the collaboration.

Table 9-2. Collaboration Impact of Example 2

Impact	Impact Category	Professional Audience Objective	Evidence
The science center will integrate the work of current science researchers into their exhibition and program development.	Attitude	Staff members describe the value of working with practicing research scientists.	Post-project in-depth interviews with science center staff indicate that staff recognize the innovative quality behind many of the interactives that they co-developed with research scientists.
	Behavior	Each project staff member collaborates with one scientist and develops an exhibition activity.	Interviews among staff indicated that more than one-half of exhibits in the exhibition were co-developed between a scientist and a science center exhibit developer.

Summary of Impact Categories

- **Impact of the collaboration:** Before the collaboration, the science center did not have a regular practice of working with scientists. Given that the project included a society of practicing scientists, this project provided the ideal environment for exploring how to best collaborate with science researchers. The original intent behind the project was to impact science centers (integrate current research scientists' work into the center's programming), which was achieved, but research society member scientists also gained something from the experience—a new appreciation for science centers, as they learned about informal science learning and the role science centers play in supporting life-long learning opportunities for interested adults and children (an unintended impact).
- **Data collection method:** Qualitative interviews with all collaborators. (At the end of this project the PI had requested that the evaluator conduct a process evaluation; therefore, only interviews were conducted. Had the PI requested process evaluation at the beginning of the project, the evaluator would have designed data collection tools and integrated data collection strategies into the procedural structure and conducted a more comprehensive evaluation of the collaboration.)

3. A collaboration among small science museums

Small museums often find it challenging to develop interactive science exhibitions due to small staff and limited organizational capacity. For the first round of NSF funding, five museums collaborated to build and circulate a small traveling exhibition and associated educational programming (see Table 9-3). A second round of funding was sought by the original five museums and three additional museums to form four mentor partnerships to more fully develop exhibition design and evaluation capabilities. The third round of funding added a research component and studied the conversations between young museum visitors and their adult counterparts to understand the construction of science learning.

Table 9-3. Collaboration Impact of Example 3

Impact	Impact Category	Professional Audience Objective	Evidence
Build capacity among small science museums to design and travel science exhibits for small science museums to host.	Knowledge	Staff will describe the steps involved in developing, building, and traveling an interactive exhibition.	The exhibition that traveled to small museums was the evidence of success. In post collaboration group discussions, staff from collaborating museums described exactly what they learned about each stage of exhibition development, including the importance of identifying goals and objectives and testing ideas throughout development with colleagues and visitors.
	Behavior Skill	Participating museums will collaborate to plan, design, build, test, and travel an interactive science exhibition.	Data points indicated that participating small museums designed and built an exhibition that traveled to other science museums.

Summary of Impact Categories

- Impact of the collaboration: A number of small museums have strengthened their organizational capacity to plan, develop, design, test, and build exhibitions (increase in knowledge; change in behavior among professional staff; new skill development).
- Data collection methods: Qualitative round-table discussions, qualitative interviews, notes from facilitated meetings, focus groups, participant essays, exhibit planning documentation, and listserv.

As evidenced by these examples, collaboration projects are often designed to provide professional development opportunities. Each of these examples also suggests that a collaborative project may produce a product, such as an exhibition, program, or multi-media production for public audiences. A collaborative project also may produce research that generates knowledge in a particular field of study. When a PI asks an evaluator to evaluate the collaborative element of an ISE project, the PI perceives the project's collaborative element as innovative and vital to the success of the project. So while NSF ISE projects will all likely involve more than one organization, conducting an evaluation of the collaboration should generally take place if the collaboration—in and of itself—represents an innovative component of the project.

Traditionally, summative evaluation is designed to report how well a project achieved its impacts, but it is essential to include the evaluator in the project from the outset. This is especially true if the collaboration is going to be evaluated in a summative evaluation, because then data collection should take place throughout the life of the project—not only at the end.

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