Field Work Poetry & Science: Briefing Materials

Project: **Field Work Poetry and Science**

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Executive Summary

Field Work Poetry & Science (Field Work) is an IMLS-funded project that brings libraries and natural history centers together to facilitate STEM learning through integrated poetry and science programming. Poets House, in collaboration with New Knowledge Organization Ltd., will work with two Poets-in-Residence and local institutions to facilitate six public programs in Milwaukee, Wisconsin and Salt Lake City, Utah. Field Work has a number of goals which include: creating public programs that explore the localities and geographies of each city, and the complementary resources each institution can share; engaging individuals of all ages from the general public and disciplinary professionals in several fields, through highly interactive, thought-provoking, and fun activities that blend natural history and poetry; and the creation of a toolkit for informal education and cultural centers to use as a resource for interdisciplinary collaborations.

The project kick-off will gather together all project partners for a meeting in Milwaukee on December 14-15, 2017. To support the project partners' preparation for and participation in the kick-off, the following set of briefing materials and excerpts from prior experiments such as the Language of Conservation introduces salient aspects and key concepts integral to achieving these ambitious projects goals. This document includes:

- Project Mission and Vision;
- Art and Science Collaboration Theory;
- Science and Moral Reasoning;
- Lessons Learned from Past Experiments; and
- The Role of Evaluation.

The Project

In order to align our efforts with the foundation and purpose of Field Work as we proceed through this project, we highlight and define the project's main mission and vision below. Please return to review this material as necessary.

MISSION

The mission of Field Work Poetry and Science (Field Work) is to "humanize" the language of science via poetry so that audiences can forge deeper, more meaningful relationships with the natural history they encounter. Field Work aspires to create pathways between libraries and museums through capacity building via collaborative institutional programming. It will provide team members with resources to become better facilitators of STEM knowledge learning for their service communities and further activate the collaborative capacities of cultural institutions that support community learning. Ultimately, Field Work aims to create a hybrid poetry-science model that others can replicate across the nation.

VISION

We envision a society in which all citizens have the capacity to engage meaningfully with scientific and poetic understandings of our world. We approach this vision through understanding how libraries and natural history museums can collaborate on meaningful STEM leaning programs to further science and poetic learning for the public. To that end, we ask, "How can libraries and science centers, working together and with artists (i.e., poets) and scientists, engage in meaningful dialogue to create outputs that deepen the public's knowledge and understanding of reality?"

Field Work brings libraries and natural history centers together to facilitate STEM programming by providing them with training and resources to increase capacity at each institution. The project will develop a new model that brings poetry and science learning together at public institutions while building mechanisms to facilitate national collaborations between libraries and local cultural organizations.

To realize this vision, Field Work will create:

- Stronger local partnerships between libraries and natural history museums;
- Increased confidence among institutional professionals regarding their skills and abilities to facilitate STEM learning via new or enhanced relationships with poets and poetry as well as local scientists and science educators;
- New audiences for libraries and natural history museums; and
- A tested hybrid poetry-science public program model for national replication.

Our main deliverable will be a replicable framework including tools and assessment metrics that can be used to facilitate successful and independently initiated collaborations among libraries and science learning centers across the county. We define success as positive knowledge exploration and acquisition.

WHAT WE ARE GOING TO DO

Working in Salt Lake City, Utah, and Milwaukee, Wisconsin, two local project teams will present six public programs in each city. Through highly interactive, thought-provoking, and fun activities blending natural history and poetry, we believe public programs can engage families with children, pre-K and elementary school children, middle and high school students, adults, senior citizens, as well as professional writers, educators, scientists, and library professionals.

Consistent with the principles of STEM learning, program components will focus on real world issues. It will address the engineering design process focused on relevant problems while seeking creative, collaborative solutions via hands-on experiences. STEM learning in this case is not intended as hypothetical, but rather an engagement with an ongoing orientation toward purposeful collaborative thinking, questioning, and reasoning.

All public programs are intended to offer audiences the opportunity to engage with the poetry and science and envision themselves as author/scientist/problem solvers. Institutions will determine their program offerings in

collaboration with their Poets-in-Residence and their full city team. The exact nature of each collaboration, and whether programs will be offered jointly or co-promoted, will be determined locally.

The library systems and natural history museums partnered in each city, the Poets-in-Residence, and Poets House will work with the institutions' educational networks, in addition to school networks and community associations to reach an anticipated 10,000 children, teens, and families in each city.

Potential programming discussed prior to the kick-off meeting for Field Work includes:

Salt Lake City, Utah

- Nature walks at the Natural History Museum of Utah (NHMU) and Salt Lake City Public Library with staff scientists and poets, resulting in writing exercises in which participants describe what they have perceived in scientific and poetic language.
- Walks around the vicinities at both NHMU and The Salt Lake City Public Library with urban ecologist and artist Stephen Goldsmith and his students, with discussion of bringing "buried nature" (creeks, etc.) above ground and restoring ecosystems within the urban space, with similar writing exercises.
- Walks with indigenous tribes, around both NHMU and The Salt Lake City Public Library, to learn about their perspectives and ways of understanding landscape.

Milwaukee, Wisconsin

- Guided Milwaukee river walks and discussions with a poet and science educator, developed around poetry like the Langston Hughes poem "A Negro Speaks of Rivers" in which he says "I've known rivers." What are the ways of knowing science can give us? What are ways of knowing poetry can give us? Other art forms?
- Guided walks addressing urban animals with a poet and biologist discussing works like Elizabeth Bishop's "The Fish" and "The Moose." Participants choose an animal in the museum exhibit and write a poem in the voice of that animal using at least three science facts and three metaphors.
- Poetry writing workshops in which participants begin by drawing "a sense of place" map of the neighborhood or city, noting the places where they have a relationship with nature.

Observation-based exercises and experiences will help participants better understand the world around them. These exercises will also generate potential material from local communities for the poetry paths and digital app.

Art-Science Collaboration

There is no definitive source that describes the relationship between the arts and the sciences. It is a vast and nuanced topic. As an organization, we have researched and explored this intersection from an academic standpoint as well as a practical, project-based standpoint. Below we present our perspective from years of experience in the field, in order to contextualize Field Work.

INTRODUCTION

Taking a cursory look over the last three millennia, we note that art and science have had a long and oscillating history of unity and division. Poetry has been intertwined in scientific study since at least the sixth or fifth century B.C., when Pre-Socratics used verse to write about physics, chemistry, geology, astronomy, theology, metaphysics, and epistemology (Curd, 2016). The separation of art from science appears to be a relatively recent phenomenon. Renaissance philosophers from da Vinci to Goethe often don't appear to distinguish between their work as artists and their study of biology, anatomy, botany, and astrology. In the eighteenth century, to some extent art and science found a reunited partnership for the benefit of society and knowledge acquisition (Morizot 2013).

While art and science were simultaneously embodied by Renaissance thinkers like da Vinci and Goethe, these two disciplines are now typified as opposed forces, polar opposites on a spectrum of mental process. As Wright and Linney (2006) note, art and science are "stereotypically thought to be at opposite ends of the intellectual spectrum," and illustrated by the "legacy of blind faith in scientific fact, coupled with romantic notions about the subjective and imaginative qualities of art" (p.11). These two disciplines are often pitted against each other due to their perspectives on core epistemological questions, where art is "comfortable with uncertainty, and is not necessarily interested in finding answers; whereas much of science is looking for answers, and is - in some cases misguidedly - seeking certainty" (Linney, 2006, p.11).

That art and science can be seen on two ends of a spectrum (objectivity vs. subjectivity, restriction vs. freedom, public vs. private) can be used as argument both for and against their collaboration. Joining forces allows collaborative teams to use subjective notions to express their objectives in a more free and public arena, feasibly touching a wider audience in an inspirational and moving manner, while at the same time conveying sound scientific knowledge.

However, some believe that the collaboration may compromise the integrity of the work, not only in its content but also in its critique. Although interesting and thought provoking, interdisciplinary work can weaken its impact by spreading itself thin between two disciplines. An individual may be taken more seriously in his or her field by focusing on their area of specialty. For collaborative work to avoid this danger, collaborators must take as a fundamental principle that the art and the science involved must be capable of being judged on their own merits. That is, an environmental art piece needs to be a good piece of art which would be taken seriously in the art world, just as a good scientific work on the environment must be perceived as valid within the science community.

As Wright and Linney (2006) explain, ***A motivating factor at the heart of both art and science is a desire for the pleasure of understanding something new and of communicating this to others*** (p. 2). The "binary division" of two paths for inquiry into the nature of life neglects to take into consideration how the social and cultural context informs the pursuit of each discipline.

EMBRACING PLURALITY OF THOUGHT

Poetry and natural history clearly have distinct cultures and distinct outputs, and yet share similar intentions and precepts at their foundations, which creates the perfect situation to explore the possibilities of their partnership. We suggest that the obstacles to appreciating the value of art-science collaborations are primarily due to a misunderstanding in how to facilitate communication between two cultures. Indeed, we believe that much of the interdisciplinary work in these fields has fallen prey to a natural tendency to acquiesce and diffuse tension through compromise. This desire to suppress difference, perhaps as a way to avoid tensions, may have concealed important epistemological differences, which play key roles in impactful interdisciplinary collaborations.

To that end, we pull from the literature of Conflict Transformation Theory in order explore a deeper potential in art and science collaborations. We acknowledge the underlying intentions of both the arts and the sciences to seek and produce knowledge, while attempting to let go of any prescribed or intended outcome. We explore collaborations with the understanding that deeper knowledge may arise, not *in spite* of a tension between the arts and sciences, but *because* of it. We acknowledge the value in paradox and tension, by allowing that two different perspectives – or a plurality of thought – can contribute different bodies of knowledge concerning the same phenomena and both be appropriate, without threatening the integrity of either intellectual pursuit. This we understand as the value of plurality of thought. In doing so, we also acknowledge the formative work by Ede (2012) who set out to characterize the challenges in both disciplines as an appreciation for their paths to understanding.

Within the field of conflict resolution, conflict is merely a point of departure from which different, seemingly incompatible trajectories begin. These two trajectories can either fail to resolve or be ameliorated through successful resolution. Certainly, having multiple and at times competing perspectives is a natural manifestation of the human experience. However, plurality of thought and tensions which cause an impasse are two different things.

In our case, poetry and science appear to have different perspectives on engaging reality. They hold similar fundamental intentions, yet they diverge in culture and method of exploring those intentions. In order to find deeper levels of truth and greater understandings of reality, as put forth by both these disciplines, we feel Bhabha's (1990) model of emergent production of knowledge in a ***third space*** is essential. The ***third space*** expresses the physical, emotional, and intellectual hybrid space that allows for learning to occur amidst two seemingly incompatible narratives. It speaks to the emotional and intellectual space needed to make meaning, gain understanding, and explore "third" ideas. In his words, it is where ***meaning is constructed across the bar of difference and separation*** (Bhabha 1990, p. 210).

Within this third space, it is important to have a moderator/interpreter (or educator in Bhabha's framing) who can ***translate*** the two languages without the goal of suppressing the plurality of thought. Ury (2000) understood this and expanded the role of an interpreter to include a community or collective in what he calls a ***third side***. Ury felt the two clearly identifiable ***sides*** (i.e., for and against a particular outcome, or in this case an exclusively science- or exclusively art-oriented worldview), cannot be separated from the specific context and contextual determinants that give rise to them.

The ***third side***, according to Ury (2000), is the community of people surrounding a conflict who, by choice, can provide a safe perspective within which to understand the divergent views. The ***third side*** is essentially an energetic, emotional and / or rational ***container*** that incubates the seemingly incompatible relationship in a positive direction. In our case, libraries and certain natural history museum settings act as ***third sides***, within which librarians' and interpreters' main goal is not the resolution of differences between poetry and science but rather the agreement about how the two cultures speak to truth and knowledge. We ask, ***How can Ury's "third side" using Bhabha's "third space" allow multiple perspectives concerning pathways to knowledge to simultaneously occur toward the goal of deeper understanding?***

SCIENTIFIC REASONING

In order to ensure Field Work's findings are clearly embedded in scientific methodology and replicable processes, we define science reasoning and its different forms below.

Scientific reasoning refers to reasoning and problem solving skills, required in creating, testing, and revising hypotheses or theories about the world around us (Morris, Croker, Masnick, & Zimmerman 2012). We support Morris et al (2012) in believing that science reasoning also entails ***reflecting on the process of knowledge acquisition and knowledge change that results from such inquiry activities***.

Scientific reasoning often includes clear stages that guide one's process of knowledge acquisition, such as Observation, Hypothesis/Prediction, Exploration, Data, and Results. This is by no means a linear process and often goes through iterations whereby new information impacts one's reasoning, i.e. Data and Results leading directly into a new set of Observations and Hypothesis. Specific forms of reasoning within science reasoning include deductive, inductive, and at times abductive reasoning.

Deductive reasoning results in specific conclusions derived from general statements. For example: All dogs have four legs. Charlie is a dog. Charlie therefore has four legs. We start with a large and general statement that applies to a wide set of phenomena (in this case, all dogs), and deduce a conclusion about a specific subset of those phenomena (in this case, Charlie who is a dog). In the case of deductive reasoning, given the veracity of the first statement, the conclusion is guaranteed.

Inductive reasoning is the opposite of deductive reasoning. It results in general statements or claims as derived from the observation of specific phenomena. In this case, we may notice that Charlie is a dog and has four legs, Suzy is a dog and has four legs, and Josephine, who is also a dog, also has four legs. From these specific observations, we induce that all dogs have four legs. Of course this may not be a true conclusion. Induction can certainly lead to false claims, and is therefore often used to form hypotheses that need to be further validated. In the case of inductive reasoning the conclusion is merely likely.

Abductive reasoning is neither inductive nor deductive. It starts with a set of incomplete observations and arrives at the most likely explanation. This process can be based on one's experience with the world, it can be creative, intuitive, or even visionary. For example, doctors make claims based on a limited set of observations, and may even go on a hunch to take their best bet at what may be wrong. A visionary example is Einstein who imagined a reality that was far from obvious, and yet through thought experiment, he arrived at the theory of general relativity. Hence, abduction is characterized as one's best bet.

Deductive, inductive, and abductive reasoning can all play a role in sound scientific reasoning. It is important, however, to understand which pathways an individual or collective are using in order to contextualize their engagement with knowledge.

MORAL REASONING

We are also aware that underneath our science endeavors lie belief systems and values. We present here our relationship to moral reasoning in order to be transparent and clear about to what end we use the tool of science in Field Work.

Fundamentally, Field Work aims to create a more harmonious world through the use of science and poetry as a means to knowledge acquisition. At its foundation is the belief that society will profit from educated citizens who are able to make well informed decisions about their environment, health, and communities.

To that end, we here coin the term Engaged Science in acknowledgement of Thich Nhat Hanh's Engaged Buddhism and in the true spirit of Conservation Biology. Engaged Science suggests that science can be viewed though a filter of moral and ethical consideration as a means to help realize society's fullest potential. Thich Nhat Hanh, nominated for the Nobel Peace Prize by Martin Luther King in 1967, defines ***Engaged Buddhism [as] just Buddhism. When bombs begin to fall on people, you cannot stay in the meditation hall all of the time. Meditation is about the awareness of what is going on – not only in your body and in your feelings, but all around you*** (Thich Nhat Hanh in Malkin 2003).

Similarly, Engaged Science is just Science. As the natural world is increasingly under attack from many threatening

factors, we too believe scientists cannot simply stay in the science lab. Equally in this regard, science is not just the objective study of phenomena, but must necessarily be cognizant of the cultural, moral and ethical stratosphere it permeates.

Through the active acknowledgement of science as a tool that can be used toward the betterment of our society, Field Work promotes engaging with science to create a more aware and knowledgeable society.

POETIC REASONING

There is a great deal of overlap between theories of science reasoning and the function of poetry in the human mind. Often characterized as poetic reasoning, there are a variety of mental processes involved in the experience of the poetic voice. In the late '50s and early '60s linguist Roman Jakobson (1960) identified six functions of language that are always present, and two are specifically relevant to this project. Most people think of language as referential, meaning focused on communicating ideas or information, typically about a situation, object, or mental state. The poetic function forefronts the form of the message including sound, appearance in written form, and embodiment in performance. The poetic function focuses on the code itself, and how it is used, a function that is foregrounded in formally recognized poetry as well as slogans, songs and some humor.

Like linguists, psychologists consider how language functions as a reasoning tool. Psychologists tend to ask questions like how we draw connections that link prior knowledge, values or systems of thinking into a novel context. Lakoff and Johnson's Conceptual Metaphor Theory (CMT) (1980) is one such approach. Conceptual metaphors are "image schemata," a mechanical function of higher order thinking. It's best to think of these as abstractions that are used to group mental percepts together in ways that simplify information and permit efficient idea sharing. Image schemata bring into the mind a systematic set of figurative forms.

Effectively, CMT can be described as a wide array of common clichés that are used blindly in discussion, but also structure our thinking and gate possibilities, because some concepts are incompatible. For example, U.S. English speakers use spatial metaphors for a number of concepts: Good, More, and the Future are all associated with Up. That, in turn, makes it harder for us to associate Bad with More, because the metaphors don't line up (Danesi, 2013).

Poetry has the potential to disrupt the common clichés and call them into question or ask the user to challenge the structure of prior thinking. This is because it draws the form of language forward or juxtaposes words in ways that do not align directly with the common conceptual metaphors of content.

It is this focus on figurative reasoning that challenges abstraction or the source of abstractions to bring topics previously situated in contrasting metaphors into an association. This process invokes a kind of connectivity or challenges reconciliation of concepts considered as separate in new form. Metonymy and irony are distinct from metaphor but serve the same poetic function by calling new associations into consciousness. We think of this process as a learning experience, a language puzzle that helps a thinker to organize information in new ways that are useful.

Prior research by NewKnowledge has found that this reasoning process can be both pleasurable and subliminal. Often the user might describe something that felt natural or logical but claim they cannot remember the words, yet when asked to guess can often recall and repeat near verbatim the metaphor presented. As such, we consider poetry, when presented alongside other content, as a force that can shape how that content is systematically organized and recalled as part of a user's image schemata.

WHAT DO WE KNOW FROM OTHER PROJECTS?

Drawing from research initiatives in which NewKnowledge has participated, we note a number of findings that have become evident in our understanding of how to facilitate successful collaborative work between the arts and sciences, and between partner institutions.

Language of Conservation

Many scientists and environmental activists who are most concerned about human impacts on biodiversity have called for educational programs that join emotion with rational analysis in order to create a deeper and more enduring conservation ethic (Briccetti, 2013).

Field Work represents the next generation of investment in a sixteen-year endeavor led by Poets House, in collaboration with the evaluation team. Over that period, this work has received support from the Institute of Museum and Library Services (IMLS), the National Science Foundation (NSF) and the National Endowment for the Humanities (NEH), philanthropic support, and support from significant cultural institutions. In each iteration, the project brought together poets, libraries, and informal learning institutions.

Working with ten institutions in five U.S. cities, five celebrated poets, an innovative evaluation team and Poets House, this project sought to bring together zoos and libraries to help members of the public deepen their understanding of conservation ethics through poetry. The project had demonstrable impact on zoo visitors:

- Up to 90% of visitors recalled seeing poetry during their visit to the zoo.
- Between 82% and 92% of those who did recall seeing poetry were able to cite specific poems or locations.
- The majority of visitors reported liking the poetry (70%), while less than 1% disliked it.
- Between 54% and 70% of visitors felt strongly that the poetry was relevant to ***what the zoo is about***.
- Importantly, 24% to 40% specifically noted the poems made them think about conservation issues.
- A significant percentage, 13% to 38% of visitors, related that the poetry prompted a slower, more thoughtful, or reflective experience at the zoo (Deming, 2013).

Findings from this project show the importance of thoughtful and bilateral collaborations between poets and institutions. Alison Hawthrone Deming, poet-in-residence on the project, writes:

The most important principle in curating the installation was to listen to the collaborators, both the zoo and library partners, to develop a sense of audience for the site and a sense of the values that shape the community's aesthetic. The best advice I had in the process was Sandra (Alcosser)'s encouragement that the process of selection was a conversation with the partners. That was very much my experience and I am grateful for the generous input and thoughtfulness of my Jacksonville partners (Deming, 2013, p. 46).

Pattiann Rogers (2013), another poet-in-residence on the project, compiled a list of criteria she felt were important in selecting and engaging poetry in cross-institutional collaborations. Although specific to zoos, these insights appear applicable to other informal science institutions such as natural history museums, to libraries, and to neutral public environments. She advises that:

- Installation poems should use poetry's greatest strengths of subtlety, imagery, suggestion, questioning, wondering, authenticity, honesty and an appeal to the sense, in order to ***awaken and evoke emotional responses***.
- There should be poems which appeal to a variety of levels of accessibility. They should explore a range of engagements from ***brief, wonderful poems that can easily be read by children or anyone reading at a third- or fourth-grade level, to rich poems that require a little more time but that offer rewards for that time*** (Rogers, 2013, p.63). Everyone who visits the institution should be able to find at least one poem he or she can enjoy.
- Installations should respect a variety of voices and approaches, such as ***serious, lyrical, musing, witty, compassionate, contemplative, light-hearted, celebratory*** (Rogers, 2013, p. 62).

Rogers also set the intention to use mostly contemporary poems, as she felt the language of contemporary poems might more easily reach contemporary institution visitors. In the end, however certain more historical poems were also included, perhaps due to their addressing the above criteria.

Lastly and not least importantly, Rogers writes: ***It is important that the poems offer a distinctly different experience from the other signs encountered at the zoo, those signs in prose giving facts and data, information, and directions. The poems should not be dictatorial, or express condemnation of human behavior, or advocate any particular action. Instead, the poems should allow readers to take pleasure in the language, to come to discoveries on their own, and have the power to engender a rapport with the living earth and its creatures*** (Rogers, 2013, p. 64)

These lessons, although directed toward poetry and zoo collaborations specifically, are apropos to collaborations between poetry and informal science institutions at large. They give us ground upon which to build a more nuanced understanding of art and science collaborations across a wider range of institutions.

Indianapolis; City as Living Laboratory

Indianapolis: City as Living Laboratory (ICaLL), is a National Science Foundation (NSF)-funded project which explores artwork and performance as conduits for informal science learning on a citywide scale. The project attempts to transform the city of Indianapolis into an informal science-learning museum through the use of sculpture, dance, music, and poetry as educational tools in promoting awareness and understanding of the city's waterways.

The most salient finding from our research on ICaLL is the impact adding layers of modes of knowledge acquisition has on the learner. We found, for example, that artists who approached science education through singular mediums had less of an impact on audiences' understanding and ability to communicate science concepts than artists who explored science education through multiple mediums. When art was coupled with discourse, audience members were better able to find meaningful connections than just through art alone. When art, discourse, and embodiment were layered together, audience members were even more impacted. Engaging the body and mind and in multiple ways were crucial in helping audience members foster understanding and the ability to communicate science concepts.

ICaLL also showed us the importance of diaphoretic metaphor, the juxtaposition of two metaphors or ways of understanding the world. In the interpretivist tradition, this is known as the blending of vision horizons. It offers an individual multiple, parallel, albeit not always clearly compatible, vistas through which to understand a phenomena. In the case of ICaLL, water sustainability; in the case of Field Work, natural history. Indeed, as it relates to Field Work, our findings in ICaLL suggest project partners will achieve greater impacts if they allow multiple metaphors, factual discourse, and the embodiment of knowledge through the physical body to simultaneously co-occur. Our research in understanding plurality of thought further suggests that libraries and neutral aspects of natural history museums will play an essential role in helping audience members resolve the seeming tensions those avenues to knowledge acquisition agitate, by providing a safe and nurturing "third side" that cultivates one's inner "third space."

Wild Minds: What Animals Really Think

Wild Minds: What Animals Really Think (Wild Minds), was an exhibition about animal cognition at two collaborating informal science institutions within a city: a zoo and a science center. Wild Minds addressed the tendency for informal science education institutions to compete with each other for resources in pursuit of their individual missions. Many of these institutions share the common goal of bettering society and the public good through science learning. Similar to Field Work, then, Wild Minds addressed how collaborative work between institutions can increase public value of science learning by setting aside competitive narratives.

Findings revealed the potential to enhance public value through community engagement. When two organizations work together, they can supplement and leverage their individual strengths to accomplish related goals. ***They have the potential to expand science literacy in their community, cross-promote to one another's audiences, and develop their staffs by learning from the approaches taken at other institutions*** (Fraser, Weiss, Sheppard, Flinner, 2013).

In the case of Wild Minds, for example, we learned that zoos valued science centers' ability to address current issues due to their exhibit adaptability, while science centers valued zoos' longer term and more deliberate efforts to address conservation issues. Considering inter-institutional collaboration, Wild Minds highlight the importance to:

- Understand complementary strengths between institutions which can further respective goals;
- Identify possible synergistic opportunities around exhibitions, programming and special events;
- Inform interpretive staff of content and efforts in both institutions so that they can help visitors make cross-institutional connections and community-wide questions;
- Share what is learned amongst the community of informal science educators and institutions; and
- Promote willing participation and cooperation toward new possibilities and avenues of generating greater public value.

Evaluation and Validity

FIELD WORK AND EVALUATION

Program evaluation is mandated as part of Field Work's IMLS funding to provide accountability and to measure progress toward advancing the IMLS mission. As constructivists, NewKnowledge makes no judgment and holds no *a priori* opinion on how your work and process should or should not manifest. Our main goal is to support and understand project outcomes as deeply as possible, being sure to be as clear and holistic in our approach as circumstances will allow. Toward this aim, we are interested in what you think is relevant about your work and your process that might help us understand your practice and process better. This section of the briefing materials is designed to provide you with general information about the role of program evaluation in Field Work.

OUTCOMES-BASED EVALUATION

Evaluation is most commonly defined as the application of social science research methods to systematically determine the merit, worth, or significance of projects, programs, or policies. Outcomes-Based Evaluation (OBE), required by IMLS, is a specific approach that is especially useful in measuring education programs and learning outcomes. At its core, OBE ensures that projects are grounded in practical and worthy causes toward the betterment of society. Outcomes in this case are defined as ***benefits to people: specifically, achievements or changes in skill, knowledge, attitude, behavior, condition, or life status for program participants*** (Institute of Museum and Library Services, n.d.)

Learning outcomes can occur at different levels and points in time. Learning occurs for the team, for the team's organization, for participants, and for those people with whom participants share their experiences. Learning outcomes can be measured during or immediately following an event, or at some point in the distant future. NewKnowledge researchers collaborate with stakeholders to determine appropriate outcome measures such as awareness, knowledge gain, behavior change, or other specific outcomes.

Collaboration is an intended outcome of Field Work that has already been identified as key to measure. Deep collaboration is a partnership rather than simple cooperation. It is based on a formal partnership with defined roles and joint authority, mutually agreed upon goals, open communication, shared planning, and shared resources. Highly functioning collaborations strengthen, extend, and deepen project impact. Theory suggests that when organizations combine their collective intellects, skills, and financial resources to further impact, they achieve greater good than if they were to each work independently.

Collaborative efforts result in combinations of different types of deliverables that each organization brings to the project. Outcomes of collaboration depend on how these components are integrated and designed to work together. Garibay (2008, p.99) states that ***it is imperative that such projects be based on a working hypothesis of why each deliverable—and the interplay among them—is necessary to achieve the intended impact.***

Evaluation Questions

Outcome measurement begins by asking questions about the program. These questions can be descriptive, causal, or evaluative in nature. Descriptive questions ask about the resources required to conduct the program, what happened during program activities, and how the participants described their experiences. Causal questions seek to determine which characteristics of the program resulted in the observed changes in outcomes. Evaluative Questions ask whether the changes that occurred had value, and if so, for whom? Did the program provide value equal or greater to the costs that were incurred to produce it? Should the program funding be renewed?

Data collection methods, such as surveys, program observations, and participant journals, are designed to answer the questions posed by program stakeholders.

Data Collection

Data can be described as either quantitative or qualitative, and different data collection methods are designed for each. Quantitative data consists of countable numbers, usually collected through surveys, which are generally amenable to statistical analysis. Qualitative data, on the other hand, refers to anecdotes and experiences that are not representable by numbers, such as testimonials, interviews, or observations. Qualitative data is typically summarized and used to illustrate case-specific or nuanced findings, however it can also be coded and subsequently statistically analyzed.

At NewKnowledge, we find that a mixed methods approach, which gathers both quantitative and qualitative data, results in the strongest evaluation study. Through a mixed methods approach, we are able to triangulate findings that withstand statistical analysis with real life experience. We gauge the validity of a finding based on how well our quantitative and qualitative data corroborate.

Validity and Reliability

Validity is the measure of how well a data collection instrument actually measures what it purports to measure. Reliability is a measure of how replicable a data set is; if we repeat the method with the same population, will the data findings be the same? Hence, when we collect data we need to follow an established protocol. For example, if we are interviewing science center visitors, we need to ask the same question in the same way to all of those that we talk to. NewKnowledge strives to incorporate best research practices into our work and will train your staff to do the same.

ROLE OF THE EVALUATION TEAM

We are here to synthesize and provide you with the techniques used for data gathering and research that are relevant to your work and the greater project at hand. As constructivist researchers, we believe it is important to understanding the processes of those being evaluated and how the information we provide may influence it. We believe having an open and honest dialogue between NewKnowledge and yourself is vital for the research outcomes of this project and urge you to have an equally open and honest dialogue with the participants you work with.

RECOMMENDED EVALUATION TOOLS

For a more in-depth exploration into OBE, please see the Outcome Based Evaluation page on the IMLS website at https://www.imls.gov/grants/outcome-based-evaluations. This is a good resource from which to understand IMLS evaluation principles. Additionally, the Public Library Association, under the division of the American Library Association, has started an initiative called Project Outcome (http://www.ala.org/pla/initiatives/performancemeasurement), which provides resources to understand and measure Library programming outcomes. For Field Work, all evaluation instruments and techniques will be provided by NewKnowledge. These resources however, will provide library-specific evaluation information that will contextualize our project and strengthen your engagement.

For Museums, the Visitor Studies Association also provides a good evaluation resource (http://www.visitorstudies.org/evaluator-competencies).

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