Many Experts, Many Audiences: Public Engagement with Science and Informal Science Education

A CAISE Inquiry Group Report

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About CAISE

The Center for Advancement of Informal Science Education (CAISE) works to strengthen and connect the informal science education community by catalyzing conversation and collaboration across the entire field—including film and broadcast media, science centers and museums, zoos and aquariums, botanical gardens and nature centers, digital media and gaming, science journalism, and youth, community, and after-school programs. CAISE focuses on improving practice, documenting evidence of impact, and communicating the contributions of informal science education.

Founded in 2007 with support from the National Science Foundation (NSF), CAISE is a partnership among the Association of Science-Technology Centers (ASTC), Oregon State University (OSU), the University of Pittsburgh Center for Learning in Out-of-School Environments (UPCLOSE), and the Visitor Studies Association (VSA). Inverness Research Associates serves as evaluator. CAISE is housed at ASTC's Washington, D.C. offices.

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Executive Summary

Introduction

Science and technology are embedded in every aspect of modern life. This report describes how Public Engagement with Science (PES), in the context of informal science education (ISE), can provide opportunities for public awareness of and participation in science and technology.

We face profound challenges and choices related to science and technology: *How should we respond to the possibility of catastrophic global climate change? How should the federal government fund stem cell research? Is nanotechnology safe?* To make the most effective and robust choices, we must draw on the best scientific knowledge that is available to us. However, ongoing controversies and uncertainties related to today's big issues—whether viewed locally, nationally, or globally—suggest that responding to these challenges is not simply a matter of utilizing the best scientific knowledge available. Increasingly we are required simultaneously to address complex social and moral questions: *How should limited scientific and technical resources be allocated? In what ways are controversies about science and technology actually conflicts over values, worldviews, and/or visions of the future? How do we make decisions about science and technology in our society? And who decides?*

As individuals, communities, and societies, our understanding of and response to science are shaped by the cultures and contexts in which we live, work, and play. This means that understandings of and responses to science are deeply informed by knowledge and perspectives from non-science domains, such as senses of ethics and morality, visions for society and future generations, and drives to explore and explain the unknown. Therefore, to address complex scientific questions and controversies in a way that fosters responsible and appropriate scientific knowledge production and decision making, we must create opportunities for an exchange of knowledge, ideas, and perspectives that involves the participation of all aspects of society—publics, scientists, and decision makers. This exchange can help create well-informed, empowered publics who are better equipped to contribute to our understanding of the world and to responsible decision making. (Note that the term publics, as opposed to public or the general public, is used frequently in PES to acknowledge the multiple identities and diversity that exist within the concept of the public. In other words, there isn't a single, unified public. Publics include ordinary people who may or may not have backgrounds in science who come in contact with ISE.)

PES is an approach that has developed in the last 10 years within academic settings and the science policy arena. PES refers to seeking public input into policy decisions about the development and application of science and technology in society. The implementation of PES in the science policy arena has helped to develop and articulate new understanding of and expectations for the relationship between science and publics in policy making and other contexts. For example, in the last several years, ISE professionals have begun to explore how the principles of PES as practiced within the science policy arena might be adapted to the practice of ISE.

In response to a request by the National Science Foundation, the Center for Advancement of Informal Science Education (CAISE) established a CAISE PES Inquiry Group to

- assemble and articulate the concepts, issues, tensions, and context of Public Engagement

with Science as it relates to informal science education

- broaden the conversation about Public Engagement with Science to include a larger and more diverse pool of ISE professionals and stakeholders, including funding agencies, the scientific community, and ISE evaluators and researchers, and
- expand the range of current ISE activities by promoting the use and study of Public Engagement with Science in informal science education.

This CAISE Inquiry Group Report seeks to serve as a prompt for discussion and exploration of PES in ISE, as opposed to being an authoritative sourcebook or how-to manual. Our goals in writing this report are to open up the conversation up further, to foster dialogue and interaction across our communities, to intentionally build on one another's work, and to push the boundaries of what PES in ISE could mean as well as to improve its effectiveness and impact. We also contend that there is a great advantage to viewing ISE as a spectrum of activities that spans two programatic models for involving the public in scientific ideas—one referred to as Public Understanding of Science and the one that is the focus of this paper, Public Engagement with Science.

What Is Public Engagement with Science?

In the ISE field, the term "engagement" is often used to describe the involvement of audiences in learning about science. However, "engagement" as it is used in this report and in Public Engagement with Science literature and practice has a specific meaning that is characterized by *mutual learning* by publics and scientists—and, in some cases, policy makers. This orientation contrasts with a one-way transmission of knowledge from "experts" to publics. Specifically, PES experiences allow people with varied backgrounds and scientific expertise to articulate and contribute their perspectives, ideas, knowledge, and values in response to scientific questions or science-related controversies. PES thus is framed as a multi-directional dialogue among people that allows all the participants to learn. PES activities in the context of informal science education may—but do not necessarily—inform the direction of scientific investigations, institutions, and/or science policy.

It is important to note that we are not advocating funding PES activities at the expense or abandonment of currently successful ISE programs and activities. Rather, this report should introduce people to the strengths of PES and clarify how it fits in with goals of ISE. PES is a useful complement to the current ISE toolbox, and PES goals may be realized in current programs.

ISE generally focuses on increasing overall interest in, involvement in, and knowledge of scientific content and processes. In addition, the goals of PES activities in ISE for individuals or communities often include one or more of the following:

- Mutual learning by publics and by scientists, allowing everyone who participates to develop new or more nuanced understandings of issues and opportunities;
- Empowerment and the development of skills for participating in civic activities;
- Increased awareness of the cultural relevance of science, science as a cultural practice, and science–society interactions; and

- Recognition of the importance of multiple perspectives and domains of knowledge, including scientific understandings, personal and cultural values, and social and ethical concerns, to understanding and decision making related to science and to science and society issues.

The goals of PES experiences align well with the broader goals of formal and informal science education as articulated in two National Research Council reports, *Taking Science to School* (Duschl, Schweingruber, and Shouse, 2007) and *Learning Science in Informal Environments* (Bell, Lewenstein, Shouse, and Feder, 2009). The discussion here is focused in terms of how Public Engagement with Science can contribute to the following informal science education goals:

- Expanding access to science and science education;
- Increasing the relevance of science and science education to people's lives;
- Improving science literacy;
- Increasing people's participation in science and society;
- Building relationships with scientists; and
- Providing new models of learning and research.

Public Engagement with Science Mechanisms and Perspectives

PES in ISE takes two general forms, as *mechanisms* and as *perspectives*. *PES mechanisms* are ISE activities or experiences in which mutual learning occurs *as part* of the experience; people from varied backgrounds and perspectives listen, share, and build on what is being presented and learn from one another. Many of these experiences occur in person, for example at live dialogue events or forums, or through mass media channels with call-in, e-mail, or text messaging capacity. PES mechanisms in informal science education contexts can involve a time lag (asynchronous interaction), particularly when they occur through blogs and online forums.

The implications of PES in ISE are potentially profound. The incorporation of PES mechanisms and perspectives into ISE creates the possibility for ISE organizations to operate not only as storehouses and/or disseminators of knowledge, but as facilitators of the production of new knowledge and understanding through dialogue and interaction among publics, scientists, and policy makers. The integration of PES mechanisms and perspectives into ISE positions informal science education as a contributor to broader cultural change, fostering increased awareness of science and a sense of shared responsibility that leads to civic participation in science and decision making. This capacity has the potential to strengthen the presence of ISE organizations as vital participants in our 21st century communities.

An ISE activity or experience using a *PES perspective*, on the other hand, explicitly addresses one or more PES goals but does not facilitate direct interaction between publics and scientists. In practice, this means that ISE activities or experiences using a PES perspective assume that scientific knowledge alone is not sufficient to fully address the topic at hand and that publics, not only the scientists or "experts," can make useful and valuable contributions to discussions and decisions about science and technology. Public contributions might depend not on scientific knowledge but on knowledge drawn from life

experience and personal and community values. While specific PES mechanisms in ISE are relatively new, some ISE practitioners have been incorporating PES perspectives for many years. For example, in a story on rainforest logging, a science television program may include perspectives from ecologists, farmers, loggers, policy makers, and others, but it does not facilitate direct interaction between these participants and the program's television viewers.

Opportunities for Incorporating Public Engagement with Science into Informal Science Education

The final section of this report addresses particular opportunities for adding PES to ISE. These opportunities are organized into four categories: (1) overall opportunities, (2) opportunities for funding agencies, (3) opportunities for ISE institutions and professionals, and (4) opportunities for scientific institutions and individuals. Four opportunities that apply overall are summarized here:

- Become more familiar with PES, how it aligns with an organization's mission and scope of work, and how it could enhance and push the boundaries of current work. This opportunity also suggests being more intentional about the use of the words *engage* and *engagement*.
- View PES activities as opportunities to expand and diversify the audiences that programs serve, the content areas of activities/portfolios, and the models of learning that are supported.
- Support research and evaluation on impacts, indicators, opportunities, and challenges in PES.
- Create opportunities for internal collaborations among departments, divisions, or directorates as well as external collaborations among institutions.