



## TEACHING & LEARNING

# Civic Engagement and Informal Science Education

**LARRY BELL**

*Museum of Science, Boston*

*Introduction by*

**DAVID UCKO**

*Visitors Studies Association*

### Introduction

The following article by Larry Bell (Museum of Science, Boston) represents reflection and analysis generated by the National Science Foundation project "Maximizing Collective Impact Through Cross-Sector Partnerships: Planning a SENCER and NISE Net Collaboration" (DRL-1612376). This National Center for Science & Civic Engagement grant was the latest in a series of efforts to explore partnerships between higher education institutions and informal learning organizations based on civic engagement strategies. As Bell points out, one of the challenges in such collaboration is arriving at a common understanding of the meaning and implications

of that term. In this piece, he suggests ways for science centers and children's museums to think about civic engagement and its future role in their activities.

Fruitful connections between SENCER and informal learning were discussed in earlier articles in this journal (Friedman & Mappen 2011; Ucko 2015). They became the basis for grants from NSF, the Noyce Foundation, and the Institute of Museum and Library Services that funded 15 cross-sector partnerships. As noted in a recent overview of those projects, "collaboration between informal science organizations and higher education institutions based on civic engagement offers potential

benefits for the partners, the students, and the public" (Semmel & Ucko 2017).

In deconstructing its definition, Bell emphasizes the value of a civic engagement focus in providing tools and knowledge that prepare individuals for future participation, both nationally and locally. At the same time, it can enhance learning among students by increasing motivation and demonstrating the relevance of STEM content to their wider interests and concerns. This complementarity and its positive impact on faculty practice became a basis for characterizing SENCER as a "community of

transformation" in STEM education reform (Kezar & Gehrke 2015).

Many avenues exist for participation in civic activities that complement and enhance STEM knowledge and understanding. For example, community-based citizen science projects often have been the platform for higher education-informal learning partnerships. We hope that this article and its proposed model for civic engagement will encourage new strategies for effective collaboration involving informal learning organizations.

—David Ucko

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## Civic Engagement and Informal Science Education

Leaders of the National Informal STEM Education Network (NISE Net) were fortunate to be part of a collaborative planning grant led by the National Center for Science and Civic Engagement to explore a strategic collaboration between Science Education for New Civic Engagements and Responsibilities-Informal Science Education (SENCER-ISE) and NISE Net, two extensive STEM networks with overlapping missions, but with distinct organizational assets and constituencies. One of the challenges NISE Net leaders had from the original conception of the project was to get a clear understanding of what "civic engagement" might mean for science and children's museums. It is not unusual for museums, steeped in the approaches of informal science education and oriented toward supporting K-12 formal education, to be unfamiliar with related but different approaches to engaging learners in science and technology. As an example, the Center for Advancing Informal Science Education (CAISE) led an inquiry group nearly a decade ago and wrote a report about "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" (McCallie et al. 2009). The field is exploring its potential roles in PES today.

Similarly, engaging with the leaders of the National Center for Science and Civic Engagement and the SENCER initiative raised questions about what "civic engagement" might mean for science museums. Initial discussions revealed that "civic engagement" might encompass a wide range of activities for which SENCER model courses might provide examples, but NISE Net leaders felt that they needed some kind of working model to understand how "civic engagement" relates to a variety of activities that NISE Net partner organizations already engage in. We also wanted to understand how characteristics of civic engagement might be differentiated from current practices in informal science education.

### Deconstructing a Definition of Civic Engagement

As a way of thinking about this question, we searched for a variety of definitions of civic engagement and decided for this exercise to use one we found in the *New York Times* (2006), which was actually an excerpt from *Civic Responsibility and Higher Education*, edited by Thomas Ehrlich:

Civic engagement means working to make a difference in the civic life of our communities and developing the combination of knowledge, skills, values and motivation to make that difference. (Ehrlich 2000, vi)

A first step in exploring this definition required further examination of some of its components. A key question for ISE organizations is *who* is “working to make a difference”? At the workshop in March, some NISE Net leaders noted that they had been interpreting the SENCER initiative incorrectly since their first exposure to it several years ago. They thought SENCER was an acronym for “science education *through* new civic engagement and responsibility” and that SENCER courses involved students in civic projects in the community during the course of which they learned the science they needed to carry out the projects. But at the March meeting, David Burns clarified that SENCER was the acronym for “science education *for* new civic engagement and responsibility.” The learning did not necessarily take place by participating in a community-based civic engagement project (although it might) but rather was designed to provide students with tools that they might need for their own future civic engagement. Similarly for ISE organizations, the question thus arises whether the civic engagement work of ISE organizations might be designed around preparing members of their audience for carrying out future civic engagement activities or whether the ISE organizations would organize civic engagement activities of their own in which members of their audience might or might not participate.

### Civic Life

The next term in the definition of civic engagement that needed exploration was “civic life.” For this the National Standards for Civics and Government provided a definition.

**Civic life** is the **public** life of the citizen concerned with the affairs of the community and nation as contrasted with private or **personal** life, which is devoted to the pursuit of private and personal interests. (Center for Civic Engagement 2014)

NISE Net leaders felt that science museums had a long history of focusing on the personal life of their audience members. This includes both personal opportunity (children should have the opportunity to pursue careers that involve science and technology) and beneficial choices in their personal life (people should have nutritional food choices). NISE Net leaders were less clear on the extent to which science museums focused explicitly

on “affairs of the community and nation” but recognized that recent developments in the governance of the country raised questions about the connections between scientific evidence and sound policy decisions. That was causing some members of the ISE community to ask questions about whether the field was doing enough about science and public policy.

### Values and Motivation

Another term in the definition of civic engagement that raised questions was “combination of knowledge, skills, values and motivation.” Many ISE organizations are familiar with a set of potential ISE impacts outlined in *Framework for Evaluating Impacts of Informal Science Education Projects* (Friedman 2008), which NSF references in its solicitations for Advancing Informal STEM Learning proposals. That document identifies the following potential impacts: awareness, knowledge, understanding, engagement, interest, attitude, behavior, and skills. Values and motivation are new potential impacts of ISE for civic engagement. The Framework speaks of “motivation” as a characteristic audiences bring to their ISE experience rather than as an impact of the experience.

*Civic Responsibility and Higher Education* describes motivation for civic engagement in this way:

A morally and civically responsible individual recognizes himself or herself as a member of a larger social fabric and therefore considers social problems to be at least partly his or her own; such an individual is willing to see the moral and civic dimensions of issues, to make and justify informed moral and civic judgments, and to take action when appropriate. (Ehrlich 2009, introduction, xxvi)

The CAISE report on PES explicitly identifies the following values in connection with the goals of public engagement activities in ISE for individuals or communities:

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. (McCallie et al. 2009)

## Making a Difference

The final element to note in the definition of civic engagement that the New York Times pulled from Ehrlich is that the purpose of civic engagement is to “make a difference.” Several sources describe what making a difference might mean:

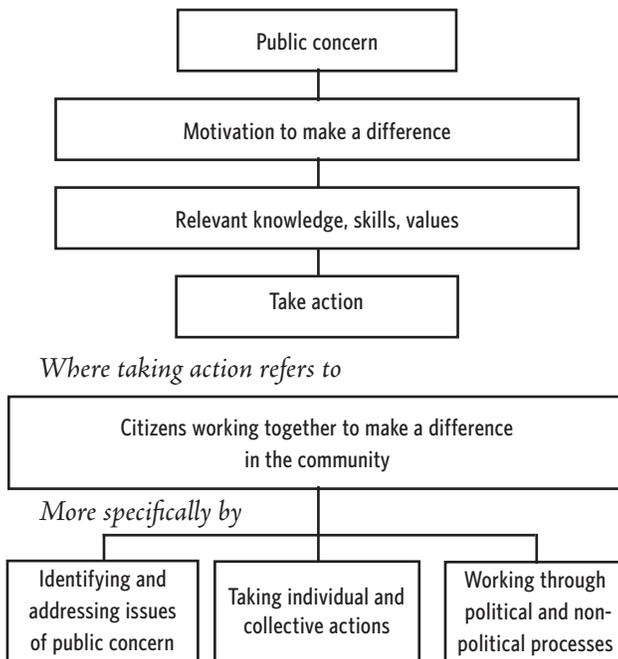
“Civic engagement is... individual and collective action designed to **identify and address issues of public concern**.” (American Psychological Association (APA) 2018)

It can be defined as citizens working together to **make a change**. (Wikipedia, 2017)

It means **promoting the quality of life in a community**, through both **political and non-political** processes. (Ehrlich 2000)

## Constructing a Model for Civic Engagement in ISE

What emerges from the definition used here and the exploration of some of the terms is a potential model for civic engagement in informal science education. Civic engagement starts with a public concern; requires motivation to make a difference and the acquisition of relevant knowledge, skills, and values; and proceeds with taking action to make a difference.



Furthermore, ISE organizations motivated for civic engagement have some options related to the question raised earlier about *who* is taking action to make a difference:

- The museum provides *members of its audience* with knowledge, skills, and perhaps values and motivations to support their civic engagement activities.
- *The museum* develops civic engagement projects of its own to make a difference in the community.
- *The museum and other community organizations* partner to carry out civic engagement projects.

Perhaps the aspects of civic engagement identified on this page can help ISE professionals think about civic engagement in terms of the things ISE organizations currently do or do not do.

## Science and Children’s Museums Themselves Are Civic Engagement Activities

On the most fundamental level, the very existence of science and children’s museums is a kind of civic engagement. Their classification as 501(c)(3) charitable organizations is recognition that their purpose is to “promote the quality of life in a community” principally or exclusively through non-political processes. Science museums may consider several different **public concerns** as the ones that drive their mission. For example,

- The talent pool for STEM innovation is too small, resulting in lower national achievement and prosperity.
- Opportunities in STEM are not equally distributed among those in the community.
- Many of the complex issues that shape our daily lives and our future require an understanding of basic science, math, engineering, and technology in order to make informed decisions.
- As science and technology pervade our lives, our societal challenges become more complex.
- There is a lack of communication between the scientific community and various publics.
- The school system alone is not adequate for stimulating children’s interest and self-efficacy in STEM.

Individuals are **motivated to address these concerns** though science museums in a variety of ways. Some work for science museums and develop a career doing so, working in a variety of ways to strengthen the effectiveness of their own organization and other similar organizations. Many volunteer their time and talents without financial compensation, working for science museums because

they find the work meaningful and fulfilling. Others donate money in small amounts or in very large amounts because they feel the organization is doing good for the community and addressing specific public concerns at both national and community levels.

Science museums work to gain the **knowledge and skills** needed to be effective in their work. Grants from National Science Foundation, IMLS, and other sources acknowledge the efforts to advance the knowledge and skills of individual organizations and of the field as a whole. Organizations like the Association of Science-Technology Centers, the Association of Children's Museums, the American Association of Museums, the Visitor Studies Association, and the Center for the Advancement of Informal Science Education all support the efforts of the field to advance its knowledge and skills and to support the values of the profession.

Science museums also **take action** to address the public concerns at the heart of their missions. Furthermore they recruit individuals, corporations, and other organizations in their communities to work together with them in addressing those concerns.

In addition to the overall work of such organizations, science and children's museums also undertake projects that are aimed at addressing specific community needs.

- The *Computer Clubhouse* (<http://www.computerclubhouse.org>), for instance, originally developed by The Computer Museum in Boston, is aimed at a gap in opportunity for youth from underserved communities and now supports a global community of 100 Clubhouses in 19 countries.
- The *Engineering is Elementary* curriculum and teacher support activities (<https://www.eie.org>) developed by the Museum of Science are aimed at a significant content gap in formal elementary education.
- Science museums conduct a variety of teacher training programs, because elementary and middle school teachers often have little training in science or science education. (Association of Science-Technology Centers [ASTC] 2014)

Not everything science and children's museums do is in fulfillment of civic engagement goals, but on a fundamental level they can be seen as civic engagement efforts

for the purpose of stimulating youth in areas of STEM learning.

But now we step aside from this fundamental perspective and look at other more specific ways in which science museums can support civic engagement.

### **Support for Visitors' Future Civic Engagement**

First we explore the idea that the museum is not organizing a civic engagement activity in the community itself, any more than it is conducting a wide range of scientific research itself, but is helping to prepare its visitors for civic engagement (or scientific research roles) in their future, much in the way that SENCER courses do for students.

In this regard, comments in NISE Net's *Nanotechnology and Society Guide* (Wetmore et al. 2013) outline societal concerns that explain the motivation behind the Guide, which seems to come from a civic engagement perspective.

*The decisions we make about science and technology have profound effects on people.... nanotechnology is poised to have a significant impact on our lives in the coming years, and as such it is very important that we engage in open conversations about what it is, what is possible, and where we would like it to go. But sometimes people's voices about science and technology are muted because it can be difficult to know how to engage in these discussions. Nanotechnology can be especially intimidating, as many people do not even know what it is. [It is] important to give everyday citizens a voice.*

The Guide describes a societal problem and works to motivate everyday citizens to take an active role by participating in open conversations and letting their voices be heard. The Guide and associated hands-on materials, training activities, and other supporting resources all provide knowledge and skills necessary to everyday citizens so that they can play a role. All of this material stops short of the "take action" step. It suggests there is opportunity to take action, but it provides no direct means for doing so, leaving such action to play out in other domains apart from the science or children's museum, except, of course, for the universal take action plan of such organizations: "learn more."

Another kind of “take action” step that ISE organizations often promote is donating funds to the organization itself to carry out its work. An interesting example of incorporating giving to a worthy cause was built into the Bronx Zoo’s Congo Rainforest Gorilla experience almost two decades ago. After walking through the forest, viewing a movie about gorilla research, and seeing the live gorillas, visitors get to decide which of the Zoo’s conservation projects their admission fee should be directed toward. In 2009 the Wildlife Conservation Society reported that the exhibit had raised \$10.6 million to fund the conservation of Central Africa’s Congo Basin rainforest and wildlife and turned seven million visitors into conservationists!

A couple of examples of “take action” steps in a temporary exhibition at the Museum of Science decades ago were incorporated by MOS staff into a Smithsonian traveling exhibition about the destruction of tropical rainforests. Evaluation reports about the exhibition at earlier sites noted that the exhibit left some visitors who care about the environment unclear about what they could do about the situation. Museum staff added to the exhibition a small gift shop of rainforest sustaining products along with their stories. There also was an area about environmental organizations that focus on rainforest support actions, with postcards visitors could fill out to get more information or to get on the mailing list of those organizations. Visitors could fill out a card and drop it in a mailbox in the exhibition to get connected with an organization to take action.

These are just a few examples. There are many others. But it is not typical for science museums to get all the way to the “take action” stage in their exhibitions and programs. Most provide support for visitors who can find their own path to action.

### Identifying and Addressing Issues of Public Concern

A characteristic of civic engagement is that it involves identifying and addressing issues of public concern. Except for the overall concerns about science education, most science museum exhibits don’t evolve from public concerns. Perhaps the biggest exception to that may be in the area of environmental conservation and climate change.

A scan of a few websites that list high-priority public concerns turn up a number of topics:

#### United Nations Global Issues

- \* Aging
- \* AIDS
- \* Atomic energy
- \* Big data for the Sustainable Development Goals (SDGs)
- \* Children
- \* Climate Change
- \* Decolonization
- \* Democracy
- \* Food
- \* Human rights
- \* International law and justice
- \* Oceans and the Law of the Sea
- \* Peace and security
- \* Population
- \* Refugees
- \* Water
- \* Women

#### Ten Social Issues Americans Talk the Most About on Twitter (Dwyer, 2014)

- \* Better job opportunities
- \* Freedom from discrimination
- \* A good education
- \* An honest and responsive government
- \* Political freedoms
- \* Action taken on climate change
- \* Protecting forests, rivers, and oceans
- \* Equality between men and women
- \* Reliable energy at home
- \* Better transportation and roads

There are many lists like these two. Some topics may be more familiar to science museum environments: AIDS, aging, climate change, food, health, oceans, population, water, and education to name a few. Science Museum of Minnesota’s *Race: Are We So Different?* exhibition is a notable recent example. New technologies like nanotechnology and synthetic biology are topics we have covered in forums, but they are generally little known by the public and so usually come not from a current widespread public concern but rather from an anticipated future public concern. One question for any large-scale collaborative project, then, is whether there is a particular global or national

public concern that tens or hundreds of organizations would want to work on together, or if organizations would prefer to address their own local concerns.

### Role a Science Museum Could Play

Assuming that a science museum, or group of museums, is particularly interested in an issue of public concern and does not want to organize its own civic engagement activity, but would like to support their visitors' civic engagement capacity, there are a number of things the museum(s) could do. If civic engagement *for individuals* involves development of *knowledge, skills, values, and motivation to make a difference*, then for whatever issue one might choose, museums could, for instance:

- + Provide visitors with background knowledge relevant to the social issue, such as
  - + Awareness of the issue
  - + Scientific data related to the issue
- + Provide visitors with skill development activities related to taking action, such as
  - + Getting further information
  - + Talking with others about the issue in productive ways
  - + Recognizing elements of arguments: scientific evidence, personal experience, social values
- + Provide visitors with experience related to the range of values associated with the issue:
  - + Exposure to the views of others in connection with the issue
  - + Visitor activity in which participants explore their own values in connection with the issue
- + Provide visitors with information about and connections with other organizations through which visitors could get involved in activities related to the issue.

This is similar to what museums have done recently for nanotechnology and synthetic biology, except that they might:

- + Be more specific about the public concern
- + Put additional effort into building motivation for involvement, and

- + Incorporate a “take action” component if appropriate.

If an organization like NISE Net took this approach, it would need to consider if it would tackle one particular concern, spend a couple of years working on it, and then disseminate materials to use in connection with that concern broadly; or if it would try to create tools to help individual partners develop materials of their own for the different specific problems they wish to address. All of this would be done with the ultimate goal of providing members of museum audiences with support *for their own civic engagement*.

### Partnering for Civic Engagement

A different approach to civic engagement that a museum might take is to partner with other community organizations to work on solving societal problems directly, rather than preparing their visitors to be able to do that on their own. The NISE Net submitted a proposal to NSF in 2016, *STEM Community Partnerships*, which is an example of that kind of civic engagement. The proposal identified a social issue:

To secure our nation's future in science and technology, the US needs a workforce that has both broad general competency in STEM and deep specialized talent in the STEM fields, and that benefits from diverse perspectives, knowledge, and abilities. Currently, the STEM workforce does not represent the U.S. population as a whole. The U.S. Department of Commerce reports that women, Hispanics, and non-Hispanic Blacks have been consistently underrepresented in the STEM fields, and are only half as likely as all workers to hold STEM jobs. The underrepresentation of women, persons of color, and other groups in the STEM workforce is not only a STEM capacity issue but also a social justice issue, reflecting a profound disparity of opportunities and resources across the population. (Ostman 2006) The project description goes on to describe partnerships among science museums and YMCA branches, similar to work that the Children's Museum of Houston does, to produce and deliver out-of-school-time experiences designed to reach underrepresented youth with engagement in STEM. The project

calls for local partnerships in each participating community and a national partnership to support the local ones. The national partnership is designed to support the professionals at museums and YMCA branches in taking action to address the concern.

Unfortunately, the proposed project has not yet been funded.

Certainly science museums have the capacity to form local partnerships to address local issues. Many such partnerships likely already exist. One question about a large-scale network project is how the network could help organizations establish these kinds of local partnerships and initiatives. Perhaps the recent and existing SENCER-ISE partnerships fit within this category.

## Conclusions

Thinking about civic engagement and informal science education raises a number of questions for the science museum community.

*Would science museums prefer a model where the museum organizations help to build their visitors' capacities for their own civic engagement?* This may be parallel to the main focus of SENCER and is perhaps closer to what museums do now but with a somewhat different focus.

*Or would science museums prefer a model where the museum organization partners with other organizations to solve civic problems directly?* This may be different from what museums are doing now if the civic problem is beyond access to quality education.

*Are there societal issues beyond access to good education that science and children's museums might be interested in pursuing?* NISE Net asked partners in an annual partner survey and at regional meetings a few years ago about topics NISE Net partners might be interested in. The favorite topics in order of priority were energy, new emerging technologies, engineering, convergent technologies, climate change, brain and neuroscience, maker spaces, synthetic biology, societal and ethical implications, computer science, and big data. NISE Net did not, however, ask them about specific public concerns or societal issues related to these topics.

*Would science museums collectively want to tackle an issue with national scope and develop resources centrally to support partner organizations in addressing the particular issue selected, with the opportunity for some customization locally?* This is essentially what NISE Net has done with nanotechnology, synthetic biology, space and earth science, and other topics, but without a focus on a set of societal issues.

*Alternatively would science museums want to tackle specific local issues with partners in their own communities and perhaps get help in doing so from an organization like NISE?* NISE Net's past activities have all supported local partnerships, for instance, between universities doing nano research and science museums, or between community organizations and science museums.

Exploration of these questions could help members of the science museum community and organizations like NISE Net map out possible courses for the future of civic engagement in informal science education.

## About the Authors



Larry Bell is Senior Vice President for Strategic Initiatives at the Museum of Science in Boston and was the principal investigator and director of the Nanoscale Informal Science Education Network from 2005 until 2017. Currently he is interested in public engagement with societal implications of science and technology, activities that engage the public in dialogue and deliberation about socio-scientific issues, and in how research in science communication can inform informal science education practices.



David Ucko has served as deputy director of the Division of Research on Learning in Formal and Informal Settings at the National Science Foundation (NSF), president of the Kansas City Museum, chief deputy director of the California Museum of Science and Industry, and vice president of programs and director of science at the Museum of Science and Industry in Chicago. He is currently vice president for organizational development of the Visitors Studies Association,

co-chair for the National Research Committee on Communicating Chemistry in Informal Settings, and president of Museums+more, LLC, where he works on developing innovative approaches to informal learning. He holds a B.A. in chemistry from Columbia College of Columbia University and a Ph.D. in inorganic chemistry from Massachusetts Institute of Technology.

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