



INCLUDES: Achieving Scale for Inclusion in STEM

A Director's Workshop

September 1, 2015

Outline of Synthesis Report

- I. Context
- II. Workshop
- III. Synthesis of Participant Input
- IV. Critical Levers
- V. Appendices
 - Participants
 - Agenda
 - External Evaluation

Readings, graphic documentation, post-convening resource contributions and dialogue have been archived in the NSF INCLUDES Workshop Group on the Center for Advancement of Informal Science Education (CAISE) website: <http://informalscience.org/community/groups/details/?id=60>



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I. Context

The National Science Foundation (NSF) has a long history of commitment of inclusion of people from all parts of society in the science and engineering fields. This commitment has been supported by a large portfolio of programs aimed at addressing various aspects of the broadening participation challenge. Every directorate and office at NSF supports programs with a broadening participation component.

Despite NSF's efforts and those of many others, progress remains uneven and slower than desired. For example, although the number of women receiving bachelor degrees in biology has risen over the last two decades, the numbers receiving physics, mathematics, or computer science degrees have not risen as quickly. According to the National Science Board in their report *Science and Engineering Indicators, 2014*, "Between 2000 and 2011, the proportion of S&E bachelor's degrees awarded to women remained flat. During this period, it declined in computer sciences, mathematics, physics, engineering, and economics."¹ The broadening participation challenge will become even more urgent with increasing demographic and socioeconomic changes underway in our nation.²

Inclusion across the Nation of Communities of Learners that have been Underrepresented for Diversity in Engineering and Science (INCLUDES) is a multiyear comprehensive national initiative commencing in FY16 that is complementary to other federal diversity efforts in STEM. The initiative's goal is to mobilize STEM research, education, and other communities to develop and implement scalable solutions to broadening participation challenges. Launching this bold new effort requires careful consideration of potential scalable, high-impact innovations in STEM education to assure success for all people across the nation.

II. Workshop

The INCLUDES Workshop convened a group of thought leaders from across the nation, sectors, and academic disciplines on June 3, 2015 at the National Science Foundation for one day of brainstorming and prioritizing of ideas, strategies, and actions that could be aggressively pursued by the INCLUDES initiative. Specific goals of this one-day working conference were: 1) to consider potential scalable, high-impact innovations in STEM education to assure success for all people across the nation; and 2) to generate ideas, strategies, and actions that will alter the current landscape and potentially achieve a transformative change for inclusion. Participants were selected for their expertise on approaches to broadening participation in a range of settings, including universities, K-12 STEM education, and informal science learning environments. The invitation list was developed in consultation with multiple NSF directorates.

¹ National Science Board. 2014. *Science and Engineering Indicators 2014*. Accessed at <http://www.nsf.gov/statistics/seind14/index.cfm/chapter-2/c2h.htm>

² Executive Office of the President. February 2013. Women and Girls in Science, Technology, Engineering and Math (STEM). Accessed at https://www.whitehouse.gov/sites/default/files/microsites/ostp/stem_factsheet_2013_07232013.pdf

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The workshop was organized using the dual frames of collective impact and catalytic innovation to generate ideas, strategies, and actions to address scaling of transformative efforts in STEM education. Prior to the working conference, participants were provided with a selection of short thought papers on collective impact, catalytic innovation, and successful approaches to scaling. The conference began with presentations that established common language and examples among all participants, before breaking into groups to share what we already know and to brainstorm around what we should do in the future in each of the three focal areas: scaling, collective impact, and catalytic innovation.

Framing the meeting

In her opening remarks, Director France Córdova noted that NSF has always been at the cutting edge of science through funding scientific research, facilitating innovation, and building the future STEM workforce. In this role, NSF has a vital interest in doing its work in ways that broaden participation in STEM and STEM learning. As Córdova pointed out, “The reason we are coming together is because we have a passion for the charge, and we have to translate that passion into really making progress.”

Córdova went on to argue that, by supporting broader participation, NSF helps to develop a new generation of entrepreneurs who will emerge to meet the global challenges facing the nation. Diversity in this workforce contributes to diverse perspectives on science, which is key to future progress. The INCLUDES initiative is intended to accelerate progress on increasing the participation of underrepresented groups in STEM careers. The INCLUDES initiative is a high priority for the President of the United States, and it forms one of four priority funding areas for the NSF 2016 budget. The aim is to move from research to action. And that action should be rapidly scalable to meet our national needs. To achieve this, we need to work collectively rather than in silos. We cannot be protective or competitive about how we work on the problem of broader participation. We need to be cooperative. Sharing success stories and capitalizing upon them is a first step forward, and this convening is where we will begin the process.

Collective Impact

In the first of three content sessions, John Kania introduced collective impact as an approach for addressing complex problems at scale. He defined complex problems as dynamic, nonlinear, unpredictable, and confounded by many causal factors. They cannot be solved merely through effort and know-how and must be attacked at scale and over time by coordinated approaches that draw on five key properties:

- Common agendas that reflect an understanding of the problem and the opportunity
- A limited set of key, common, and shared measures
- Mutually reinforcing activities across collaborative efforts
- Continuous communication between collaborators and stakeholders
- A vibrant backbone organization that keeps efforts focused and in synch

Broadening participation in STEM is a complex problem. Kania recommended that efforts such as the INCLUDES initiative require a shift from isolated efforts towards a coordinated, longer-term approach. The kinds of individual projects that NSF has previously funded will not, in Kania’s view, ever be sufficient to “move the needle” at scale. A new kind of collective impact effort is needed.

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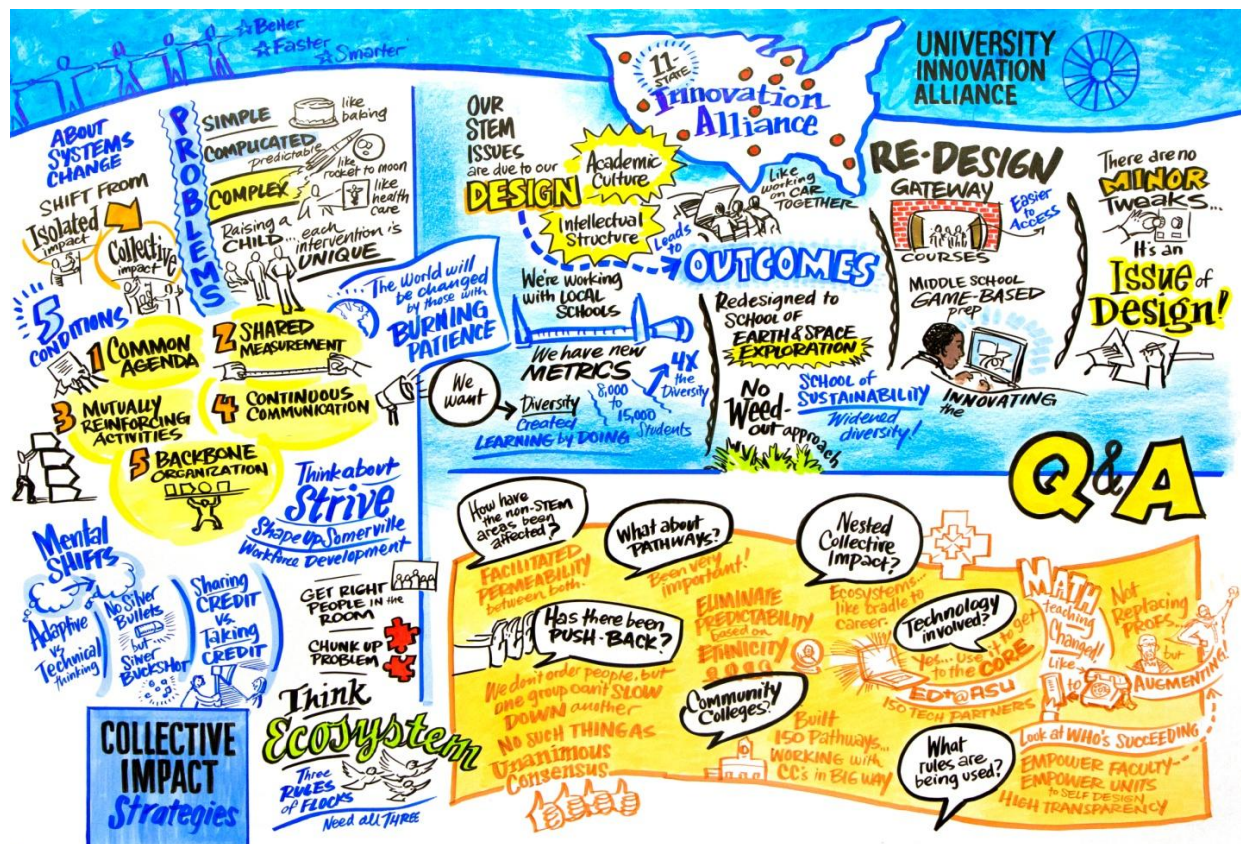


Figure 1. A graphic summary of the collective impact and scaling content presentations, created in real time during the INCLUDES convening at NSF.

Scaling

In the second presentation, Michael Crow described a coordinated approach to scaling: “If we desire to have a society which has very few barriers into the forward movement of STEM disciplines, we need to design new approaches to intervention that do more than tweak existing structures: they need to be truly transformative, disruptive, and aimed at broadening participation in every facet of STEM and STEM education.” Crow, who is president of Arizona State University, described the example of ASU’s engineering training. In an attempt to broaden participation, among other things, the training has evolved from traditional, and siloed departments to an interdisciplinary, problem-focused model. Crow credits the transformation with more than doubling enrollment in engineering programs, increasing the retention rate to 90%, and increasing the diversity of students in the programs. There is a focus on the concept of exploration as the theme of learning, which has helped to break down barriers to STEM participation. Crow argues that part of transforming education at scale is to examine, “the fundamental ways in which human beings are thwarted, where do they encounter the barrier that they cannot get around and how do you help them to get around that barrier?” These barriers can exist in all sorts of places in and out of the classroom, requiring a holistic rethinking of educational pathways. Crow described scaling the ASU model, and exploring others, as part of a multi-institution alliance that could eventually impact up to 400,000 university students. Among their common goals, the institutions in the alliance have committed to graduating

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more students, sharing innovations, being transparent about problems, and working to lower costs of higher education, which remain a significant barrier for many families.

Catalytic Innovation

The third content session included representatives from four NSF-funded projects, presenting examples of local successes they have had in broadening participation. Linda Katehi (participating remotely) presented the work of her Increasing the Participation and Advancement of Women in Academic Science and Engineering Careers (ADVANCE) grant at UC Davis. Echoing themes from the prior presentations, Katehi described an ecosystems approach to broadening participation as necessary to changing university institutional culture. She described how measurements of change and performance were critical to tracking progress in order to redirect efforts or, for that matter, to celebrate success. Full participation of the campus and leadership was important to increase the chances of sustainability beyond any particular project or grant. Successful efforts should be very visibly recognized, with the goal of catalyzing broader campus conversations about diversity as an indicator of strength and quality. All people at the university should internalize diversity as a value in all areas of their work. Katehi described how a range of institutional policies and faculty training programs implemented over the last decade have paid off at UC Davis, where women have increased from about 25% of new hires to the current rate of more than 50%. In the same time frame, new hires of people representing minorities have increased from 11% to 20%.

The other three presenters were part of a moderated panel discussion: Mary Jo Daniel describing work on her New Mexico EPSCoR project; Juan Gilbert his Broadening Participation In Computing Alliance (BPC-A) project; and LeRoy Jones II representing his Louis Stokes Alliance for Minority Participation (LSAMP) project.



Figure 2. Graphic summaries of the catalytic innovation presentation and panel discussion.

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Mary Jo Daniel explained that because scientific broadening participation *and* research are dual foci of her EPSCoR project, it provides a good example of how scientists and educators can work in ways that contribute to diversity. Her project achieved its goal of 50% female and underrepresented minority participation within two years, and Daniel recounted how this was the result of being strategic about how they involved new people in the research enterprise and how they established policies and practices in ways that: “got the whole research enterprise engaged in the broadening participation effort.”

Among other priorities, LeRoy Jones underlined the importance of NSF funding in highlighting efforts and commitment to broadening participation: “Throughout the state of Illinois, we have increased the visibility and credibility for broadening participation. Early on it wasn’t appreciated or valued, but working on it collectively with the different coordinators throughout the states, we have been able to make an impact.” Jones also outlined how the visibility of NSF funding has provided impact beyond the university, giving him leverage to get the attention of industry for partnerships and internships that target underrepresented students, and thus establishing specific pathways between university training and STEM jobs.

All three panelists endorsed the key role of partnerships, mentioning industry, K-12 schools, and informal STEM providers. The partnerships come with many benefits, but also challenges. There were several examples of how university students and faculty are not always equipped with the skill sets and dispositions needed, for example, to work in distressed schools or neighborhoods. Panelists stressed the importance of staying open to opportunities to partner, noting that many future STEM challenges can only be glimpsed today, and thus projects that provide infrastructure to broaden participation should remain flexible about who can help them achieve success.

The greatest challenge noted by the panelists was the need to go beyond spotty project funding to erect a long-term and reliable infrastructure. Juan Gilbert noticed that we somehow have developed: “the expectation of participation on a shoestring budget, and the expectation to sustain it somehow without funding. I tried to think long and hard about an example in our country where we said we are going to do something and we gave it a little money and said we won’t fund anymore and it actually did better. If it’s really a problem, if we see there is something worth doing, we should actually do it and you have to fund it appropriately. Otherwise it is a lot of rhetoric.”

III. Synthesis of Participant Input

The second half of the convening saw participants working in breakout groups around the three themes of collective impact, scaling local success, and catalytic innovation. The schedule allowed for two rounds of breakout groups, so that each participant could discuss, critique, synthesize, and react to two of the three topics in more depth. Participants chose which groups to attend based on interest and experience. Each group had a facilitator and recorder who tracked conversations on large sheets of paper. After the two rounds of breakouts were complete, the facilitators characterized the discussions in a report out session. Participants then engaged in a “gallery walk” around the meeting room where they perused large sheets of paper with summary bullet points from each session and “voted” on ideas they supported by putting a sticker next to them.

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We next summarize the breakout sessions, noting the questions that framed the discussion, and then presenting synthesized input drawing on data from the breakouts, report out discussion, and voting results from the gallery walk.

Collective Impact Strategy Breakout

Framing Questions

- How might the collective impact approach be applied to the broadening participation in STEM challenge?
- What would you foresee as key success factors and potential challenges?
- What role could NSF play in catalyzing and supporting scaling strategies for broadening participation in STEM?

Participant Input

The **backbone organization** needs to be neutral, credible in the community, and respected by community members. The backbone should be chosen by consensus, not self-nominated or self-declared. What's the best way to fund a backbone organization given that most funding environments are competitive and not cooperative? And current funding periods are often limited, with 5 or 10 years being the longest. But complex problems require longer, sustained efforts. New funding models and strategies will be needed.

How can we think about collective impact across a broader **STEM learning ecology**? Equity and access really demand a broader ecologies view of learning – as opposed to the traditional pipeline view, because we need to be reaching more youth earlier in their lives. We need to be working on broader participation with museums, Boys and Girls clubs, university summer and afterschool programs, religious and community organizations, and place-based learning settings, among others. But transitions between out-of-school and in-school experiences are tricky. A positive experience in a science museum won't counter a negative experience in a school. There need to be tighter connections and sensible hand-offs all along the pathways to STEM, between out-of-school and in-school experiences, and then on to community college and/or university, and beyond.

It is important to form a **common agenda that moves beyond the usual suspects**. Achieving broader participation through collective impact will require working with a broad range of organizations who do not necessarily see their missions as directly related to diversity, equity, and/or STEM education. Collaborating organizations may not start out knowing much about broader participation, but they can work with organizations that can help them see how they can participate, and they can play a specific role as part of a common agenda. The missions and goals of each collaborating institution do not need to be the same, but the common agenda must be central. Setting the common agenda can take 6 to 12 months and it will be painful. If it isn't painful, we probably haven't invited all of the relevant people/organizations to the table.

We need to create an **enduring national agenda** and a **common understanding of diversity**. A great deal of discussion was devoted to a shared definition of what we mean by diversity, and thoughts about the role of NSF in helping to shape a national conversation. Although everyone in the room was assembled with a common goal of broadening participation, several attendees noted

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that work focused on increasing participation of women, minorities, or people with disabilities does not always connect or provide strong synergy. People tend to shape local projects based on their own interests and needs, but all of those projects are often only loosely associated with a broader movement. If we had a national agenda, or at least a common goal, what would we hope to achieve in 10 or 15 years? Who gets to define what success is? We need to ensure we are advocating correctly for the groups we are trying to reach. Are we doing enough to include communities and stakeholders beyond universities and/or working scientists? Do we have a broad or narrow understanding of what STEM educational outcomes should entail? And there needs to be a sense that there is a long-term commitment to broadening participation that will not evaporate when the next administration takes over. An agenda for 10 or 15 years needs to be rooted in more than government policy in order to be flexible and resilient over time. Our goals, our strategies, and our framework will need to evolve in organic ways as we learn to work together. Collective impact is an iterative process.

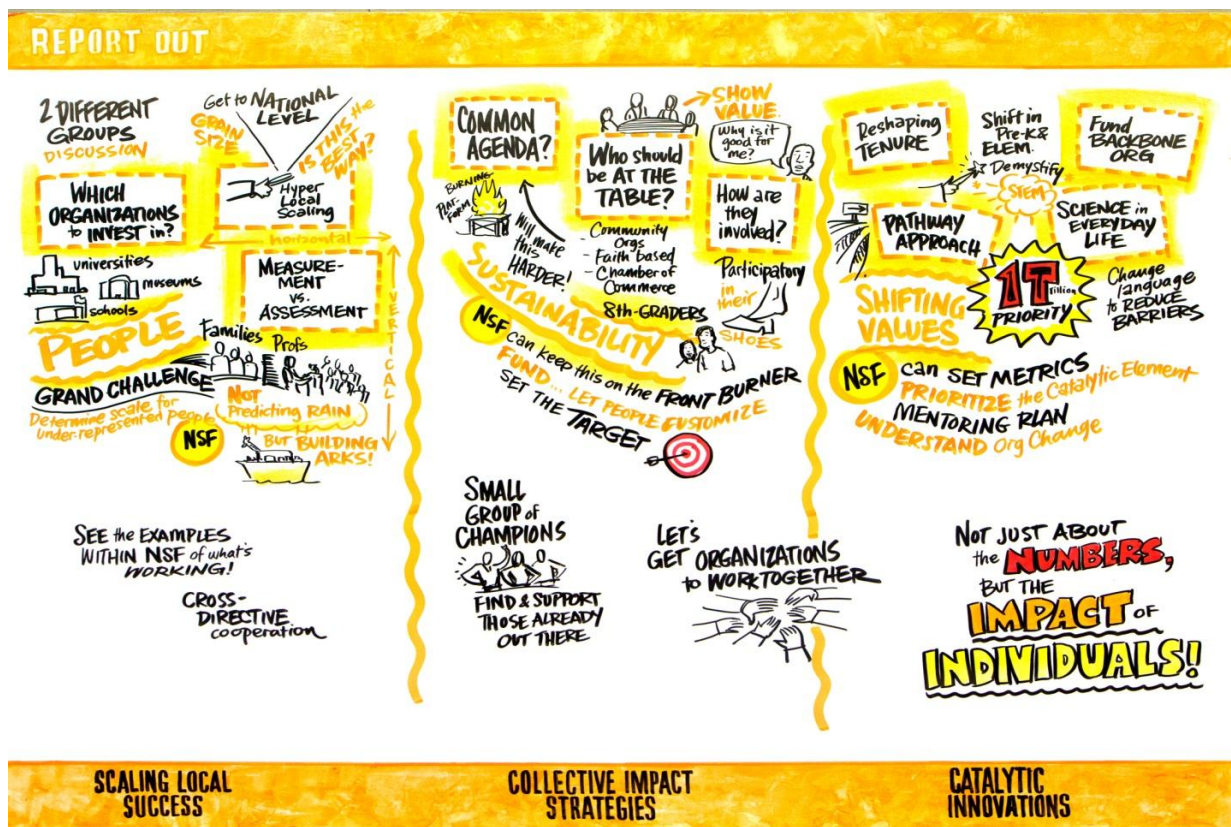


Figure 3. Graphic summary of the report out session for the breakout groups.

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Catalytic Innovation Breakout

Framing Questions

- What are (could be) some catalytic innovations for disrupting the broadening participation *status quo*?
- What would you foresee as key success factors and potential challenges?
- What role could NSF play in catalyzing and supporting scaling strategies for broadening participation in STEM?

Participant Input

Although all agreed that we have a long way to go, participants shared examples of successful interventions and agreed that we need to **learn from and build on current successes**. During the catalytic innovation breakouts, many examples of local success were shared. Although all participants were involved in some way in broadening participation, many talked about their surprise at all of the work represented at the convening of which they were unaware. Discussions of why innovations are successful were broad, with a range of “active ingredients” identified across different interventions. However, many of the most successful examples appeared to be collaborations that produce the kinds of long-term institutional changes identified by the morning speakers. The way people worked together on the problem appeared to be at least as important, if not more important, than the approaches people took. As participants came from many different fields and sectors, how can they find out about and share innovations? Could there be one (or several) backbone organizations with the mission to disseminate successful examples and models?

Many current innovations have implications for the **changing roles of universities**. The culture of research productivity and tenure can undermine efforts to broaden participation. Several participants noted that more family-friendly policies could make a large difference for underrepresented groups, particularly women during post-doc and early faculty years. Although many faculty would like to explore broader impacts in their work, institutional expectations often make that difficult. NSF’s focus on funding work to broaden participation can help with this, as it makes it visible to university administration that engaged scholarship around diversity is a national priority. Broadening participation would also benefit from stronger connections among universities and community partners. Participants discussed innovations connected to student field placements, internships, and collaborative research and outreach with informal STEM organizations. Could there be appointments of adjunct faculty from community and informal STEM education organizations? Are there ways to draw upon expertise from outside the university when mentoring and supporting students from underrepresented groups? Particularly when it comes to college readiness, many current innovations focus on constructing **learning pathways** that help students connect different experiences across time and place. Even if they are successful in one experience, it can be difficult for students to navigate around barriers to further STEM participation. Vertical alignment programs such as early college high school and linked learning have been shown to increase diversity of participants.

The need to **co-construct an understanding of STEM** with the communities we hope to reach was often noted in the breakouts and in the rest of the convening. As one person put it: “It’s hard to broaden participation without participants.” We talked about the importance of making STEM

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relevant and accessible. Some talked about the need to demystify STEM especially when working with audiences that don't have direct STEM experiences, such as families with young children or pre-K and elementary school teachers. Others talked about the need to chip away at the perception of STEM as nerdy and to communicate examples of scientists and problems that run counter to some of the STEM stereotypes that underrepresented students may buy into. Such interactions need to be two-way: It is critical that the communities we work with have a voice in establishing what counts as relevant and important in their STEM education. We should be open to discovering new ways to connect with communities, including new topics, new approaches, new people, and new settings for education and outreach. Ongoing partnerships between universities, schools, informal learning organizations, and community-based organizations will be needed for sustainability.

Scaling Local Success Breakout

Framing Questions

- How can such successes be scaled (sustainability and spread) to achieve national-level impact on the broadening participation in STEM challenge?
- What would you foresee as key success factors and potential challenges?
- What role could NSF play in catalyzing and supporting scaling strategies for broadening participation in STEM?

Participant Input

Discussions of scaling often centered around issues of **metrics and measurement**. Noting that it is difficult to scale what cannot be measured, participants explored the extent to which the success of current interventions could be demonstrated by measurement. Issues around validity and reliability arose, particularly given the difficulty of assessing longitudinal impact of particular programs. But participants also discussed the extent to which existing measures were useful for understanding why certain interventions worked. Distinctions between evaluation, research, and assessment were discussed, and it was clear that, while there many interesting conversations, participants did not have a shared understanding of the potential role of measurement. There were suggestions that measurement should be one of the primary tasks of backbone organizations, both in terms of collecting and analyzing data as well as in sharing best practices from other projects.

Scaling requires **sensitivity to local differences** in culture and context across communities. Answering the question of what worked in one instance doesn't necessarily mean you can generalize to others. Some participants were wary of large scaling efforts and spoke of the value of hyper-local knowledge of audience, partners, and opportunities in making their own interventions effective. Participants discussed the need for a culture of collaboration across projects, doing research together on what scales and in which situations. This was a call for design-based implementation research. As one participant said: "There needs to be a replicable recipe that keeps track of details but allows general principles to work rather than too rigid a structure. This allows for adaptation. Each context will have its own strengths and weaknesses."

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Building on that theme, participants wondered about the level at which we should scale. Some came into the discussion with traditional notions of scaling: That we might produce some set of “shrink-wrapped” experiences, curricula, or professional development approaches that will solve the problem. But the conversations quickly turned to more nested models. Many saw the role of NSF as helping to catalyze a **grand challenge** to address broadening participation, by working to bring in more funding from other foundations and agencies, establishing common national priorities and expectations, and connecting research and practice communities across the current broadening participation landscape. But the collective work of broadening participation would exist at the local or regional level. The idea of **learning ecosystems** was key here. Each region has unique communities and resources, so the enactment of any solution will have a distinctly local flavor.

IV. Critical Levers

Based on a synthesis of participant input, we identify critical levers to increase the impact of the INCLUDES initiative.

1. NSF should position broadening participation as a grand challenge for STEM and STEM education, providing national leadership around the need, what we know, and approaches that have proven to be successful. NSF should help to engage industry and state-level STEM education players and to activate private foundations and other federal agencies around the challenge. New energy, language, and goals at the national level would help local efforts thrive.
2. Interventions should be funded at the level of local or regional learning ecosystems, with specific pathways supported between informal learning settings, K-16 formal STEM education settings, and the workforce beyond. Backbone organizations, sustained collaborations, and long-term infrastructure have been identified as key elements that are difficult to fund through existing grant opportunities.
3. NSF can help to build a connected field of research and practice around broadening participation. Although many successful projects have been funded so far, they have come from many directorates and focused on many different sectors. There was enthusiasm around the idea of staying connected and sharing knowledge. Particularly with respect to the issue of scaling, a vibrant and rigorous research/practice community is needed to explore how to scale around core principles in ways that are responsive to local conditions. Issues of measurement and assessment would also be greatly supported by a connected research/practice community.
4. It is clear that the complex problem of broadening participation requires that we institutionalize new ways of doing our work, even when we do not have diversity as a main goal for our work. Thus, beyond funding targeting interventions through the INCLUDES initiative, NSF can help to move the needle by shifting internal practices, with language in other RFPs that highlights diversity, broader impacts, collaborations, impact evidence, and longer-term collaborations between universities, schools, informal STEM institutions, and community-based organizations.

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APPENDIX 1

WORKSHOP PARTICIPANTS

I. Organizers & Presenters

Association of Science-Technology Centers

Margaret Glass	Director, Professional Development
James Bell	Director, Center for Advancement of Informal Science Education (CAISE)
Ann Hernandez	Program Manager, Inclusion Initiatives
Jared Nielsen	Online Producer, CAISE
Wendy Hancock	Manager, Professional Development Services
Lesley Markham	Concept Paper Writer
Bruce Van Patter	Graphic Recorder, BVP Illustration Inc.

Inverness Research

Becky Carroll	Senior Researcher, Evaluator
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National Science Foundation

Rebecca Kruse	Science Education Administrator (Program Director), DRL
Janice Cuny	Program Director for Computing Education, CNS
Uma Venkateswaran	Program Director, IIA
Bevlee Watford	Program Director, ENG/EEC

Facilitators

Valerie Bockstette	Managing Director, FSG
Kevin Crowley	Professor of Learning Sciences and Policy, University of Pittsburgh
Kirsten Ellenbogen	President, Great Lakes Science Center
Erin White	Associate Director, FSG

Speakers (in order of appearance)

Joan Ferrini-Mundy	Assistant Director, Directorate for Education and Human Resources, NSF
France Córdova	Director, NSF
Pramod Khargonekar	Assistant Director, Directorate of Engineering, NSF
John Kania	Managing Director, FSG
Michael Crow	President, Arizona State University
Wanda Ward	Director, Office of International and Integrative Activities, NSF
Linda Katehi	Chancellor, University of California, Davis
Mary Jo Daniel	Director, NM EPSCOR, University of New Mexico
LeRoy Jones II	Dean, College of Arts and Sciences, Chicago State University
Juan Gilbert	Associate Chair of Research, Comp. and Inf. Science & Eng., Univ. of Florida

II. Participants

Jennifer Adams	Associate Professor, Brooklyn College, CUNY
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Ashok Agrawal	Managing Director, American Society for Engineering Education
Maria Alvarez	Professor and RISE Program Director, El Paso Community College
Judy Brown	Senior VP of Education, Patricia and Phillip Frost Museum of Science, Miami
Bridget Burns	Executive Director, University Innovation Alliance, Arizona State University
A. Calabrese-Barton	Professor, Michigan State University
Nilanjana Dasgupta	Professor, University of Massachusetts, Amherst
Alexander Gates	Professor, Rutgers University
Wesley Hall	Director, Tennessee STEM Innovation Network
Ira Harkavy	Associate Vice President, Founding Director Netter Center for Community
Partnerships	University of Pennsylvania
Mariana Haynes	Senior Fellow, Alliance for Excellent Education
Aimee Kennedy	VP Education, Battelle/Ohio STEM Learning Network
Richard Ladner	Professor in Computer Science and Engineering, University of Washington
Alan Leshner	National Science Board, AAAS Emeritus
Shirley Malcolm	American Association for the Advancement of Science
S. Yancy McGuire	Director Emerita, Retired Professor of Chemistry, Louisiana State University
Mary Jo Ondrechen	Professor, Northeastern University
Nancy Peter	Director, Out-of-School Time Resource Center, University of Pennsylvania
Laura Peticolas	Senior Fellow, Space Sciences Laboratory, University of California, Berkeley
Christine Reich	Director of Exhibit Dev. and Conservation, Museum of Science, Boston
Herb Schroeder	Vice Provost for ANSEP, Professor of Engineering, University of Alaska
Jim Short	Director Gottesman Center for Science Teaching and Learning, AMNH, NY
Jessi Smith	Professor of Psychology, Montana State University
William T. Trent	Professor of African American Studies, Univ of Illinois at Urbana-Champaign
Rose Tseng	Chancellor and Professor Emerita, University of Hawaii
Isiah Warner	Vice President for Strategic Initiatives, Louisiana State University

NSF Participants

Richard Buckius	OD
Fay Cook	SBE
F. Fleming Crim	MPS
Sally Dickerson	BCS
Scott Edwards	DBI
Jim Hamos	DRL
Sylvia James	HRD
James Kurose	CISE
Kathleen McCloud	PHY
Roger Wakimoto	GEO

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APPENDIX II

Workshop Agenda

Background Readings

- Christensen, Clayton M.; Baumann, Heiner; Ruggles, Rudy; Sadtler, Thomas M. *Disruptive Innovation for Social Change*. Harvard Business Review. December 2006.
- Coburn, Cynthia E. *Rethinking Scale: Moving Beyond Numbers to Deep and Lasting Change*. Educational Researcher, vol 32, No. 6, pp. 3-12. August/September 2003.
- Kania, John, and Kramer, Mark. *Collective Impact*. Stanford Social Innovation Review. Winter 2011.

Activities

1. Welcome – Joan Ferrini-Mundy, Assistant Director, Directorate of Education and Human Resources, NSF
2. Opening Remarks – France Córdova, Director, NSF
3. Collective Impact Strategies – John Kania, Managing Director, FSG
4. University Innovation Alliance – Michael Crow, President, Arizona State University
5. Q&A with Speakers
6. Table Discussion: A Vision for Broadening Participation
7. Panel Discussion: Local Successes in Broadening Participation
 - ADVANCE – Linda Katehi, University of California, Davis
 - EPSCoR – Mary Jo Daniel, NM EPSCOR, University of New Mexico
 - BPC – Juan Gilbert, University of Florida
 - LSAMP – LeRoy Jones II, Chicago State University
8. Q&A with Panel followed by lunch
9. Breakout session 1 – each participant chose one of three topics:
 - Scaling Local Success – Kevin Crowley
 - Collective Impact Strategies – Valerie Bockstette and Erin White
 - Catalytic Innovations – Kirsten Ellenbogen
10. Breakout session 2 – each participant chose one of three topics:

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- Scaling Local Success – Kevin Crowley
- Collective Impact Strategies – Valerie Bockstette and Erin White
- Catalytic Innovations – Kirsten Ellenbogen

11. Facilitator Reports from Breakout Sessions

- Scaling Local Success – Kevin Crowley
- Collective Impact Strategies – Valerie Bockstette and Erin White
- Catalytic Innovations – Kirsten Ellenbogen

12. Gallery Walk Prompt: Use sticky dots to show what ideas, strategies, and actions discussed today in the breakout sessions are most compelling and worthy of further exploration.

13. Open Discussion

- What ideas, strategies, and actions discussed today are most compelling and worthy of further exploration?
- Are there other approaches to impact at scale in broadening participation that should be considered?
- What other next steps would you suggest for NSF?

14. Individual Reflections

15. Reception for INCLUDES participants and closing comments by France Córdova, Richard Ladner, and Nilanjana Dasgupta

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APPENDIX III
External Evaluation

MEMO

TO: Margaret Glass, ASTC, and Jamie Bell, CAISE
FROM: Becky Carroll, Inverness Research
RE: Findings from NSF INCLUDES Workshop post-convening survey
DATE: July 23, 2015

On June 3rd, ASTC and CAISE facilitated a workshop that convened thought leaders for one day of brainstorming and prioritizing ideas, strategies, and action items aimed at addressing the nation's challenge of broadening participation in STEM. Inverness Research administered a post-survey to collect feedback on the meeting itself, and more importantly, to gather additional ideas about key action items that might be taken to address this challenge. Fourteen respondents returned a survey, of the 30 participants invited to complete surveys, a return rate of 46%.

Feedback about the Workshop

We asked workshop participants to rate the following in relation to the workshop:

- how clear the goals and purposes of the workshop were prior to their arrival,
- the relevance of particular sessions for furthering the goals of the workshop,
- how much they learned about each of the core workshop topics,
- the extent to which they felt the goals of the workshop were met,
- the most valuable aspects of the workshop, and
- any aspects of the workshop that could have been improved.

• ***Clarity and goals of the workshop ahead of the meeting***

Nearly half of the participants (46%) rated the goals and purposes of the meeting as "somewhat clear" to them ahead of the meeting. The majority of the remaining respondents (38%) rated the goals and purposes as "clear" or "very clear," with the remaining respondents rating them as "pretty unclear."

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- ***Relevance of sessions for furthering the goals of the workshop***

We asked workshop participants to rate the relevance of individual sessions for furthering the specific goals of the workshop. Respondents rated each of these sessions using a scale of one-to-five, with one being “very low,” two being “low,” three being “mixed,” four being “high,” and five being “very high.” We also gave respondents a “did not attend” option since workshop attendees could only attend two of the available breakout sessions. We also provided a space for optional comments; one respondent commented.

The breakout session on Catalytic Innovations was the least attended -- six of the 14 respondents marked “did not attend” for this session; the breakout session on Scaling Local Success had three respondents who marked “did not attend.” The breakout session on Collective Impact Strategies and the Gallery Walk were both marked by one respondent “did not attend.” The following table presents the ratings for the sessions.

Percentage of respondents rating the extent to which they felt individual sessions were relevant to furthering the goals of the workshop:

	% 1s and 2s	% 3s	% 4s and 5s	% Did Not Attend
Panel and Discussion on Collective Impact and Alliances	0%	27%	72%	0%
Table Discussion: A Vision for Broadening Participation (using S & T indicators)	27%	18%	54%	0%
Panel and Discussion on Examples of Local Success	0%	27%	72%	0%
Breakout session: Scaling Local Success	0%	45%	27%	27%
Breakout session: Collective Impact Strategies	0%	36%	55%	9%
Breakout session: Catalytic Innovations	0%	9%	36%	55%
Report out from Breakout Sessions	9%	36%	55%	0%
Gallery Walk	20%	40%	30%	10%
Discussion and Individual Reflections	17%	17%	66%	0%

None of the sessions were rated as “very low.” The panel discussions were the most highly rated as being relevant to furthering the goals of the workshop. The table discussion on the vision for

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broadening participation had a range of ratings, with slightly more than one-quarter rating this as “low” or “very low” and about half rating it as “high” or “very high.”

The comment from the one individual with regards to the relevance of individual sessions to furthering the goals of the workshop was:

This could have been me...but it ended up feeling more theoretical than practical.

One comment in the “areas for improvement” section of the survey was relevant to the gallery walk session:

The gallery walk was a bit confusing. It was unclear how many stars each participant should place; some placed only three, but other participants seemed to have placed many more.

- ***How much participants learned with regard to core topics***

We asked workshop participants to rate how much they learned, on a scale of one-to-five (with one being “nothing,” two being “a little,” three being “some,” four being “a lot,” and five being “a great deal”) about four core topics of the workshop: current efforts to broaden participation in STEM; opportunities and challenges in scaling (sustainability and spread) local success to achieve national impact on the broadening participation in STEM challenge; how the collective impact approach might be applied to the broadening participation in STEM challenge; and potential catalytic innovations for disrupting the broadening participation status quo. The following table presents the ratings for this question.

Percentage of respondents rating how much they learned about each of the core topics.

	% 1s and 2s	% 3s	% 4s and 5s
Current efforts to broaden participation in STEM	36%	36%	27%
Opportunities and challenges in scaling (sustainability and spread) local success to achieve national impact on the broadening participation in STEM challenge	9%	45%	45%
How the collective impact approach might be applied to the broadening participation in STEM challenge	0%	72%	27%
Potential catalytic innovations for disrupting the broadening participation status quo	25%	58%	16%

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The topic more participants rated as learning “a lot” or “a great deal” about was the opportunities and challenges in scaling local success to achieve national impact. Comments from survey respondents indicated that participants felt it was hard to rate that they had learned “a lot” or “a great deal” about any topic through a one-day workshop, but rather, they learned some things and identified several areas they wanted to know more about. Comments from respondents included the following:

My response to how much I learned "Some" does not adequately reflect how much I learned overall. Mostly I learned about some key projects that are outstanding and I'd like to learn more about. One day is not a long time to learn "A great deal." It was just a beginning and I already came knowing a lot.

I personally learned more content and less about opportunities for application.

- ***The extent to which the goals of the workshop were met***

We asked participants to rate the extent to which they felt two specific goals of the workshop were met: to consider potential scalable high-impact innovations in STEM education to assure success for all people across the nation, and to generate ideas, strategies, and actions that will alter the current landscape and potentially achieve a transformative change for inclusion. Respondents rated this on a scale of one-to-five, with one being “not at all,” two being “to a small extent,” three being “to some extent,” four being “to a large extent,” and five being “to a great extent.” Neither of the goals was rated by respondents as being met “not at all” or “to a great deal.” A slightly higher percentage of respondents (33%) felt that the second goal, of generating ideas, strategies and actions, was met “to a large extent” than for the first goal of considering innovations (27% rated this goal being met “to a large extent”). The majority of respondents rated this “to some extent” for both goals. One respondent noted that this meeting was important in acknowledging work that had happened and was happening:

I think the goals were ambitious and that this was a really great start. I hope that you will continue to convene these types of meetings and to make sure that the leadership at NSF understands all the amazing work already happening.

And one respondent in the “any additional comments” section noted that the goals of the workshop were not entirely clear, even at the end:

The workshop goals are still not 100% clear to me--is the focus on STEM education itself or on finding mechanisms to include more diverse individuals in conducting STEM research? These are not necessarily the same. Might there be other ways to engage more diversity in research than focusing on formal education (at any level)? Does the research enterprise itself need to be reshaped?

INCLUDES

- ***The most valuable aspect of the workshop***

Ten of the fourteen survey respondents answered this open-ended question. Six of the ten mentioned meeting new people and networking with colleagues as the most valuable aspect of the workshop. Three respondents mentioned listening to the stories and ideas of experts and those in the field who had been engaged in this work as the most valuable.

Listen to the ideas, optimism and frustrations of experts from the field who have been dealing with this issue for decades

The "case studies" of success around the country in this topic area and meeting others who share a passion and expertise in this area of broadening participation in science and engineering.

Two respondents noted that the readings participants were asked to do ahead of time were most valuable. Finally, one other respondent noted that the morning presentations were the most valuable:

I really liked the two morning presentations, regardless of whether or not they ignite change in "broadening participation."

And two respondents were thankful for the meeting happening in the first place, and expressed hope that it would turn into real progress:

Thank you very much for putting this workshop together. I hope that it will turn into real action and progress.

The meeting helped me to learn more about successful programs and about how to increase their impact. Thank you.

- ***Aspects of the workshop that could have been improved***

Nine respondents provided specific comments to this open-ended question, and we also include responses from previous sections of the survey that were relevant to this question. Two of the nine responses to this specific areas of improvement question noted that they either nothing needed improvement, or provided positive comments on the workshop:

Given the constraints of timing (1-day workshop) and how fast the workshop was put together, I thought it was excellent. Bravo to those who made this happen around this very important topic. And thank you very much. I hope the momentum will continue.

INCLUDES

Specific areas of improvement mentioned by respondents focused on the short duration of the meeting providing less-than-ample time to dive deeply into the challenge, or engage as much in problem-solving as participants would have liked. Several other participants expressed a desire for the workshop to be more action oriented. And others wished that there had been new voices, perspectives and innovations highlighted more during the workshop, and specifically, more K-12 representation. Still others felt that the summary sessions at the end were not specific enough. Comments included the following:

The workshop was very short and it took time to adjust to the ideas presented.

It was too short. Some sessions were way to short. Although I read the papers before coming, the ideas were pretty abstract. I would have like to see more grounding in concrete examples, before going to the abstract models. The examples in the papers were interesting, but were not related to broadening participation in STEM.

The meeting could have been more action oriented.

Maybe because the workshop covered so many strategies and included so many perspectives...but it seemed heavy on the content delivery, case studies and commiserating; and light on the authentic problem solving.

It seemed like we had very knowledgeable, experienced individuals involved, but there needed to be new voices and perspectives actively included. We heard about projects and programs that have had some success, but nothing very new or innovative--everyone was pretty invested in the current system.

More K-12 representation.

The K-12 versus undergrad/grad focus was not clear.

I thought that summary at the end was too general. There could have been more specific identification of challenges, goals, and solutions.

The small group discussions with the charts seemed pointless and rushed.

Feedback about the Highest Priority Work to Undertake in Addressing the Broadening Participation Challenge

Survey responses to the open-ended question, “What is the highest priority work for NSF to undertake in this arena? For the field to undertake?” included comments about the need for more

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sustained funding and the need for identifying existing strategies that have been proven to work and build from them, as well as finding new strategies.

The comments about the need for sustained funding included the following:

Provide longer-term grants, i.e. eight-to-ten years, and don't expect dramatic results and outcomes from three-to-five years.

Sustained funding from NSF for opportunities to show collective impact and sustainability.

Comments about the need for identifying both existing and new strategies included the following:

There is a need to identify new approaches and strategies that work.

Funding initiatives that have proven their effectiveness at moving the needle forward. Scaling the successful initiatives.

Do due diligence. Do your homework: see how other effective interventions and strategies work.

I think a lot of good things have happened in broadening participation at NSF over the past ten years. I like the idea of building on those successes, rather than starting from scratch. The idea of having a backbone organization is realized already in some of the national alliances that have been created for women, minorities, and people with disabilities.

Additional comments related to this discussed the challenges and benefits inherent in research-and-implementation types of projects, and the importance, again, of identifying existing successful models and building/scaling from those:

The NSF focus is research and not practice. However, what I heard from the workshop is that NSF is being asked to move from a research focus to an implementation focus. I think this is really challenging! I think maybe NSF needs to fund some cross-purpose efforts that both include a research focus but about how to take researched- best-practices from the NSF field and apply them across the country in start-up companies, within Universities, new schools. There were some people at the meeting who are doing this work, so I think NSF must be already considering this direction and I would agree that this is the right direction. NSF has some examples of this already - and many of us were at the meeting.

The mission of NSF is both research and education. Not every project has to be fully innovative to make progress in the education, human resources side of the equation. A good example is the GRF program that supports graduate students for 3 years. This is basically a human resources program, although applicants have to submit a "research proposal." For broadening participation, there are well know strategies that work, strong mentoring, critical mass and community building. Build on these.

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Summary

Overall, participants generally thought that, given the constraints of tackling the topic of broadening participation challenges in a one-day workshop, it was very valuable to have the workshop. Participants valued hearing from experts and colleagues in the field, and digging in to this challenge with their peers. For the most part, people wanted more time -- longer sessions, and more time to discuss the articles and the lessons learned to date. In terms of respondents' suggestions for the most important aspects to focus on going forward, longer-term funding to address this challenge, as well as more focus on scaling and building from existing, proven strategies and identification of new strategies were deemed as important.