IM STEM

Using Collective Impact to Broaden Participation in STEM and CTE through a Multi-State Systems Approach

REPORT

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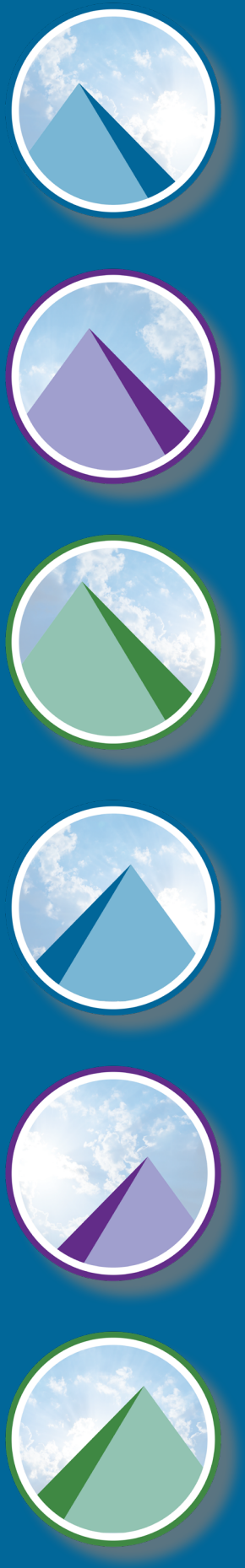

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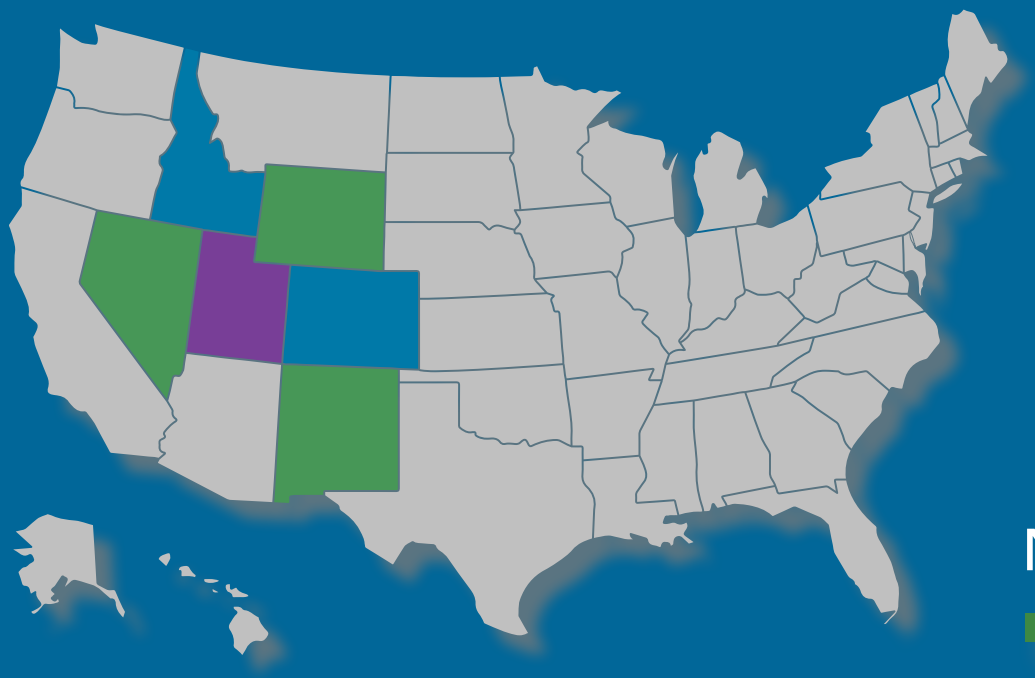
Introduction

The challenge of increasing education equity and the diversity of the science, technology, engineering, and mathematics (STEM) workforce is everywhere in mainstream media and on the tongues of policy makers, educators, and corporate leaders. The fact that the needle has moved so slowly even though considerable attention is being paid to these issues is frustrating. How can we address such a complex, "wicked" problem like inequities in STEM education and the workforce and make a real and lasting difference?

In 2016, the National Science Foundation (NSF) identified ten "Big Ideas" in which to invest. One of these Big Ideas is an initiative aimed at transforming education and career pathways to broaden participation in science and engineering called Inclusion Across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science (NSF INCLUDES). NSF INCLUDES seeks to improve collaborative efforts aimed at enhancing the preparation, increasing the participation, and ensuring the contributions of individuals from groups that have been historically underrepresented and underserved in the STEM enterprise such as African Americans, Alaska Natives, Hispanics, Native Americans, Native Hawaiians, Native Pacific Islanders, persons with disabilities, persons from economically disadvantaged backgrounds, and women and girls. Significant advancement in the inclusion of underrepresented groups in STEM will result in a new generation of STEM talent and leadership to secure our nation's future and long-term economic competitiveness. NSF solicited proposals for Design and Development Launch Pilots (DDLP), two-year projects to explore the feasibility of using collaborative change strategies in bold, innovative ways on a limited scale to solve broadening participation challenges in STEM. NSF particularly encouraged efforts that used a collective impact approach.



Utah
Idaho
Nevada
Colorado
Wyoming
New Mexico

In 2017, the National Alliance for Partnerships in Equity Education Foundation was awarded an NSF INCLUDES DDLP grant to implement the Intermountain STEM (IM STEM) network. The National Alliance for Partnerships in Equity (NAPE) has been working since 1992 to increase the capacity of state and local educators to increase access, equity and diversity in career and technical education (CTE) and STEM education. As a consortium of state and local education agencies, NAPE has built collaborations with multiple stakeholders to leverage their knowledge and resources and facilitate policy and program change at the state and local level.

IM STEM included STEM education, CTE, and workforce development stakeholders from government, business, education, and communities across six states (Colorado, Idaho, New Mexico, Nevada, Utah, and Wyoming). Using a collective impact approach, the network worked to identify and scale effective policies and practices that positively impact the critical junctures in the STEM education pathway—middle school to high school transition and STEM course taking, high school STEM and CTE course completion, and entrance to STEM majors—where significant challenges for underserved populations (women, members of racial and ethnic groups, persons with disabilities, and persons with low socioeconomic status) create barriers to their participation, retention, achievement, and transition.

Collective impact is used to create local, place-based, cross-sector collaboration as a strategic approach for the improvement of educational outcomes and community development in cities across the United States (Henig, Riehl, Rebell & Wolff, 2015). Recently these local efforts have been linked into national networks of community-based collective impact efforts. However, relatively few examples exist as to how the collective impact model could be used in a larger, more complex context, such as with and across multiple states and focused on systems change impacting public policy (Ferber & White, 2014).

IM STEM used the collective impact model in a cross-state collaboration to create systems changes in state-level agencies and organizations with the goal of providing diverse students access and opportunities for success in STEM and CTE. Our efforts to bring together stakeholders and build a collective impact network across six states over the past two and a half years had both challenges and successes. We are sharing what we learned so others can learn from our mistakes and apply promising practices to their own efforts to impact state level policy and local implementation, including in the area of broadening participation in STEM and CTE. In addition, we describe what we have learned from this grand experiment about the ways in which the collective impact model works well—and doesn't work well—in this context.

The three authors of this article each have a different role in IM STEM *(see bios on page 27)*:

- **Mimi Lufkin** is the CEO Emerita of NAPE and was the project director and former principal investigator of the IM STEM project.
- **Selena Connealy** of New Mexico EPSCoR represented one of the six states involved in the effort.
- **Ginger Fitzhugh** of Education Development Center led the external evaluation of IM STEM.

THE STEM DIVERSITY CHALLENGE

The data regarding women and people of color's participation in STEM education is discouraging. Disparities in STEM start early when children are developing their sense of belonging in school and beginning to explore and express career aspirations. Socially driven divergence and systemic inequities in educational opportunities have massive deleterious effects on student opportunity and ultimately on the diversity of our STEM labor force. For example, Latinx and African American students participate at much lower rates in Algebra 1, and experience a 13 and 20 percentage point gap respectively in Algebra 1 passage compared to their White peers (USDoEd, 2016). In high school, girls participate at lower rates than boys in STEM-related CTE career clusters like information technology (31%); architecture and construction (19%); manufacturing (18%); and transportation, distribution, and logistics (22%) (OCTAE, 2019). In addition, 2020 math SAT test results show a 15-point advantage for high school boys over girls (The College Board, 2020).

These national trends are magnified in the Intermountain Region of the United States. The six IM STEM states have significant STEM industry and infrastructure investments and a critical STEM workforce shortage. For every 27 STEM jobs in Wyoming, there was only about one qualified worker in the state (New American Economy, 2016a). Colorado had 15.3 job openings, Idaho had 12.3 job openings, and Nevada had 7.2 job openings for every unemployed STEM worker in 2016 (New American Economy, 2016b, 2016c, 2017). Utah cannot keep pace with engineering openings needed by its high-tech corridor in part because only 13.3% of Utah female students and only 27% of African Americans and Hispanic students graduating in 2017 have an interest in STEM (Alliance for Science and Technology Research In America, 2016). In New Mexico, 2,600 STEM students graduate each year for 4,600 high tech job openings (New Mexico Legislative Finance Committee, 2016).

The IM STEM states also share the significant challenge of needing to provide STEM education across rural communities, in small schools, and in colleges serving large geographic areas. Because of their common STEM workforce shortage threat, the need to increase the numbers of students graduating in STEM, and the similarity of their education systems, these six states were ideally suited to form a collective impact movement to increase the diversity of their STEM pipeline.

Our Approach

ELEMENTS OF COLLECTIVE IMPACT

Collective impact has been defined as "**the commitment of a group of cross-sector actors to a common agenda for solving a complex social problem**" (Kania & Kramer, 2011). Collective impact initiatives are characterized by the following five core elements, which have been distilled from study of the experiences of successful cross-sector collaboratives to date. All five elements need to be present—in forms adapted and customized for the context—to effectively facilitate cross-sector collaboration and the resulting population-level impacts (Juster, 2017).

No one element is more important than the others; rather, a collective impact effort needs all five to effectively drive long-term, population-level changes in a given topic or area of focus (Juster, 2017).

1 BACKBONE SUPPORT

An independent, dedicated staff provides support and key functions for the sustained operation of the collective impact initiative.

2 COMMON AGENDA

All participants share a vision for change that includes a common understanding of the problem and a joint approach to solving the problem through agreed-upon actions.

3 CONTINUOUS COMMUNICATION

All players engage in frequent, structured communication to build trust, assure mutual objectives, and create common motivation.

4 MUTUALLY REINFORCING ACTIVITIES

A diverse set of stakeholders, typically across sectors, coordinate a set of differentiated, mutually reinforcing activities.

5 SHARED MEASUREMENT

All participants agree how to measure and report on progress, with a short list of common indicators identified to drive learning and improvement.

IM STEM OVERVIEW

IM STEM's formation came from a group of state level stakeholders who had been involved in NAPE's programs over the years and who shared a common interest in collaborating across states to leverage each other's resources and knowledge to broaden participation in their own state. Using a collective impact model, NAPE staff and a core group of IM STEM leaders, all of whom became members of the Steering Committee, developed the NSF proposal that included an initial strategic plan to set direction for the two years of the NSF INCLUDES grant. This strategic plan included a proposed vision, mission/common agenda, overarching goal, and a workgroup structure to engage a larger network of individuals in the effort to create deliverables. IM STEM's vision was to create a cross-state alliance of formal education system partners committed to systems change to create a culture of success for every student in STEM and CTE, ultimately leading to a more diverse STEM workforce.

IM STEM's structure included three levels of engagement:

Steering Committee

The steering committee is composed of cross-sector leaders, decision-makers, and community members who provide strategic direction, champion the effort, and align their own organization's work on the common agenda (Juster, 2017). The IM STEM Steering Committee included members representing state-wide organizations with influence over STEM education and CTE systems (see Box #1). Their role was to provide overall project guidance, direction, and progress monitoring. Steering Committee members served as state liaisons and conducted outreach to expand the IM STEM network within their state, engaged in the development of the strategic plan, identified potential programs that could be scaled, identified resources to share, and provided leadership for at least one workgroup.

Workgroups

Workgroups typically represent affected populations, entities that implement related services and solutions, government agencies, and other relevant partners, who together design, align, and implement a related set of strategies (Juster, 2017). Four initial workgroups were created that were aligned with the IM STEM activities. Each workgroup was led by one of the Steering Committee members and staffed by the Backbone. Workgroups included: Communication and Outreach; Asset Map Building; Effective Practice; and Metrics, Data Collection, and Reporting.

Network Members

A collective impact structure has formal members but seeks to work with other stakeholders and community representatives beyond its members (Juster, 2017). Each state conducted outreach to build a network of state partners from organizations that shared the IM STEM vision and mission. Network members participated in network activities and/or served on workgroups of their choice depending on their organization's alignment with the common agenda and their expertise.

In addition to following the collective impact model, the Steering Committee was committed to a strong plan for learning and evaluation. We engaged Education Development Center (EDC) to lead the external evaluation of the IM STEM network activities and outcomes. The evaluation used a collective impact lens to examine the ways in which partner institutions engaged in the project (Preskill, Parkhurst & Juster, 2014). We used a variety of methods to understand and document the development of IM STEM, including formative interviews with Steering Committee members about nine months after the start of the effort, a survey administered to the Steering Committee and early network members near the end of the project's first two years, and project metrics (Fitzhugh, 2020). The external evaluator also worked with the project team to establish a set of metrics to monitor and measure its progress.

BOX 1: Steering Committee Member Organizations *(For a detailed list of individuals, see page 27.)*

NATIONAL	◆ National Alliance for Partnerships in Equity
	◆ Education Development Center
COLORADO	◆ Colorado Education Initiative
IDAHO	◆ Idaho STEM Action Center
	◆ Idaho National Labs
	◆ Idaho EPSCoR - Idaho Diversity Network
	◆ Idaho State University
NEVADA	◆ Clark County School District, Las Vegas, Nevada
	◆ Nevada Governor's Office of Science, Innovation and Technology
NEW MEXICO	◆ New Mexico EPSCOR
	◆ Dona Ana Community College
UTAH	◆ Utah STEM Action Center
	◆ Utah Valley University
WYOMING	◆ Wyoming Afterschool Alliance
	◆ Wyoming Department of Education

Backbone Support | **Common Agenda** | **Continuous Communication** | **Mutually Reinforcing Activities** | **Shared Measurement**

In the following sections, we will describe how we implemented each of the five elements of the collective impact model, relevant evaluation outcomes, challenges that we experienced, and lessons we learned in hopes that others attempting to use this model of collaboration for a multi-state approach to systems change can learn from our experience.

NAPE as the Backbone

The research and work of the Collective Impact Forum (2012) suggests that the backbone organization in a collective impact effort both helps maintain overall strategic coherence and coordinates and manages the day-to-day operations and implementation of the work, including stakeholder engagement, communications, data collection and analysis, and other responsibilities.

NAPE serves as the backbone organization for IM STEM. Since 1992, NAPE has provided its members with professional development, technical assistance, research, and advocacy on equity and diversity in education and career development. NAPE has also served as a catalyst for state and local education agencies to collaborate, share resources, and create partnerships that have allowed for greater impact than if these groups had been working alone.

The formation of IM STEM came about as a result of NAPE's commitment to facilitating collaboration among its partners by leveraging their expertise, resources, and common goals. All six of the IM STEM states have a history of working with NAPE as partners by collaborating on special projects, implementing NAPE's professional development, or serving in a leadership role in NAPE. This group of states had been collaborating through these efforts informally and NSF INCLUDES provided the opportunity to formalize and deepen this collaboration. NAPE leadership had also been studying the growing collective impact movement and was interested in determining if this model could be applied beyond community-based efforts to a multi-state systems level approach. Based on NAPE's history and its capacity to support collaborative efforts, NAPE was ideally suited to serve as a backbone for this six-state effort.

The National Alliance for Partnerships in Equity (NAPE) believes that every student should have an education that prepares them to earn a living wage.

NAPE delivers research-based, strategy-driven, practical professional learning to equip educators to create equitable learning environments where every student can thrive.

NAPE

As the backbone to IM STEM, NAPE staff worked closely with the IM STEM Steering Committee to implement the strategic plan and to support the partner's mutually reinforcing activities. Staff managed monthly Steering Committee meetings and quarterly network meetings, supported workgroup activities, prepared a monthly newsletter, fed social media outlets, and maintained the IM STEM website and network member records. Having staff to support the IM STEM activities and workgroups was critical to its success as Steering Committee and Network members participated as volunteers.

Evaluation results suggest that NAPE provided effective leadership for IM STEM. In interviews and surveys conducted by the external evaluator, IM STEM Steering Committee and Network members reported that IM STEM's leaders had the skills for working with other organizations, communicated well with members, and maintained a focus on IM STEM's goals. Stakeholders also said that IM STEM leaders supported members in carrying out their responsibilities and utilized members' strengths.

While NAPE has the requisite skills and abilities to serve as the backbone in this collective impact effort, it was challenged by having limited financial and human resources to carry out that role. Less than half the respondents to a survey administered near the end of IM STEM's second year agreed that the project had sufficient financial or human resources to accomplish its goals. Furthermore, just a quarter of respondents agreed that coalition members had sought outside sources of support for coalition operations. Providing backbone functions takes dedicated staff time.

Having NAPE's staff support the IM STEM activities and workgroups was critical to its success as Steering Committee and Network members participated as volunteers.

SUCCESSES

- Created a six state collective impact network led by state-level agency staff, all of whom were committed to addressing equity in STEM and CTE.
- Built a strong and committed Steering Committee whose members were engaged and supported the efforts of the network.
- Grew a network of individuals and organizations from the six states who shared the common agenda to include over 1,000 members.
- Built the capacity of NAPE to support a multi-state-level collective impact network.

CHALLENGES

- Creating a sense of shared ownership amongst the partners so the backbone isn't driving the initiative.
- Balancing support and engagement of Steering Committee members and Network members.
- Finding ways to keep Steering Committee members engaged and enthusiastic about the effort when it moves so slowly.
- Having adequate funding to support backbone staff at the level needed to maintain the continuous communication and support workgroup outcomes.
- Finding ways to better engage the network beyond quarterly network meetings.
- Determining the right amount of backbone staff support to manage workgroup activities yet keep leadership in the hands of the Steering Committee and Network members.

RECOMMENDATIONS

- Workgroup formation, identification of deliverables, and ownership of outcomes needs to be built by consensus and commitments articulated by all workgroup members—not dictated by the backbone.
- Workgroup implementation must be significantly staff-supported if workgroup members are volunteers.
- Staff must be proactive in engaging Network members in workgroup activities by maintaining consistent communication and regular meetings.
- Backbone staff are very important and a significant amount of resources are needed to support them. Based on our experience in this type of collective impact effort—especially one engaging across multiple levels and kinds of systems—an individual from the backbone should be assigned to this effort with ultimate oversight.

Creating a Common Agenda

According to the Collective Impact Forum (2015), a common agenda is "a vision for change shared by all participants that includes a common understanding of the problem and a joint approach to solving the problem through agreed-upon actions." Common agenda elements generally include principles (agreed-upon values and how the group is going to work together overall), a common problem definition (shared understanding of root causes and setting of boundaries), a goal (measurable at the population level), a framework for change (structure for how to divide work), and a plan for learning (how to track progress).

For IM STEM, creating a common agenda was the most challenging element of the collective impact model and the one we were the least successful in establishing. Although the group was united around a common commitment to broadening participation in STEM, a number of factors inhibited our ability to solidify a common agenda.

Expectations of the funder, NSF, and the requirements of the INCLUDES solicitation to delineate very specific activities in a relatively short period of 24 months, meant that the workgroups and timeline were set before the vast majority of partners were engaged in IM STEM activities. The initial vision—drafted by a small steering committee during the NSF proposal development—was "to create a cross-state alliance of formal education system partners committed to systems change to create a culture of success for every student in STEM, ultimately leading to a more diverse STEM workforce." On the one hand, the vision was so broad that it was easy for partners to understand and to see how their own organizations' missions were aligned. Each state had tens if not hundreds of people and organizations already working in support of this vision. On the other hand, it may have been overly broad, without accounting for understanding of root causes, setting of boundaries, and a measurable population level goal. The biggest shortcoming in the vision was that it did not specify what we intended to change. In hindsight, a commitment to "systems change" was not specific enough to drive the creation of a common agenda that was shared across partners.

We were able to successfully implement a structure to divide project activities. The Steering Committee, made up of representatives from each state, met bi-monthly to provide guidance to the overall work of IM STEM. Workgroups (described in mutually-reinforcing activities) implemented strategies to accomplish the goal of the network. The backbone, NAPE, convened the Steering Committee and supported individual workgroups.

A **common agenda** is a vision for change shared by all participants.

The external evaluation results suggest we were successful in establishing a broad, shared vision and mission for the group early in the effort—no easy feat given the number of partners and states, as well as differences in members' roles within their states (with representatives from higher education, statewide coalitions, state education agencies (SEAs), and local education agencies (LEAs)). However,understanding and agreeing upon specifics for achieving that mission takes time and effort, and our effort might have benefitted from investing more time in clarifying and (re)articulating our common vision for the near-term work. In interviews with Steering Committee members conducted by our external evaluator at the end of our first year, all members articulated a similar broad vision and mission for IM STEM (namely, to create a cross-state alliance of partners committed to closing equity gaps in STEM education). Similarly, in a survey administered to IM STEM Steering Committee members and partners at the end of our second year, almost every survey respondent agreed that the coalition had clearly defined the problem it wished to address. However, a somewhat smaller number of respondents (two thirds) agreed that they themselves understood what IM STEM was trying to accomplish, or that they thought others in the group knew and understood IM STEM's goals. While the majority of our stakeholders were in agreement about the purpose of our work, a smaller, but still significant, number of stakeholders perceived the need for more clarity.

Several factors may have contributed to some IM STEM stakeholders' confusion about the specifics of the work. First, as previously noted, members had a wide range of roles within their state. Members' organizations operated at different scales, from local to statewide. As such, individual members had different spheres and degrees of influence. While some states had active members who represented both local and statewide educational purviews, other states only had representation at the state level or the local level. Another factor that potentially contributed to lack of clarity regarding the mission is that members varied in their capacity to contribute time to meetings or work on specific tasks, especially since their time was mostly uncompensated. Finally, over the course of the project, a few representatives were unable to continue serving on the Steering Committee due to retirement or changes in job responsibilities, and the backbone became responsible for identifying replacements. Turnover within a short time frame can contribute to confusion.

Collective impact is a long-term play, not a shortcut to social change.

Sarah Stachowiak & Lauren Gase

SUCCESSES

- Developed a common agenda at the proposal stage that continued to be relevant throughout implementation.
- Created support for a common agenda where all partners could find relevance regardless of the diversity of their organizations' perspectives.

CHALLENGES

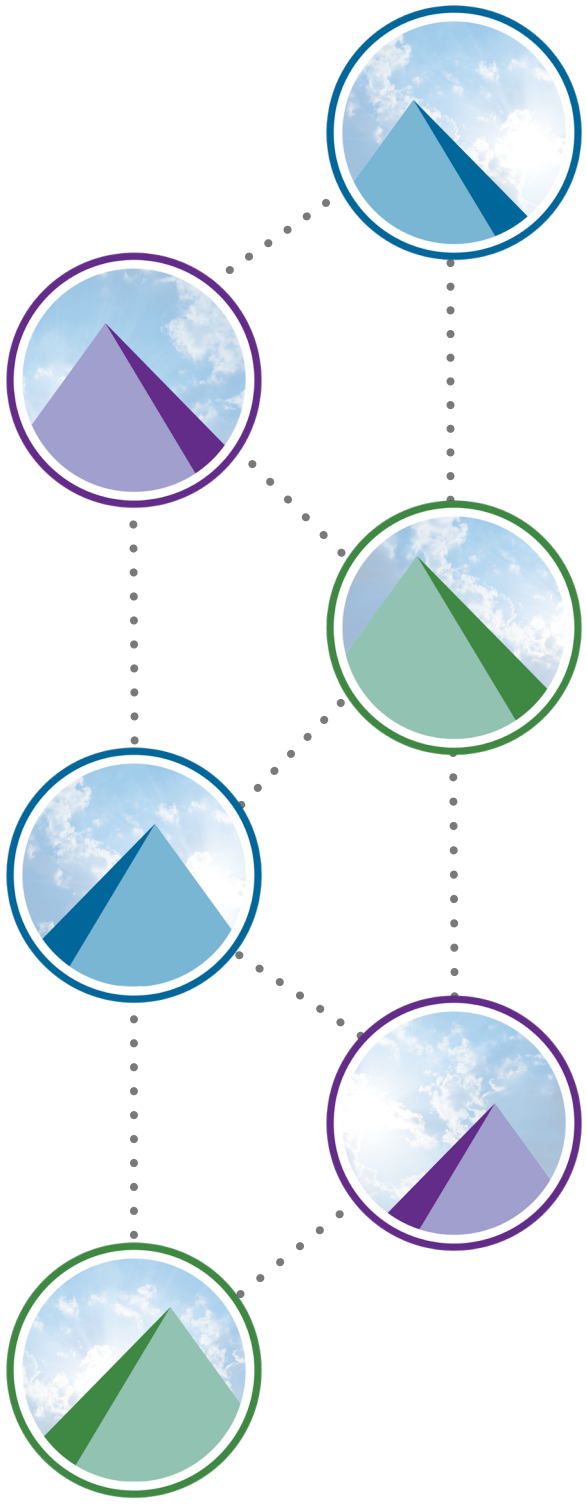
- Initiating activities and work groups before partners were fully engaged was driven by the relatively short period of the award.
- Creating a common agenda takes time. The Tamarack Institute (2017) suggests that creating a common agenda takes 12 to 18 months and the grant period was only 24 months, although we extended our work through a no-cost extension for an additional 12 months.
- Finding common ground to take action was challenging because of the diversity of the participating organizations and individuals.

RECOMMENDATIONS

- Instead of jumping straight into the workgroup activities that were described in the proposal, we would have been better served by spending a significant amount of time addressing the elements of creating a common agenda.
- Consider how best to describe collective impact work in funding proposals to provide enough detail while at the same time allowing space for creating a common agenda. Funders also need to expect that proposing coalitions will need time and resources to develop an actionable common agenda.
- Take adequate time to build a common agenda that addresses the capacity and needs of the partners.
- Ensure there is alignment between the system you are trying to change and the sphere of influence participants in the change effort have.
- Ensure that there are enough resources to support backbone staff and partner engagement to keep things moving.

Continuous Communication

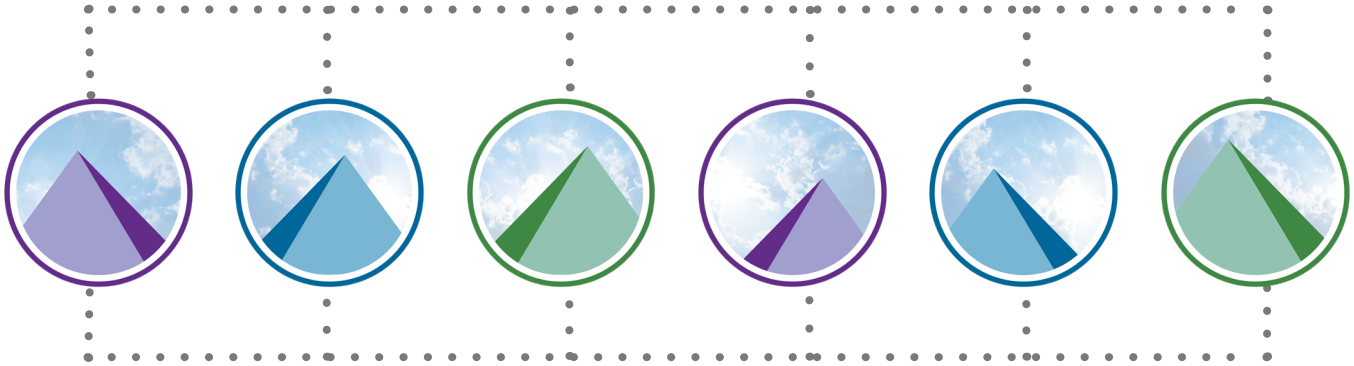
According to Kania and Kramer (2013), continuous communication is an important element of effective collective impact initiatives because "consistent and open communication is needed across the many players to build trust, assure mutual objectives, and create common motivation." Communication across the IM STEM project can be characterized across two broad categories: internal—associated with the Steering Committee and workgroups who carried out the work of the project, and external—communication with broader stakeholders including Network members, who were primarily people engaged in STEM broadening participation work in the six states.



To communicate internally within the Steering Committee and workgroups, we employed standard communication tools: email, shared Google documents, and virtual meetings. One workgroup was charged with external communication and developed content and messaging for the website, a mechanism for recruiting and welcoming members to the Network, a social media strategy, and a framework for a monthly Network newsletter. The quarterly Network meetings provided a platform for communicating about IM STEM programs and activities (e.g., the STEM Equity Program Evaluation Rubric) as well as other broadening participation in STEM resources (e.g., a National Academies consensus study on English Language Learners in STEM Subjects).

Effective communication required backbone staff to take the lead, with the Steering Committee or workgroup members taking a supporting role. For example, the Communication and Outreach Workgroup created a standard welcome email for those who signed up via the website to participate in the Network. Backbone staff monitored the signups and alerted the Communication and Outreach Workgroup member who was next in the rotation. Then, the welcome email was sent personally by that member of the Workgroup to the new Network member. The monthly newsletter was created by the backbone staff and distributed via the IM STEM listserv, also managed by the backbone. Newsletter content was curated by backbone staff and by Steering Committee members. Social media postings were fed by the backbone staff, and members of the Steering Committee who were active users of social media translated that activity to postings on the group LinkedIn page and Twitter.

The communication strategies selected were intended to provide both passive (newsletter) and active (social media) vehicles for communication across the network. The goal of the communication strategy was to get Network members to share resources, strategies, and activities and to engage them in professional development through the Network meetings. We found that these communication strategies did not create the two-way communication platform that we had hoped for. However, these strategies did build the network, and they provided vehicles for sharing resources from the leadership to the field and offered professional development on broadening participation in STEM. Registration for the Network meetings ranged from 60-110 participants with about 50% of those who registered attending. The IM STEM News letter open rate averaged 22%. Social media platforms were not well utilized by members of the Network with postings predominately coming from backbone staff and a handful of Steering Committee members. Despite the struggle with trying to create a more interactive communication strategy, the network did maintain visibility within the six states. Over the two and one half years, the IM STEM Network grew to over 1,065 members on its listserv.



SUCCESSES

- Created multiple ways for network members to communicate and share resources through various social media and a direct email newsletter.
- Built a **website** where all activities of the network can be found, including archived issues of the newsletter and recordings of all network meetings.
- Grew the IM STEM Network to more than 1,000 members through outreach and website sign ups.
- Created a sense of community and a personal touch by having Steering Committee members send personal welcome emails to new members when they signed up to participate in the network.

CHALLENGES

- Creating mechanisms for two-way communication.
- Growing the network when there are so many competing interests and STEM initiatives.
- Fueling social media takes significant attention and staff resources.
- Engaging steering committee members and Network members in contributing to the communication strategy.

RECOMMENDATIONS

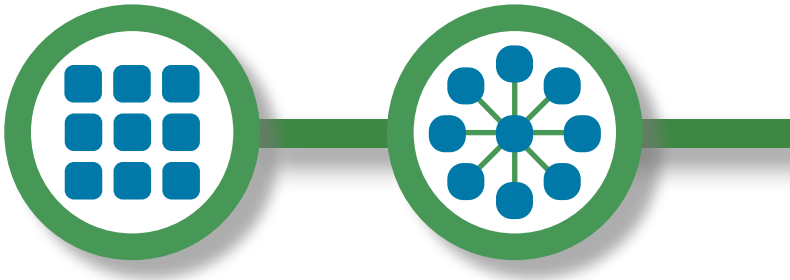
- Identify ways that Network members can communicate with leadership through surveys, blogs, virtual listening sessions. Build mechanisms where Network members can communicate with each other and with the Network's leadership.
- Understand your network's values and needs and tailor your communication strategy and messaging to those values and needs. That will help mobilize your network to take action and engage.
- Invest in adequate staff resources to implement the communication strategy.
- Ensure that Steering Committee members and Network members have a role in participating in the communication strategy.
- Focus your communication strategy on vehicles you can manage and that are appropriate for your members.

Mutually Reinforcing Activities

Mutually Reinforcing Activities, as explained by John Kania (Global Managing Director, FSG) and Mark Kramer (Founder and Managing Director, FSG) in their foundational 2011 article, mean encouraging collaborators to "undertake the specific set of activities at which it excels in a way that supports and is coordinated with the actions of others." Participants' unique capabilities and actions, thoughtfully combined, move the collaborative closer to a solution. Mutually reinforcing activities involve both individual and collective work of organizations, work that is both differentiated based on context, and coordinated (Kania & Kramer, 2013)

The mutually reinforcing activities of IM STEM were accomplished through workgroups that were identified during proposal development: Communication and Outreach (addressed in the previous section); Effective Practice (described next); Asset Map Building (described next); and Metrics, Data Collection, and Reporting (described in Shared Measurement). Workgroups were chaired by members of the Steering Committee and Network members were invited to participate, though few Network members regularly attended workgroup meetings. Workgroups met irregularly based on their activities and their progress was reported at each monthly Steering Committee meeting by the backbone staff member assigned to support that workgroup.

Two of the workgroups, **Effective Practice** and **Asset Map Building**, lend themselves to an examination using a collective impact lens.



Effective Practice

Asset Map Building

EVALUATION FINDINGS

Evaluation results suggest that workgroup members were generally positive about the efforts and effectiveness of their workgroup. All respondents to the survey administered at the end of our second year agreed that the workgroups were an effective way to organize IM STEM activities. However, some workgroup members expressed frustration with the number of participants in their group and felt that the work was accomplished by a small, but dedicated group of 2-4 Steering Committee members with little input from the larger Network, despite calls for additional participation.

EFFECTIVE PRACTICE

The goal of the Effective Practice Workgroup was to develop strategies that would help practitioners in the six states identify and promote effective practices to broaden participation in STEM. Given the limited budget and short project timeframe, workgroup members narrowed the focus and identified a common need—a stronger and more explicit focus on equity as a measure of quality in STEM education programs—and researched existing initiatives and tools, e.g., **STEMWorks (a database of the nation's leading STEM education programs)**. Finding that the existing resources did not sufficiently address equity, the workgroup developed their own tool with input from IM STEM Network members.

The **STEM Equity Program Evaluation Rubric** (IM STEM, 2019) is designed to help program administrators, coordinators, and funders identify the equity attributes of STEM education programs and the degree to which they are inclusive and support access and success for all students, especially those who have not historically engaged in STEM. The rubric contains eight sections, each with research-based attributes and corresponding examples and criteria for high-quality, equitable STEM programs. The rubric is intended for program leaders to self-evaluate how well their programs meet the standards of equity in STEM education on each attribute on a scale with four stages: undeveloped, developing, established, and accomplished.

ASSET MAP BUILDING

The Asset Map Building Workgroup was tasked with determining a strategy for identifying STEM education programs across the six states. The workgroup identified existing STEM asset maps and inventories in three states—**Idaho**, **Wyoming**, and **New Mexico**—which were led by the Idaho STEM Action Center (2018), Wyoming Afterschool Alliance (2020), and New Mexico Out of School Time Network (n.d.), respectively. Idaho's and Wyoming's asset maps were presented at two Network meetings. Additionally, the workgroup collaborated with the Nevada Governor's Office of Science Innovation and Technology to develop a small scale asset map that shows the geographic location of STEM programs in the state. The Nevada asset map also includes a profile for each program that includes type of program, program description, target audience, participant demographics, partner organizations, funding, and contact information. Currently, there are two states in the network, Colorado and Utah, without STEM education asset maps but many examples and lessons learned to help them if and when they are ready to create their own STEM asset maps. Lessons learned and effective practices were shared across the IM STEM states, but ultimately, the workgroup found that asset map building was an activity best undertaken at the state level.

SUCCESSES

- Built effective workgroups that were able to complete useful deliverables for the network.
- Conducted **quarterly network meetings** that highlighted effective programs for underrepresented students in STEM and CTE and brought national experts to the network.
- Supported the development of a pilot asset map in Nevada and disseminated asset maps from **Idaho**, **Wyoming**, and **New Mexico** across the IM STEM network.
- Created a **STEM Equity Program Evaluation Rubric** to support the implementation of best practices for underrepresented students in STEM education.

CHALLENGES

- Implementing practices across different contexts, including rural/urban, and across state lines when the same supports are not available.
- Measuring the impact of activities on the target populations, especially given the small scale of funding and short time frame.
- Engaging the broader Network members around workgroup activities in order to create local commitment and investment.

RECOMMENDATIONS

- Choose the right kind of mutually reinforcing activity that is well-suited to collaboration with diverse partners.
- Form workgroups out of the needs and desires of the partners so they are committed to engaging and investing in collective workgroup activities and local implementation.
- Maintain flexibility and be willing to change course if something is not working, and take advantage of new opportunities and needs.
- Build workgroup management structures, including distributed leadership with support from backbone staff, in order to set goals, monitor progress, and complete tasks.

Shared Measurement

Of the five conditions of collective impact, practitioners report that one of the most challenging to achieve is shared measurement—the use of a common set of measures to monitor performance, track progress toward goals, and learn what is working and not working (FSG, 2011).The process of creating a shared measurement system can be fraught with competing priorities among stakeholders, concerns about confidentiality, collection of comparative measures, limited capacity for data analysis and the significant time and cost of developing and maintaining a shared measurement system among multiple organizations.

IM STEM measured the effectiveness of the collective impact effort by attempting to measure progress toward the shared vision across the six state partners through the collection of common data to be shared in a visualization platform.

SHARED METRICS AND DATA COLLECTION ACROSS STATES

The IM STEM leadership chose to include shared measurement as one of the mutually reinforcing workgroup activities. The Metrics, Data Collection, and Reporting Workgroup took on the responsibility of considering what common metrics could potentially be collected across the six states. The Steering Committee found the creation of this workgroup a challenge because of the breadth of data that could potentially be collected from the six states. In an effort to make this effort manageable and to pilot the shared metric concept, the Steering Committee decided to limit the pilot to looking at CTE data. These data were also managed by many of the state representatives on the Steering Committee, increasing the potential for a successful outcome. Ultimately, the workgroup members included state education agency staff with data collection and reporting responsibilities for CTE.

The workgroup grappled with the idea of sharing data across the six states showing participation, concentration, and completion in STEM-related programs at the program level. However, the workgroup looked at the manufacturing career cluster first and found significant differences in how these courses and programs were named and identified across states, which raised concerns about the validity of attempting to do any cross-state comparison. The workgroup agreed that the data that they reported to the US Department of Education's Office of Career, Technical and Adult Education (OCTAE) in their annual consolidated report was as close to a cross-state comparison that could be made. As a result, NAPE updated its online **data dashboard of CTE concentrators disaggregated by state, career cluster, and gender**, as these data are available publicly on **OCTAE's Perkins Collaborative Resource Network** website.

The workgroup members were also significantly impacted by the reauthorization of the Carl D. Perkins Career and Technical Education Act (Perkins V) in July 2018 and the subsequent changes in the data collection

systems that were made due to new accountability measures in the law. This limited the capacity of the workgroup to be able to accomplish its larger goal of finding ways to share data across the six states. One of the workgroup members, Idaho, was willing to share its program level data with NAPE to create a pilot data dashboard that could help inform the workgroup members of the potential for using data visualization as a way to identify equity gaps in CTE. NAPE supported the workgroup's efforts and worked with Idaho to complete a data sharing agreement and created a set of data dashboards for Idaho as a pilot for the workgroup. These dashboards included data for 2016, 2017, and 2018 for both secondary and postsecondary institutions, disaggregated by gender and cross tabulated with race, economically disadvantaged, English language learners, and students with disabilities. These were the most current data available at the time from the U.S. Department of Education, Office of Career, Technical and Adult Education.

These dashboards helped Idaho as their staff were preparing to embark on their state planning process for Perkins V, which included new requirements for conducting a comprehensive local needs assessment and equity gap analysis. The dashboards helped Idaho determine gaps in student subgroup access to CTE at the district/college and program level and to set baselines for student concentration in nontraditional CTE programs—an accountability measure in Perkins V. The dashboards were also an example of what members of the workgroup could do in the future to help provide technical assistance to their local education agency recipients as they undergo the equity gap analysis in the comprehensive local needs assessment required in Perkins V.

The process of creating a shared measurement system can be fraught with competing priorities among stakeholders, concerns about confidentiality, collection of comparative measures, limited capacity for data analysis and the significant time and cost of developing and maintaining a shared measurement system among multiple organizations.

SUCCESSES

- Created a community of sharing with data specialists from the state education agencies managing CTE data.
- Built a pilot data dashboard for one state that served as a model for other states as they embarked on their Perkins V state planning.

CHALLENGES

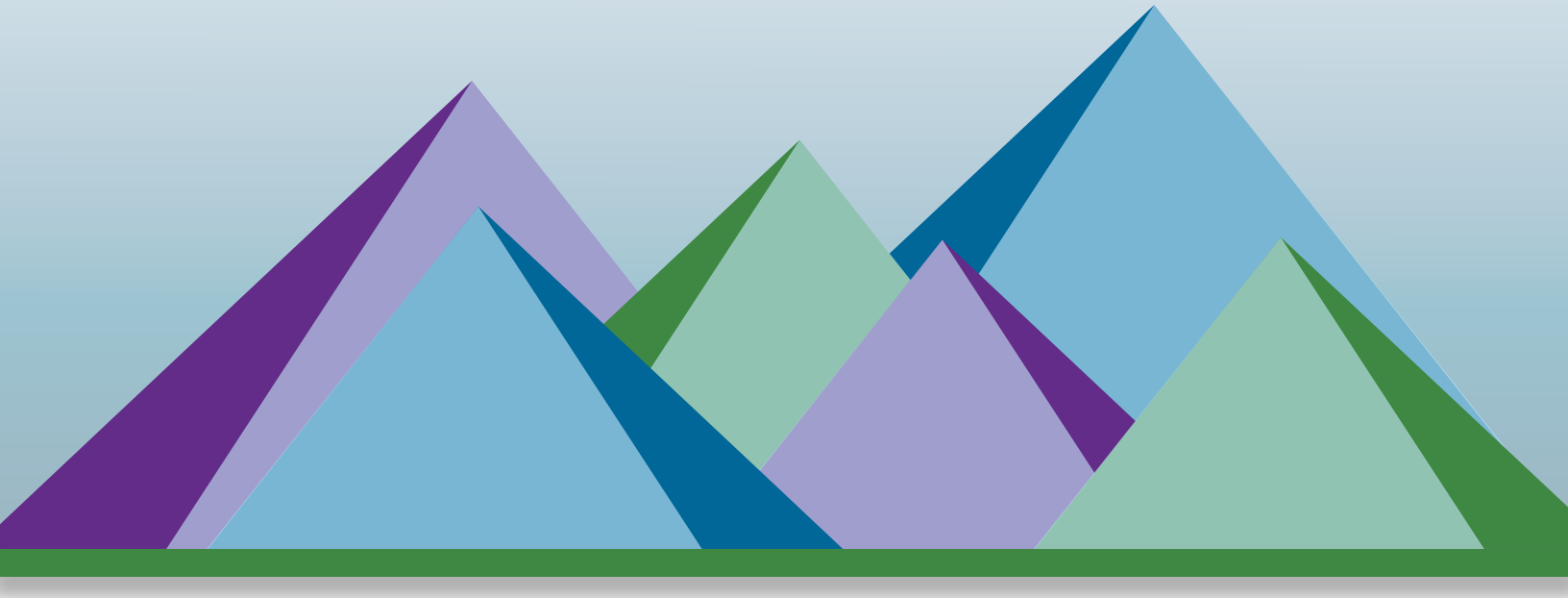
- Building consensus on a set of common metrics/ data elements that are aligned with the anticipated outcomes of the collective impact effort.
- Getting access to data that are not publicly reported by state agencies.
- Finding time for state staff to fulfill data requests.
- Managing Family Educational Rights and Privacy Act issues when data cell size is small because of subgroup disaggregation to understand equity gaps.
- Finding comparable data. There were issues with common student group definitions, use of Classification of Instructional Program codes, and different course titles.

RECOMMENDATIONS

- Align metric identification with easily accessible publicly available comparable data or with comparable data elements already collected by the partners, which they are willing to share.
- Have all partners sign data sharing agreements that commits them to sharing the agreed upon data for the purposes of the collaboration.

What's Next

IM STEM's funding from NSF has ended, resulting in some of the network's activities coming to a close, including the monthly newsletter and quarterly network meetings. Because NAPE served as the backbone for the network, the IM STEM network will continue to be supported by NAPE through its membership services. For example, while there will no longer be an IM STEM-specific newsletter, activities of the network will be included in NAPE's PIPEline Press, a monthly e-newsletter that focuses on equity in STEM education and CTE. The Steering Committee has indicated an interest in continuing to collaborate and is currently exploring the feasibility of forming a NAPE Member Affinity group where they will create a charter to sustain the IM STEM collaboration. NAPE was awarded an NSF INCLUDES Planning Grant in late 2020. The Planning Grant will leverage IM STEM into a national network of state and local education agencies focused on broadening participation for underserved students in STEM and CTE in the middle grades. All the members of the IM STEM leadership have indicated their support and willingness to participate in this effort. In addition to these more formal outcomes, the relationships that have been formed by the state-level organizations in the IM STEM States have expanded their ability to collaborate beyond their own state.



Overall Reflections

IM STEM's use of the collective impact model to build a network of state-level organizations working together to broaden participation in STEM showed promise. Typically, collective impact is conducted at a community level and there are few models of using this approach to facilitate systems change across states like IM STEM. At this early stage—about two years after forming—the partners have all expressed the value they have found in the collaboration, the connections they have made, and what they have learned from each other. Upon reflection, there are many things that we would like to do over or wish we understood before embarking on this journey. We hope the following lessons we learned will help you as you consider using collective impact to create systems change.

Don't boil the ocean

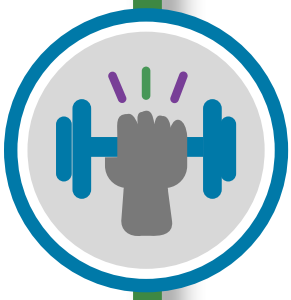
It is important that as part of the collective impact process to identify very specific outcomes the partners want to achieve. Although it is tempting to change the world, trying to take on an agenda that is too broad can damper enthusiasm and cause partners to wonder what is in it for them. Keep outcomes focused and achievable and be sure that everyone is committed to them. The best way to do this is to revisit the goals often, report progress at regular intervals, and hold everyone accountable.

Commit adequate resources to support the backbone

Ensuring that your collective impact work continues to make progress requires the support of a backbone entity who can serve as convener, provide staff, and collect and report results. Attempting to do meaningful and significant collective impact work with only volunteer partners can result in uneven effort, disappointed partners, and missed opportunity.

Get it right from the beginning

The collective impact process requires that all stakeholders contribute to the development of a common agenda and strategic plan. If your collective impact work is started in response to a funding solicitation that requires a complete plan, it should be revisited once the partners are in place. Don't assume that everyone owns the plan if they were not involved in creating it. If possible, secure a planning grant to initiate your collective impact project.



Build on the strengths of the partners

Take time up front to understand the assets that each of the partners bring to the table and how these assets can be leveraged to support your collective impact work. Make an asset inventory part of your planning efforts and have partners formally commit to having these assets available. Revisit the inventory often and update when new partners join or leave the network. This will help ensure that the right people and organizations are at the table and that they bring more than a passion for the common agenda. Be sure that all partners have a meaningful role to play and are responsible for some aspect of the work to give them ownership and a reason to be engaged.

Stay true to your common agenda

Once a common agenda has been set by the partners, take the time to revisit it regularly to ensure that the partners reinforce their commitment to it. Revisiting your agenda will also provide an opportunity to determine if it still fits the partners that are engaged. Having diverse partners with different areas of expertise and perspective can be valuable for bringing creative solutions to the table, but it can also increase the possibility that your agenda may shift or broaden. Be sure that all activities of the network align with the common agenda and support the network's vision.

Take time to do this work – Be patient

It takes time to create real change. In a study conducted by the Collective Impact Forum of systems change efforts using collective impact as their framework, the time between inception and impact ranged from 4 to 24 years (Stachowiak & Gase, 2018). In the words of the study's authors, "**Collective impact is a long-term play, not a shortcut to social change.**"

In closing, the authors want the readers to know that all of the successes, frustration, and challenges were well worth the effort. The lessons learned were significant and will be applied as all the organizations involved in this pilot continue to be creative, innovative and collaborate to increase opportunities for diverse learners in STEM and CTE.

Report Authors

Mimi Lufkin has over 40 years of experience as an educator advocating for access, equity and diversity in education and workforce development. From 1994 to 2018, Mimi served as the Chief Executive Officer of the National Alliance for Partnerships in Equity (NAPE). Mimi continues to support NAPE in her retirement as CEO Emerita.

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Members are listed in alphabetical order.

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Alex Carter	Colorado Education Initiative
Selena Connealy	New Mexico EPSCOR
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Links to Participating States Asset Maps that were disseminated through this project:

Wyoming After School Alliance - https://wyafterschoolalliance.org/stem-map/

Idaho STEM Asset Map - https://idaho.maps.arcgis.com/apps/webappviewer/index.html?id=bdd523126ade4d978d340def28f4667d

New Mexico Out-of-School Time Network STEM Asset Map -https://nmost.org/nmost-stem-map

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