



Expanding STEM Learning

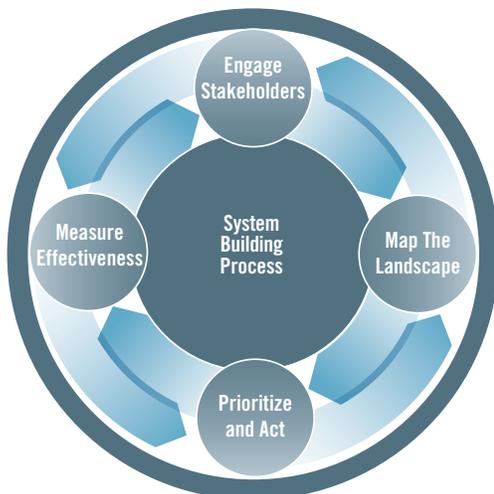
Lessons Learned & Early Impacts of
Statewide Afterschool Networks
System Building Efforts

The System Building Landscape And Process

FIGURE 1
Components of STEM System



FIGURE 2
System-Building Process



The system building work of states happened at the intersection of existing initiatives and networks supporting quality afterschool and those focused on STEM education. Each statewide afterschool network is at a different stage of development and utilizes different strategies to reach their goals, but all are engaged in building statewide systems to support quality afterschool, summer and expanded learning opportunities.

Likewise, there are a growing number of champions in the public and private sectors and new initiatives focused on STEM education more generally. These efforts aim to strengthen STEM education in K-12, higher education and beyond in order to increase the preparation of students as workers in a 21st Century economy.

COMPONENTS OF STEM SYSTEM

The Noyce grantees entered this rich and evolving STEM ecosystem and sought to intentionally build the supply and quality of informal science offerings in afterschool. The work focused on building five key interconnected components of systems to support quality informal science in afterschool – **partnership and leadership development; evaluation and data collection activities; quality building and professional development opportunities; communication and policy; and financing and sustainability.**

THE SYSTEM BUILDING PROCESS

In order to support development of these elements, the system-building states each take on a similar process that involved the iterative steps shown in figure 2.

Networks do not all place the same emphasis on these steps or even complete them in the same order, but they all put a focus on:

Engaging key partners around a vision of quality informal science in afterschool;

Mapping the existing landscape of afterschool and STEM efforts, including:

- Key stakeholders in STEM and in afterschool;
- Key investments in STEM generally and specifically in informal science in afterschool;
- Afterschool program offerings for informal science; and
- Professional development networks and capacity in afterschool and in STEM.

Prioritizing strategies and **Acting** to expand awareness of, supply and quality of informal science in afterschool through communication, policy, and professional development;

Measuring the effectiveness of efforts, with a focus on:

- The supply of informal science offerings in afterschool;
- The quality of informal science offerings in afterschool; and
- The impact of informal science programming on youth participating.

While the overall process is similar across the states, the particular players involved, and the strategies that are prioritized and acted upon vary depending on the state context and afterschool network structure. This diversity offers a prime opportunity for learning from both the successes and challenges states meet during their system building efforts.

Planning Grant Accomplishments – Small Investment But Big Impact

Network leaders are adept at developing partnerships – this is at the heart of the work they do, and they began planning work with broad statewide networks of individuals interested in afterschool. From proposal starting point, most states established a dedicated planning body within their afterschool networks to address informal science in afterschool. Others identified an existing statewide planning body and took the Noyce planning focus to that group. Working to map the field of STEM in their states helped network leads identify key stakeholders across the STEM learning ecosystem to invite to the table. Participants ranged from higher education, business, local foundations, and afterschool intermediaries to K-12 leaders and STEM-focused institutions.

The networks utilized the short 6-month planning grants provided to **ignite cross-sector STEM** conversations in their states. The interest and initial investment of a national foundation, and the potential for an implementation grant helped to bring stakeholders to the table and create a charge and focus for the initial work. This charge and focus was critical, as network leaders found that the range of partners interested in STEM and willing to come to the table made it challenging to agree on state level priorities. The need to create a proposal for Noyce that described how they would collect data and develop program capacity to deliver high-quality afterschool STEM statewide helped to focus their planning groups.

Networks also took advantage of short-term opportunities for action, while they were doing the longer-term work of system-building. Early in the development of these planning groups, leaders began identifying existing conferences and planning bodies focused on afterschool and/or STEM. They worked to get on the agenda of these efforts to talk about the opportunities for offering informal science in afterschool. This created “quick wins” in terms of new awareness of the importance of STEM in afterschool, credibility of the networks as a leader on STEM, and engagement of new partners. The continual awareness-building and outreach is a critical component to maintaining the state vision as new STEM efforts continue to surface in states.

During the **planning grant, networks engaged partners and began to gather data** at the state and local level on the range of STEM professional development opportunities in their state, to map where afterschool programs are currently providing STEM opportunities and to understand what the needs and barriers are for providers to deliver high-quality STEM in afterschool. This data informed the development of the system-building plan for their state.



System-Building Strategies & Early Impact

This section describes early impacts of the system-building work of the states receiving Noyce implementation grants on each of the key system components:



Partnership and Leadership Development



Evaluation and Data Collection Activities



Quality Building and Professional Development Opportunities



Communication and Policy



Financing and Sustainability

For each component, the sections include key strategies and early impacts across states, examples from particular states, and tips for system-builders seeking to replicate the success of implementation states.



The Noyce funding enabled networks to position themselves as hubs of cross-sector collaboration at the state level in the quickly evolving STEM ecosystem. During the planning grant phase, state leaders identified and engaged key stakeholders in developing a vision and plan for STEM in afterschool. While most states established a dedicated planning body within their afterschool networks to address STEM in afterschool; others identified an existing statewide STEM planning body and took the Noyce planning goals to that group. A few networks both convened a group within their network and participated in larger statewide efforts already focused on STEM. Regardless of the mechanism used to engage partners, there was a significant increase in both the number and range of stakeholders working together in afterschool STEM in a state as a result of this investment.

Network leaders highlighted informal science in afterschool as part of the solution to the problem of limited interest, proficiency and engagement of many young people in STEM subjects in school and careers over the long term. The focus on STEM made it possible for network leads to engage new partners, particularly business leaders, higher education, leaders of STEM-rich institutions and public officials and agency leaders interested in workforce and economic development. It also helped state networks to deepen and add new momentum to existing partnerships, particularly with State Departments of Education. The Noyce funding helped state networks to bring new resources to their state education afterschool partners and engage education Commissioners and other leaders who are focused on STEM as a priority.

Early Impacts of Partnership and Leadership Development Work

- Networks have had important influence on the priorities, policy and funding of statewide STEM initiatives. State Network leads have convened and participated in statewide planning efforts for STEM and gained recognition by public agency and policy leaders of afterschool as an important setting for delivering STEM-rich content.
- Networks have new and strengthened partnerships with K-12 Education, higher education, industry, workforce development, and STEM-rich institutions that provide a strong foundation for scaling STEM opportunities in afterschool settings across the state; and
- Networks have brokered new connections between afterschool providers and the growing field of STEM-rich institutions that are bringing new opportunities for learning to both providers and students in afterschool settings.

EARLY IMPACT EXAMPLES

Influencing Statewide STEM Initiatives

Maryland Out of School Time Network was invited to chair the subcommittee for authentic learning experiences in STEM in the State Department of Education's STEM Education Planning Process and is using this opportunity to include both formal and informal perspectives in this process.

The **Massachusetts Afterschool Partnership** (MAP) was able to engage the Governor's STEM Advisory Council, the Massachusetts Pipeline Fund and Executive Office of Education to leverage funds to support informal STEM learning opportunities. The network advocated for the role of informal STEM opportunities in the student interest portion of the Council's work as the State redrafted its STEM standards. These efforts have positioned MAP as a lead expert on STEM in afterschool while being able to recommend budgetary guidelines to the council. As the legislature moved to codify the Governor's STEM council to assure its presence when a new administration is sworn in next year, it modified the makeup of the council to include a representative of the out of school time field. The latest Request for Proposals to the Regional STEM Networks was changed to include priority points for submitting proposals that strategically focused on afterschool collaboration across the region. As of 2014, *the collective partnerships have directed \$1.7 million toward informal STEM initiatives.*

The **Michigan After-School Partnership** participates on the Michigan Economic Development Corporation (MEDC) Career Inspiration Advisory Committee, which is rolling out a statewide initiative to advise on STEM and entrepreneurship, collaborating with the Michigan Department of Education and the Workforce Development Agency.



EARLY IMPACT EXAMPLES

Convening Multiple Players to Address STEM

The **Indiana Afterschool Network** created and supports the Indiana Afterschool STEM Taskforce which provides the core infrastructure and leadership for the informal STEM system in Indiana. In the first year alone, they *experienced a 53 percent growth in the active representatives in the state*. The Taskforce works closely with other leading STEM initiatives in the state, including those led by the Indiana Department of Education, I-STEM Resource Network (university coalition) and an informal coalition of industry leaders in advanced manufacturing and defense. All of these initiatives have representatives on the Taskforce and work actively to make additional connections and intersections with their work. New and deeper partnerships are evolving on a regular basis such as partnering with the STEMx network on how they can work toward improved policies for STEM in the state.

Partnering with Business and Industry to Promote and Support STEM in Afterschool

The **Missouri AfterSchool Network** has engaged leadership from the Chamber of Commerce, who are interested in ensuring that students build strong skills and interest in jobs in STEM industries. Chamber leadership is chairing the Network STEM committee. Additionally, MASN has provided mini-grants to local Chambers of Commerce to bring together key business leaders, K-12 education leaders, and afterschool program administrators to plan a local STEM summit during which they identify local STEM partnership priorities. In November 2013 the Network cosponsored a STEM summit with the Chamber of Commerce. The Network ensured that afterschool programming had its own track focus at the summit.

Partnership & Leadership Development: Tips for System Builders

1. Use the focus on STEM to broaden and deepen the base of partners in afterschool.
2. Get partners to the table by participating in development of a broad vision for STEM in afterschool – keep them there with clear priorities and action.
3. Be clear about staff and partner roles in building your system.



Statewide Networks have been at work for a number of years to support statewide systems to ensure afterschool, summer and expanded learning programs are of high quality. The role of the network within that infrastructure and the depth and breadth of that infrastructure varies widely across states. The Noyce funding enabled Network leads to focus on integrating attention to STEM content, curricula, and quality in that infrastructure in a way that had never been attempted.

States employed three primary strategies in their work to increase the number of students engaging with STEM-rich content in afterschool:

1. They shared information broadly with providers of afterschool programs about the benefits of offering STEM content in afterschool, a framework for quality informal science, and quality curricula;
2. They assessed the field and identified existing professional development resources where they could build capacity to address informal science in afterschool. This included the identification of existing afterschool professional development resources where they could build the capacity to deliver STEM content through training of trainers, as well as linking stem-rich institutions in their states to afterschool providers. Several states incorporated a regional and local focus to this work, building the capacity of local intermediaries to promote and support STEM in afterschool and create local learning communities;
3. Finally, state Network leaders worked to build a focus on STEM into the existing afterschool funding, professional development and quality building systems in their states.

Early Impacts of Quality-Building and Professional Development Work

- The development of new STEM-focused afterschool infrastructure including: integration of STEM-specific standards into afterschool quality standards; prioritizing STEM programming in afterschool funding requests such as 21st Century Community Learning Centers Grant; and integrating a STEM focus in data collection and quality monitoring and evaluation required by afterschool funders. *These efforts achieve statewide scale quickly and are critical to the long-term sustainability of the work;*
- A significant increase in the availability of STEM training and professional development opportunities for the afterschool field; and
- The development of regional and local awareness and capacity to promote and provide STEM professional development opportunities and learning communities.

EARLY IMPACT EXAMPLES

Integrating STEM in Afterschool Professional Development and Quality Infrastructure

Indiana Afterschool Network developed Indiana STEM Standards and online assessment tool for programs and partners to define and track quality as part of their larger quality work with the Department of Education. Programs can produce a report of their results and receive a Pledge to Quality Poster for completing the assessment. The network will be able to aggregate data across sites, track results and target professional development to gap areas by the end of the year.

Michigan Afterschool Partnership initiated a revision of the Model Standards for After-School Programs, which are the state standards of quality for afterschool programs that have been adopted by the State Board of Education. The revised standards include STEM specific standards and provide self-assessment tools including Dimensions of Success (DoS) Evaluation Tool and Youth Program Quality Assessment (YPQA) STEM Tool as a permanent support to the field. The Board of Education approved the standards in 2013. A STEM endorsement process for the Michigan School Age Youth Development credential is underway. Discussions have centered around trainings, including both online (such as Click2Science PD) and face to face trainings. Recently, the network is partnering with the Michigan Department of Education, Math and Science Center Network, Michigan State University and 4H Extension, along with Eastern Michigan University Bright Futures 21st CCLC program to pilot the use of open digital badges as a means to earn the STEM endorsement for the afterschool workforce as well as STEM related youth badges aligned with the Next Generation Science Standards.



EARLY IMPACT EXAMPLES

Developing Statewide Training Capacity in Kansas

Kansas did not have a well-developed statewide training infrastructure for afterschool, so the **Kansas Enrichment Network** worked to recruit trainers from multiple provider networks, with a focus on achieving geographic coverage of the state. Trainer sessions were held on NPASS, Equity in STEM Education, NASA, 4-H Science, and SciGirls curricula. Trainers from a variety of afterschool programs participated in training, including the Boys & Girls Club, Communities In Schools, School District programs, Parks & Recreation programs, YMCA, YWCA, 4-H, and Resource & Referral staff. These trainers bring strategies back to their provider networks, and act as regional resources for training. Network staff also participated in a Master Trainer Institute for NPASS, enabling them to train other trainers. Kansas has trained five master trainers and has six in training in 2014. Through this strategic approach, Kansas now has training resources addressing informal science in afterschool in most regions of the state.

Developing a STEM Learning Community

In 2013 the Maryland Out of School Network (MOST) chose their first cohort of 38 sites for the SySTEM Learning Community. Participating sites choose two ambassadors to participate in learning community trainings and share information with their programs, where they choose to focus on one of ten evidence-based curricular models. MOST provides technical assistance, data collection, and trainings to Learning Community sites. This work has had a significant impact on the availability of high-quality STEM resources to sites and dramatically increased partnerships between sites and STEM-rich partners. The next phase of work will focus on expanding the number of learning communities and build out a strong core of STEM engaged afterschool professionals that can help translate best practices to programs.

Power of Discovery: STEM2 – a project of the **California Afterschool Network** (CAN) and the California STEM Learning Network focused on increasing building regional capacity in order to take the STEM professional development to scale in the state. Five Regional Innovation Support Providers worked with afterschool programs in their region to improve STEM learning in afterschool. Programs were offered professional development, curriculum resources, the establishment of communities of practices and interagency network of support for programs in their regions. A virtual Innovation Support Center was established by CAN to host a range of quality STEM curriculum and program management resources to serve program providers throughout the state. Recent findings have shown that line staff are attending more STEM trainings, have greater efficacy in implementing STEM activities and have more frequent discussions with classroom teachers about STEM concepts being taught in school as a result of this work. In addition, staff reported an increase in the numbers of meetings with parents to discuss STEM programming and the number of STEM-related events for parents. The network also found that STEM activities that are engaging and challenging can foster the development of students' interest and motivation in science and mathematics, including future careers in these areas.

Quality Building & Professional Development: Tips for System Builders

1. Tap into existing curricula and professional development capacity in afterschool, informal science and STEM.
2. Integrate attention to STEM into existing professional development and quality assurance infrastructure for afterschool.
3. Establish learning communities focused on informal science in afterschool.



The Noyce Foundation asked state networks to engage in an ambitious set of data collection efforts that went broader (measuring the impact of system-building work on the supply of STEM programming across the state) and deeper (measuring the impact of STEM system-building work on program quality and individual students) than most states had undertaken previously. This was challenging work for networks that resulted in many lessons learned and a refined set of tools and processes for measuring STEM system-building work. *This important focus on data collection and quality not only moved the needle on the depth and range of data that the networks gathered but more importantly helped to bring a framework around quality and measures of STEM impact to key STEM and afterschool stakeholders in a state.* Often, this was the first state level conversation on defining a framework of quality afterschool STEM for states. States emerged from the first round of data collection efforts with greater clarity about what is important to measure, what level of incentives and supports are required to successfully collect data from programs with limited administrative staff and capacity, and how they can use data to continuously improve program quality. For example, as states implemented DoS observations for purposes of assessment, they found that program staff valued the process as an important means of continuous improvement. Networks are now seeking to explicitly target technical assistance and professional development to programs based on results of the DoS assessment.

Early Impacts of Evaluation and Data Collection Work

- Implementation states utilized the DoS tool and Common Instrument with sites, enabling PEAR to refine these tools as important resources to the field, and building capacity in program staff and external staff to use them for continuous improvement purposes;
- States developed and refined tools and processes for understanding the *existing supply of STEM programming in afterschool* that they continue to use to inform their priorities for STEM system-building; and
- States have *institutionalized key measures of supply and quality of STEM programming into ongoing data collection efforts in the afterschool field*, including the use of DoS and the YPQA observation tools by 21st Century Community Learning Center Programs (CCLC) and state funded programs; and integration of Common Instrument measures into ongoing data collection from 21st Century Community Learning Center programs.

EARLY IMPACT EXAMPLES

Missouri AfterSchool Network partnered with their state Department of Education to ensure that observations of 21st CCLC and licensed school-age child care programs include observation of STEM programming through the YPQA – STEM. They also helped the state to integrate Common Instrument questions into the ongoing data collected to evaluation 21st Century programs. They are refining the instrument and will make web-based version of it publicly available.

Connecting data to professional development and training – both the **Indiana Afterschool Network and Beyond School Bells**, the **Nebraska afterschool network**, are exploring how to utilize DoS as a continuous improvement tool to identify what training and professional development supports are needed to improve STEM quality. In Nebraska, the network is partnering with Click2SciencePD housed at the University of Lincoln and city intermediaries to connect the data from DoS observations to the 20 essential skills within the online site.

Michigan Afterschool Partnership – strong partnership with the Michigan STEM Partnership (STEMx network) in the state has recently resulted in the inclusion of afterschool and summer programs as part of the MI STEM registry. The funding for this registry has been included in the state budget so that it will be maintained and updated regularly. This initiative has funded five STEM hubs to increase the awareness, interest, and participation in STEM classes and industries. *In the most recent round of funding, 70 percent of funds were allocated toward afterschool and summer programs.*

Indiana Afterschool Network developed an online database for afterschool programs, including programs offering STEM. The database allows parents, schools, and community partners to search for STEM programs by zip code, city, county, age group and produce reports at the state and local level.

Evaluation and Data Collection: Tips for System Builders

1. Align your data collection efforts to the goals and outcomes you are trying to achieve.
2. Be realistic about the time, expertise, and resources needed to collect, analyze and use data effectively.



The focus on STEM that the Noyce funding brought to the statewide Networks led them to emphasize the importance of STEM investments in their ongoing communication efforts with public agency officials, legislators, governor's and their staff, and industry leaders. For example in Pennsylvania during Statewide Advocacy Day and Afterschool Challenge, STEM and afterschool was a focus of talking points for legislative visits. It also helped networks to obtain a seat at key statewide policy tables where leaders came together to address STEM. Their presence at STEM planning tables helped to ensure that afterschool was included in state plans to promote STEM education. The result was important influence on both the policies and funding of state agencies that fund and monitor afterschool programs (such as 21st CCLC), as well as new state initiatives, plans and funding to address STEM education.

Early Impacts of Communication and Policy Work

- States successfully integrated attention to STEM in state afterschool quality standards and quality monitoring;
- The participation of State Network leaders in statewide policy initiatives addressing STEM led to the inclusion of afterschool programs in state policy and funding initiatives to address STEM.
- The broad-based communication efforts to the field of afterschool providers led to significant increases in awareness in the field of what STEM education is and what resources are available to help programs implement STEM.

EARLY IMPACT EXAMPLES

Pennsylvania Statewide Afterschool Youth Development Network – engaged the Pennsylvania Department of Education early in the planning and systems building work. From the inception, the Director of Student Services who oversees the 21st CCLC program has been a key partner in the work. The last two RFPs for 21st CCLC programs now include priority points for afterschool programs that include STEM programming as part of their work. In addition, the network STEM portal is a resource for 21st CCLC programs across the state and several 21st CCLC sites are part of the network's pilot STEM professional development efforts.

Beyond School Bells, Nebraska's statewide afterschool network, developed a statewide public awareness campaign to promote STEM. A critical factor in the success of their campaign was the development of partnerships that expanded the reach of their messaging. These included strategic partnerships with Nebraska's public broadcasting entity, Nebraska Educational Telecommunications (NET) and a statewide public awareness campaign, Nebraska Loves Public Schools (NELovePS). These partnerships led to statewide programming raising public awareness about OST STEM including an hour-long feature program on NET and a series of short persuasive OST STEM videos on NELovePS. In 2014, Nebraska partnered with Gallup to develop podcasts to be run on a Nebraska STEM YouTube site that feature interviews of individuals in the STEM field in the Omaha metro area.

At the **Maryland Out of School Time Network**, STEM is a major component of all their communications efforts, especially through social media. STEM was the focused topic at their statewide policy forum that featured youth STEM programming using 3D printing at the state house in Annapolis.

Indiana Afterschool Network participated on the STEM Action Coalition that helped the Department of Education to create a new STEM School Certification. As part of this certification application rubric, STEM Schools should offer opportunities outside the school day (that may or may not be held at school) resulting in many ways for students to extend their STEM learning. These STEM opportunities must have a strong connection to the school curriculum and activities that lie within.

Communication and Policy Development: Tips for System Builders

1. Understand the goals and objectives of the various STEM learning initiatives in your state and be strategic about how your work can align or build off their efforts to develop more comprehensive STEM learning policy.
2. Broaden your engagement strategy to include partners who can support your system building communication goals.
3. When exploring policy and funding opportunities, consider ways to expand afterschool through a workforce, economic development, college and career ready lens as well as through education.



Statewide networks have made important strides in building a sustainable foundation for the STEM work. Their efforts to sustain the STEM work have focused in three areas: 1) Sustaining the network capacity to do system-building work; 2) Sustaining the professional development and quality improvement infrastructure; 3) Sustaining the informal science programming in afterschool settings.

Similar to their financing strategies for the networks as a whole, networks are primarily focused on private foundations and a few aligned public sources (21st CCLC, Child Care funds) to support their capacity to do system-building work. Networks such as the Maryland Out of School Time Network, Beyond School Bells, Indiana Afterschool Network and the Pennsylvania Statewide Afterschool Youth Development Network have found that the STEM focus has enabled them to attract new foundation partners to their work and to gain in-kind donations from industry and business partners. These new partners have acted as connectors to additional funders and businesses within states. Some states, such as Missouri Afterschool Network and the Oklahoma Afterschool Network, are also employing a fee structure to support STEM trainings for afterschool providers.

In order to sustain professional development infrastructure and STEM programming, they are working to institutionalize attention to STEM in the afterschool professional development infrastructure, and funding.

Early Impacts of Financing and Sustainability Work

- States report leverage of over 1.6 million dollars in direct public and private grants to support their system-building work and to pilot STEM programming. The dollars they have influenced through their efforts to institutionalize attention to STEM in state afterschool policy and professional development infrastructure are much larger.
- States have successfully advocated for the prioritization of STEM work in state administered afterschool and child care funding streams.
- Networks are opening doors for cross-sector partners to connect and explore funding to support the broader STEM learning ecosystem at the local and state level.
- Inclusion of STEM in state quality standards and quality monitoring efforts for afterschool.

Conclusion

The joint investment is an example of a very successful strategic partnership that mobilized existing capacity to seize a moment of opportunity. The Noyce investment brought networks a focus, national credibility and expertise and resources directed toward STEM at a point in time of great new investment and interest in STEM. The existing capacity and the credibility networks had built with a range of stakeholders enabled them to move quickly to influence statewide conversations and policy about STEM. It also has left networks stronger, with a larger base of partners, champions and funders who are interested in cross-sector collaboration in STEM.

