How communities across the country are scaling STEM mentorship and maker-centered learning experiences for underrepresented students through cross-sector partnerships to bridge the opportunity gap.

This initiative was made possible by Arconic Foundation and Schmidt Futures.
Foreword

Since its launch at the White House Science Fair five years ago, US2020 has been at the forefront of a national movement to dramatically increase the number of STEM professionals engaged in high-quality STEM mentoring for youth.

This initiative is critical to building a just and fair society. By the time they have completed 6th grade, low-income students have spent an average of 6,000 fewer hours engaged in learning than their middle class peers. Underserved and underrepresented students are much more likely to pursue STEM careers and coursework if they have role models, and if they have an opportunity to engage in hands-on, project-based learning.

One new approach to inspire students to excel in STEM is maker-centered learning. By taking advantage of new hardware and software tools that empower students to design and make just about anything – maker-centered learning can promote mindsets and skills such as agency, curiosity, invention, and collaborative problem-solving.

That’s why US2020’s efforts to work with communities across the country to embrace maker-centered learning are so important. As a result of these partnerships, communities are setting ambitious goals, and mobilizing the public and private resources to meet them. They are building dedicated makerspaces for young people, and providing teachers with the professional development they need to integrate making into the curriculum, and the public and private resources to meet them. They are building dedicated makerspaces for young people, and providing teachers with the professional development they need to integrate making into the curriculum, and providing mentors, employers and engineers, and philanthropists and foundations with the important support for this effort, but we need an all-hands-on-deck effort to provide these opportunities for more young people – the 21st century equivalent of barn-raising in every community in America. We need parents and principals, mayors and mentors, employers and engineers, and philanthropists and foundations. If learning is the “lighting of a fire, not the filling of a pail” – please join us in providing that spark to every young person in America.

-US2020 STEM Coalition Challenge Applicants

The above map highlights the communities and lead organizations that responded to US2020’s call to action.

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-Thom Kalil
Chief Innovation Officer
Schmidt Futures
About the Challenge

Research shows that by the time they reach the sixth grade, students in poverty have spent 6,000 less hours learning than middle class peers. Bridging this opportunity gap is the challenge, and often, this lack of opportunity derives from having limited access to opportunities and role models nearby. Many students can be discouraged from pursuing STEM because they do not know anyone who works in these fields and do not understand what STEM professionals do. Research also shows that project-based learning catalyzes student science interest more than traditional classroom learning, and that learning by doing is six times more impactful than learning in the classroom/tests. Sparking student interest in STEM requires inspiration in their own lives, but, more often than not, this inspiration is not as easily found in the lives of the students.

To bridge this gap, US2020 launched The STEM Coalition Challenge, a competition for communities across the country to develop cross-sector partnerships to bring quality hands-on maker-centered learning to underrepresented students at scale through STEM mentorship.

Bringing more opportunities to students - specifically for girls, students from low-income families, and students of color - is key to ensuring the economic and social success of students and their local communities.

The Challenge process surfaced innovation in STEM focused maker-learning

The Challenge launches

October 2017

November 2017

92 communities respond

15 communities deemed finalists

January 2018

Finalists revise and resubmit proposals

January 2018

Finalists convene at STEM Collaboratory

February 2018

Winners announced

May 2018

US2020 puts out a call to action for communities to mobilize around STEM mentorship and maker-centered learning.

Within five weeks, communities across the country mobilize local partners to put forth their approaches for bridging this opportunity gap.

A panel of expert judges support US2020 with identifying the strongest 15 applicants working to ignite moments of discovery for underrepresented students.

After a process of coaching and feedback, finalists submit a strengthened proposal for their work.

Finalists meet with experts and community builders to reflect on their work, learn from one another, and identify new opportunities and approaches to bring back to their communities.

8 communities share $1 million in prizes, including human staff support and cash grants, to further their work and are inducted into US2020’s Community of Practice.

Applications were reviewed and scored based on four criteria

Impact

Effective Partnerships

Creative Engagement

Sustainability

Coalitions should have bold ambitions to grow quality STEM mentorship experiences.

Coalitions must mobilizing local ambition, knowledge, and networks to reach students.

Tomorrow’s workforce requires new learning that emphasizes experimentation and doing.

A sound financial plan ensures students are reached and are continue to be served in the future.

The Judges

LeVar Burton

Actor, Activist, & Founder, LeVar Burton for Kids

Stephanie Chang

Executive Director, MakerEd

Leslie Cruz

Chief Executive Officer, STEM Connector

Balaji Ganapathy

Head - Workforce Effectiveness, Tata Consultancy Services

Dorothy Jones-Davis

Executive Director, Nation of Makers

Esra Ozer

President, Arconic Foundation

David Shapiro

Executive Director, MENTOR

Eileen Yang

Senior Manager, Genentech

Communities were called on to share their approaches to innovative partnership building, creating sustainable STEM-mentorship pipelines, and embedding maker-centered learning in students’ lives by applying a collective impact approach. The result to this call to action was overwhelming - over 90 communities across the country responded with proposals for new models and solutions to bridge this gap.

Bringing together a panel of STEM experts, Mentorship specialists and creative community builders, each application was scored based on their merit across four main criteria: Impact, Effective Partnerships, Creative Engagement, and Sustainability.

This process resulted in shortlisting 15 finalist communities, and ultimately, 8 winners, across which over $1 million of prize value has been distributed. This report highlights what we’ve learned about how communities are approaching their work, and showcases how communities across the country are bringing creativity and new thinking to their approaches for bridging the opportunity gap through STEM mentorship and maker-centered learning.
A national response

The country’s response to the first round of the Challenge was extraordinary. Within five weeks, 92 applicants representing 82 communities across 35 states responded to this national call to action, sharing more about their STEM and maker-focused visions and future expansions. Over 2,384 organizations across the country are taking part in this effort, by developing or deploying programming, bringing role models to students who have limited access to STEM opportunities, or by building the social and economic infrastructure within these communities to allow for new learning opportunities to thrive. From Playground City in Orlando, FL which is in the process of building partnerships with over 40 partners, to Alabama STEM Education Inc. in Bessemer, AL which has mobilized small gifts from over 80 individuals to accrue $5,000 for local efforts, coalitions across the country shared their varying approaches, highlighting how a variety of strategies are being employed to bring more STEM learning opportunities to underrepresented students.

STEM mentorship and maker-centered learning for all students. Nearly 40% of applicants are actively putting forth programs that directly target girls. For example, the Museum of Discovery in Little Rock, AR is aiming to develop a statewide coalition that focuses on STEM programming for young girls, while Pink Think in D.C. is working with girls in specific low-income neighborhoods who lack STEM mentors and hands-on learning opportunities. Ninety percent of applicants are targeting low-income students, while over 84% are targeting minority students. For example, coalitions led by organizations like the Community Education Coalition in Columbus, OH or the Boulder Library Makerspace in Colorado are specifically targeting low-income Latinx students, citing STEM access challenges such as homesickness, language barriers, and limited access to mentors. These coalitions are consciously aware of their communities’ opportunity disparities and are working to close those gaps through cross-sector partnerships that bring STEM mentorship and maker-centered learning to all students.

Breaking down silos between stakeholders. Communities also mobilized partners and proposed solutions for how to bridge opportunity gaps through STEM mentorship and maker-focused activities. The highest percentage of applicants came from the South, while the Mountain West and parts of the Midwest had comparatively minimal responses. Research shows that children from the South are much less likely to become inventors than anywhere else in America. However, the Challenge surfaced significant interest in addressing STEM disparities in the South, with 34% of applicants applying from this region. Over 11% of applicants came from overlapping regions, such as multiple applications from the Atlanta, Minneapolis, and Washington, D.C. metro areas, indicating a shared potential for work still to be done in breaking down silos between STEM stakeholders in order to maximize the impact of new partnerships.

Industry and government involvement in grassroots movements. Coalitions are developing inclusive partnerships that tap into new resources across the country. Arizona places last in the percent of students graduating and making programming specifically targeting girls is worth additional discussion as the field continues to find ways to shrink gender disparities.

Boosting female representation in STEM continues to be a challenge, with women making up only 26% of the STEM workforce. Despite this, only a third of Challenge applicants focused their efforts specifically targeting girls. Some of those who are targeting female students include The Beacon House in Hagerstown, MD which is partnering with Girls Who Code, and The Robot Garden in Livermore, CA which is working with the Girl Scouts. The lack of STEM mentoring and making programming specifically targeting girls is worth additional discussion as the field continues to find ways to shrink gender disparities.

Targeting underrepresented students in STEM. Coalitions are especially high on low-income students and students of color, and plan to implement programming that specifically targets girls.

92 organizations leading cross-sector partnership building efforts. The lead organizations come mostly from the nonprofit sector.

92 applicants representing 82 communities and 35 states STEMming change across the country.

Communities across the country are working to transform STEM and maker-focused learning opportunities.

2,382 partners across sectors coming together. Coalitions are developing programs for students at all ages.
Coalitions come in different shapes and sizes, often determined by the nature of their lead organizations. Some insights that surface from mapping the lead organizations to the approaches they are taking include:

Organizations that target students in both urban and rural contexts are often focused on work at regional or statewide scale. Aside from the obvious driver of this correlation — that many regions and all states feature both urban and rural populations — this may also highlight how many city-based organizations extend their reach into surrounding areas to ensure that programming equally reaches rural populations. University of Texas - Institute for Instructional Excellence is focused on providing learning opportunities to youth not only in its hometown of Dallas, but also in nearby communities where it also has influence. North Louisiana STEM Alliance recognizes that areas beyond its base in Shreveport face challenges in accessing learning opportunities.

Statewide coalitions often take advantage of their influence over both rural and urban communities to help ensure that all student-serving programs will meet a specific standard regardless of their context. The coalitions in Colorado and Idaho are starting with a top-down approach, by implementing common principles for STEM learning across their states. In contrast, two other coalitions — the Greater Green Bay STEM Network in Wisconsin and Fab Newport in Rhode Island — are seeking to first pilot and test learnings within their metro areas and then scale across the state. The one urban-only outlier with statewide aspirations is Yell Academy in Tyrone, Georgia, which will similarly pilot its program in the city, but achieve statewide scale by convincing other organizations to adopt it.

Other coalitions -- often those led by direct service providers -- find value in specificity versus standardization. Emerging Leaders in Technology and Engineering, Inc is focused on expanding learning opportunities to students in lower-performing schools across Harlem, while just a few miles away in Brooklyn, Pratt is working to improve quality learning experiences for students in specific Title I schools. University of Southern California in Los Angeles has developed a movement across the whole school district to align work within a very specific population to ensure consistency of experience across their programs.

This map highlights:
- the number of coalitions reaching rural students, urban students, or both*
- the number of coalitions taking hyper-local, local, regional, or state-level approaches* (x-axis)
- the type of organization leading the coalition (y-axis)

*definitions

Hyperlocal: A coalition focused on students in a specific neighborhood, area or set of schools.
Local: A coalition focused on students or schools in a place connected to a city or locality. In urban contexts, this could include multiple school districts in a city. In rural contexts, this region can be defined as a specific county.
Regional: A coalition that crosses geographic and governmental boundaries. These sometimes include multiple school districts, as well as both rural and urban communities. The demographic makeup of these regions can be quite diverse given their wide geographic spread.
State: The coalition is anchored in a state office, or has ambitions of partnership-building efforts at a statewide level.

Backbone: Plays primarily a coordinating and strategy-setting role in the community.
Direct service provider: Devise and delivers programs to community.
Both: Plays both roles.

*natural: Communities in areas less than 100,000. Many define their challenges as a result of being a rural community.
*urban: Communities based in cities of over 100,000.
*both: Communities that incorporate geographic regions that include cities of over 100,000 and communities outside of this defined area.
Mentorship meets making

While STEM mentoring and maker-centered learning are complementary strategies for boosting educational and career access, not every program incorporates both.

STEM Volunteerism. Mentor-providing organizations -- such as companies and professional organizations -- may or may not focus their STEM volunteerism efforts on providing the kinds of hands-on learning experiences that spark student interest. In fact, most mentor-providing organizations involved with the Challenge are not trained in delivering maker-centered learning activities. There appears to be value in making a case about the impact of experiential learning among mentors from companies and organizations already focused on STEM volunteerism.

New perceptions of who can mentor and who should be mentored. Diversity in the Challenge applications also revealed great diversity in the types of organizations that receive mentors, as well as the backgrounds of the mentors themselves. Organizations hosting student programming range from the Liberty Science Center in Jersey City, NJ, which leads student hackathons, to the collaboration between the Portland Metro STEM Partnership in Oregon and their local zoo, to the Big Brothers and Big Sisters in San Antonio, TX, that has partnered with a sustainable architecture company.

Diversity in mentors’ careers. Similarly, STEM mentors come from unconventional places, diversifying the face of science and technology and showing that STEM skills can be an important part of any career. The Santa Clara Environmental Education Consortium in California provides mentors who are sustainability and conservation professionals, while The Regents of the University of California and MESA in Los Angeles have developed a maker-focused curriculum that can be easily applied and implemented so students in academia are effectively peer-mentoring one another. Dreamsoar, Inc in Grand Rapids, MI, is a volunteer-fueled organization providing maker opportunities to kids, but often finds it difficult to keep up with demand given it’s a volunteer-run organization, mobilizing retired mentors to coordinate partnerships and deliver high quality programming to students. Over time, the success of programs like these has the potential to shift cultural understandings of who is and can be a STEM professional.
Common agendas

Coalitions across the country are utilizing three main strategies to grow learning opportunities for students: trying new models, sparking new cultural norms, and meeting workforce needs.

Trying new models

From scaling what’s already working to launching new pilots, coalitions recognize that programs must be engaging to get students interested in STEM subjects. In Chattanooga, TN, Art 120 has partnered with MakeE$ on an Urban Art Bike program in which mentors and mentees create kinetic sculptures that demonstrate the power of STE(A)M in their community and around the world. Inspired by the maker movement, other coalitions are developing programs that engage community members beyond just mentors and students — such as families and teachers — to highlight new ways of approaching creativity and innovation. In Jackson, The Mississippi Children’s Museum is looking to create a statewide “Day of Making” to mobilize families, makers, and the broader community. In Riverside, The University of California Captio De Entomology wants to engage students in real life ecology research by connecting them with environmental scientists, master gardeners and environmental educators to design pollinator gardens. Organizations like El Paso Children’s Museum in Texas and Venture Cafe Miami in Florida want maker-centered learning activities to activate the building of social-emotional skills, such as collaboration, risk-taking and perseverance. Vector Space in Lynchburg, VA, has ensured program quality by requiring special training for mentors and teachers and by lowering student/mentor ratios.

Sparking new cultural norms

Coalitions across the country see a need to shift perceptions about what STEM education can be and who is positioned to be a mentor. Organizations like Explora in Albuquerque, NM, are partnering with organizations like FIRST Robotics to bring a competitive element to activities and highlight how STEM education can facilitate play. In Washington state, STEM-M for WAG in Richland is measuring the number of female mentors they can engage with girls and The Foundation for Tacoma has launched a STEM awareness campaign that highlights diverse faces in STEM. From Augusta, GA, the Clubhouse, Georgia Power Company, and CSSARC collaborate to host STEM Club for Girls, an after-school program led by female engineers that educates middle-school girls in science, technology, and career opportunities. Mobilizing professional female engineers continues to be a focus with Femineers San Diego, CA, to bring more young girls into STEM. Remake Learning Bay Area works with mentors from public utilities companies. These programs focus on how role models who look like and can relate to the students they are interacting with can shift students’ perceptions about their own future paths.

Meeting workforce needs

Across the country, employers are experimenting with the role they can play in building workforce pipelines. Research shows that STEM occupations are projected to grow by 8.9% from 2014 to 2024, compared to 6.4% growth for non-STEM occupations. Coalitions led by organizations like MidAmerica Industrial Park in Pryor, OK, are exploring the potential of connecting business and education leaders to augment shorter school weeks with creative mentorship programs. In Lancaster, PA, the Chamber of Commerce is spearheading efforts to match school demand for mentorship opportunities with emerging business volunteerism efforts. In Macon, GA, Lee University伐筑了onship views mentorship as an approach to boost local graduation rates. Struggling with job loss in Wisconsin Rapids, WI, McMillian Memorial Library used the Challenge as an opportunity to refocus its economy around STEM and making. Still other coalitions — such as Sci-Tech Discovery in Frisco, TX, who is partnering with Collin College and Raytheon — are working to further build tangible STEM pipelines.

Coalitions are experimenting with mentorship models

In mapping applicants’ visions and goals, three main priorities surfaced — to try new models, to spark new cultural norms around STE(A)M in their community and around the world. Inspired by the maker movement, other coalitions are developing programs that engage community members beyond just mentors and students — such as families and teachers — to highlight new ways of approaching creativity and innovation. In Jackson, The Mississippi Children’s Museum is looking to create a statewide “Day of Making” to mobilize families, makers, and the broader community. In Riverside, The University of California Captio De Entomology wants to engage students in real life ecology research by connecting them with environmental scientists, master gardeners and environmental educators to design pollinator gardens. Organizations like El Paso Children’s Museum in Texas and Venture Cafe Miami in Florida want maker-centered learning activities to activate the building of social-emotional skills, such as collaboration, risk-taking and perseverance. Vector Space in Lynchburg, VA, has ensured program quality by requiring special training for mentors and teachers and by lowering student/mentor ratios.

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The potential for solutions is ripe

Mapping the challenges shared by coalitions revealed four major barriers to successfully bringing STEM mentorship and maker-centered learning opportunities to underserved students. These include having the operational capacity to drive forward collective impact work, efficiently mobilizing resources across communities, driving forward systemic change, and creating access - whether geographically or socially - to programming.

Efficiently mobilizing community assets

While coalitions have big ambitions, they encounter a variety of challenges as they begin to implement their work.

Operational capacity to advance collective impact work

The majority of coalitions discussed how having limited funding and/or operational capacity is a barrier to truly scaling their collective efforts. Coalitions led by organizations like the Arizona Science Center in Phoenix and University of South Florida in Tampa have described difficulty in building the staff capacity to support tasks like coordinating efforts among partners and training mentors and teachers. STEM Advantage in Cota de Caza, CA is making the transition from an all-volunteer organization to a nonprofit, and learning how to most effectively manage costs and staff. Other communities struggle with building buy-in among government agencies and schools for breaking down silos and working together, in Indianapolis, IN, The Maker Foundation has been working with schools to develop curricula and set a skills agenda that schools can adopt in their classrooms.

Creating equitable access to programming

In both rural and urban communities, coalitions find it challenging to fund transportation costs or decentralize their programming enough to ensure that students have easy access to it. In places like Greensboro, NC, geographic and financial burdens make it difficult to create equitable access to programs, but even in densely populated areas like Compton, CA, transportation costs are prohibitive. In communities like Woodville, MS, the challenge lies in generating family buy-in, whereas in Little Falls, MN, transportation costs are prohibitive. In communities like Woodville, MS, the challenge lies in generating family buy-in, whereas in Little Falls, MN, transportation costs are prohibitive.

While many practitioners stated an interest in shifting educational programming toward more volunteer-fueled, maker-centered learning, they reported systemic barriers ranging from narrow curricular focus to overworked teachers to budget cuts. Many coalitions, such as STEM West in Hickory, NC, and Agency by Design in Oakland, CA, are focused on expanding teacher capacity, while Providence After School Alliance in Rhode Island seeks to embed learning opportunities outside of the school day. While community-wide challenges such as poverty, drugs, and violence can be major barriers to students’ success, they also sharpen the focus on how STEM opportunities can be a solution. Coalitions like Esperanza in Philadelphia, PA, and Pink Palace Museum in Memphis, TN, providing activities for students in communities where engaging learning opportunities might otherwise be sparse. Make Nashville in Tennessee is working with nonprofit partners to reduce youth violence through mentoring and making.

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Regardless of the challenges they face, communities across the country are finding ways to mobilize local resources and knowledge to advance making and mentoring programming. From local industry talent, to the social capital that derives from positive working relationships between organizations, to pipelines that expand access to maker-focused STEM learning, community stakeholders are working together to create, leverage, or expand upon existing assets. These strengths can be categorized into four dimensions: Community-focused, economic, physical, and cultural.

**Community-focused:** Often rooted in successful existing relationships, applicants are establishing new collaborations around their shared interests in STEM and maker-focused learning. For example, Kids in Tech in Lowell, MA, leveraged its stellar reputation to mobilize local organizations to collaborate, while the University of Southern California partnered with the Los Angeles’ existing “Women in STEM initiative.” The United Way of Central Jersey in Milltown and the United Way of South Texas in McAllen are utilizing the United Way’s impressive reputation in communities worldwide to launch STEM mentoring movements locally.

**Economic:** In Boston, MA, CodeSquad incentivizes companies to get involved in STEM mentorship and maker education by touting the benefits of offering volunteer opportunities to potential employees, as well as the opportunity to develop future workforce pipelines. The Nature Conservancy runs pilots in Philadelphia, PA, with a vision of eventually using the model nationally to promote careers in environmental preservation. Despite these success stories, over a third of coalitions referenced local companies they haven’t yet engaged with. Tapping into this potential could strengthen existing activities and accelerate the development of new ones.

**Physical:** Communities are building or reimagining local spaces and tools in creative ways. Breitung Township Schools in Kingsford, MI, is transforming its gymnasium into a makerspace, while the Scott Family Amazeum in Bentonville, AR, used the creation of its makerspace as an opportunity to bring community partners together, demonstrating the potential for these efforts to mobilize community leaders around a common goal.

**Cultural:** Some efforts are capitalizing off of deeply-rooted institutional or social norms. From Tacoma, WA -- which was recently branded an Etsy-designated Maker City given its vast number of local makers -- to La Grande, OR, where the school district is exploring opportunities to deepen hands-on learning, coalitions are leveraging the individuals and leadership that spark creativity within their communities. The Betty Brinn Children’s Museum in Milwaukee, WI, developed a three-year plan to establish makerspaces that could ultimately be staffed and managed by community members, with ongoing mentoring, training and support from maker-educators.

Coalitions are creatively using local assets to devise solutions

Applicants described the community strengths that were being leveraged in building their mentoring and maker-centered learning partnerships. Mapping their responses led to the creation of four categories: Community-focused, economic, physical, and cultural.

| # of Coalitions |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 10              | 20              | 30              | 40              | 50              | 60              |
| 70              | 80              | 90              | 100             |                 |                 |

- **Strong, established partnerships**
- **Local interest to promote maker-centered learning**
- **New, emerging partnerships**
- **Proven success through measurement and evaluation**
- **Partnerships with national organizations**
- **Geographic size**

- **Untapped industry partners**
- **Successful local economy**
- **Regional proximity to industry**
- **Local natural resources**

- **Maker spaces with equipment**
- **Local partners with access to maker spaces**
- **In-kind support**
- **Reimaging local spaces for maker-activities**
- **Openness to experimenting with programs**
- **Programming that solves local challenges**
- **Infrastructure for partnership programming**
- **Programming alignment with curriculum**
- **History of making in community**
- **Programming that solves local challenges**

- **Ongoing presence in the community through events or outreach**
- **In-kind partnerships**
- **Program alignment with community**
- **History of making in community**
- **Programming that solves local challenges**

- **Infrastructure for partnership programming**
- **Programming alignment with curriculum**
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The finalists and the winners

Finalist and winning cities were selected based on their approaches to building local STEM mentoring and maker-centered learning movements. These communities are models for how others across the country can work across sectors to leverage local assets and develop new strategies to bring engaging learning opportunities to students underrepresented in STEM. The pages that follow highlight themes that emerged in their applications, and provide deeper dives into each coalition’s model and strategy.

US2020’s STEM Collaboratory was the first gathering for this cohort of communities, an opportunity to refine their strategies and share successes and challenges in scaling mentoring and maker-centered learning. This convening served as the entry point into US2020’s national community of practice, which meets twice a year to exchange learnings and best practices.
Project Exploration, a nonprofit organization that provides programs to youth from historically underrepresented communities, is deepening its impact in the city’s largest neighborhood. Using a place-based approach, Project Exploration is developing a community center for innovative STEM learning experiences, by engaging and connecting local resources for West Side youth and families. Additionally, as the backbone organization for Chicago’s STEM learning ecosystem initiative, the Chicago STEM Pathways Cooperative, Project Exploration will work with cross-sector stakeholders to identify opportunities for expanding mentorship, professional outreach, and maker-based learning. Project Exploration will also curate a toolkit to support mentor outreach in their programs, which they will disseminate broadly.

“The partnerships and coalition proposed are strong. They have both local and national partners involved, and the potential of this pilot if successful could be huge.”

Dorothy Jones-Davis, Founder and Executive Director, Nation of Makers

I love their approach. Often, it’s assumed there’s only one pipeline for students. There are other ways to think about STEM, and they’re thinking about creative ways for partners to make a contribution”

Dorothy Jones-Davis, Founder and Executive Director, Nation of Makers

Project Exploration

Chicago, Illinois

Winning Coalition
Buffalo, New York

Interdisciplinary Science and Engineering Partnership

Interdisciplinary Science and Engineering Partnership (ISEP) is broadening participation of under-represented and under-served populations in STEM education and STEM careers. ISEP will develop a maker-centered learning curriculum in partnership with the Buffalo Science Museum to bring more opportunities into the classroom. As Buffalo’s demographics change with new immigrants and refugee communities coming into the city, ISEP will leverage its partnerships with the Buffalo School District, Buffalo Science Museum, SUNY Buffalo State College, and the University at Buffalo to develop and implement high-quality programs that not only meet curriculum standards but will target high need students to inspire their interest in STEM careers.

Greater Cincinnati STEM Collaborative

Cincinnati, Ohio

Partnering with a variety of different organizations and institutions across a three-state region, the Greater Cincinnati STEM Collaborative (GCSC) developed its vision and mission back in 2011 and were inspired by the maker-movement to create a pathway to further achieve its goals. Serving primarily middle school-aged children, GCSC will expand its after school and summer camp offerings to more girls, low income students, and students of color through STEM Bicycle and 3D Printers Clubs and maker-focused summer camps. By working closely with local partners and companies, GCSC will support more kids, spark their interest and imagination, and showcase how students themselves can become problem-solving STEM professionals.

“I’m really impressed with their data and evidence based approach and how this is moving the needle. There’s elements of scale, partnership in it; it went above and beyond that.”

Balaji Ganapathy, Head - Workforce Effectiveness, Tata Consultancy Services

“Cincinnati is really bringing a new definition to maker-centered learning. Through their bicycle program, they’re truly redefining what it means for maker-centered learning to be accessible. They’re also bringing in female scientists; they really have a great model. I’m excited to see what else they’re able to bring.”

Eileen Yang, Senior Manager of Corporate Citizenship, Genentech
The DC STEM Network is working for all students in the nation’s capital to apply STEM knowledge and skills to enhance their lives and lead improvements in their local and global communities. A network made up of local partners, including the DC Office of the State Superintendent of Education (OSSE), it is led by Carnegie Academy for Science Education (CASE). Having initially launched their work by conducting a cross-sector Asset Mapping Workshop, the coalition identified STEM assets, barriers, STEM education spaces to inform a strategic plan to advance STEM education across the city. Presently, the DC STEM Network has successfully launched three cohorts, including “Making in DC” which is a Maker Residency cohort to increase the number of collaborations between makers and teachers with ultimate goals to increase underrepresented student access to maker-centered learning. Starting with a pilot in 5 elementary schools in D.C., the Maker Residency will mobilize makers to train teachers in maker-focused curriculum, and seeks to impact 150 students by July 2019.

"There are some very compelling partners in DC, all actively engaged in strong efforts, and they're looking to create an environment where making can truly thrive. By convening makers and community members, leveraging the local Maker Faires, and focusing on mentor recruitment, there's really a potential to embed making across the city.

- Stephanie Chang, Executive Director, MakerEd

The Idaho STEM Action Center seeks to bring together partners across Idaho with a shared goal of expanding STEM education and ensuring every student in Idaho has access to high-quality STEM mentors and maker activities. A governor-led state initiative bringing more STEM opportunities to students across the state, the team used inspiration from the STEM Coalition Challenge to speak with and mobilize with a variety of stakeholders across the state to identify strategies for bringing more STEM and maker-focused activities to students. In collaboration with business, schools, libraries, and nonprofit partners, Idaho will develop an online platform to facilitate virtual mentorship across the state, especially in rural communities where STEM learning opportunities are less prevalent, mobilize its local libraries as makerspaces to scale programming, and expand local and regional competitions to continue sparking student interest in STEM.

"Rural kids need love too. Their work has the potential to really make an impact on these kids' lives; the passion and need is there - I’m excited to see where their work takes them."

- LeVar Burton, Actor, Activist, Founder of LeVar Burton for Kids

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Winning Coalition

Washington, D.C.

DC STEM Network

Idaho

Idaho STEM Action Center

Winning Coalition

Winning Coalition
Socorro, New Mexico
New Mexico Institute of Mining and Technology

The New Mexico Institute of Mining and Technology is promoting, supporting and increasing underserved student interest in, skills, and encouraging the pursuit of STEM-related degrees and careers to build local community and state economies. The New Mexico Institute of Mining and Technology has spearheaded a coalition by pushing forward meetings with the superintendent, principals, and outreach coordinators from a variety of local organizations. Based in a rural community, the first meeting brought together over 70 people, including key administrators from NMT, Socorro schools, and the Mayor. As partners come together to provide STEM mentorship and maker-centered learning activities available to under-represented students, the coalition is working on streamlining efforts to mobilize mentors and maximize impact.

Colorado Succeeds
Colorado

The mission and vision of the Colorado STEM Coalition is that all Colorado learners have the STEM education experiences needed to succeed in the innovation economy. Colorado Succeeds has been working closely with companies across the state to create a state-wide coalition that fosters innovation and equips students to meet the work needs of tomorrow. Working closely with corporate partners to create a unified vision, mission, and set of goals to set the state up for success, Colorado is identifying ways to create strategies and programs that are suitable to both urban and rural communities across the state that equip students with the STEM skills to succeed in its innovation economy. With an existing statewide network of implementation partners such as key state agencies, civic and community leaders, aligned nonprofit organizations, school and district partners, and chambers of commerce and industry associations, the coalition is exploring new ways of engaging stakeholders and innovative programs that bring quality learning experiences to students across the state.

The Michigan Science Center is broadening the pipeline of the next generation of STEMinistas by inspiring girls to leverage their interests and skills into the STEM careers and STEM entrepreneurship that support their dreams and create meaningful impact in the world. Through a collaborative model, Michigan Science Center will bring more maker-centered STEM learning opportunities to young girls between grades 4-8 by working closely with partners. By tapping into the local maker-movement, developing metrics and evaluation techniques that capture long-term impact this coalition seeks to create long-lasting change who live in low-income communities. Over the course of the next 3 years, Michigan Science Center will engage a variety of local corporate partners to impact over 6,000 girls and scale best practices across the city.
Pittsburgh, Pennsylvania

Remake Learning

“Remake learning has done a great job of balancing STEM, mentoring, and maker-centered learning. They are embedding quality mentorship into their model working with the Mentoring Partnership of Southwestern PA and putting lasting relationships at the center offers a key asset that will make a real difference in students’ lives.”

David Shapiro, Executive Director, MENTOR

The Columbia Gorge STEM Hub

The Dalles, Oregon

The Columbia Gorge STEM Hub will support all students in The Dalles, and the Columbia Gorge more broadly, in attaining the exposure, hands-on learning, and support needed to envision themselves in—and successfully pursue—STEM careers. Through a collaborative process, The Columbia Gorge STEM Hub worked closely with partners, including Gorge Technology Alliance - a network representing over 3000 STEM professionals in the region, to guide the direction of the initial STEM collaborative and maker-centered learning programming in the community. In partnership with the STEM Hub Leadership Team, which includes representatives from local school districts, the community college, and industry, the coalition applied insights from partners on developing the its local STEM action plan, with goals to scale this pilot (if successful) to the entire Columbia Gorge region. By participating in the Challenge process, the team is moving forward with developing a maker-focused mentorship program that connects students and professionals in settings show students first hand how they can become STEM professionals.

Winning Coalition

Winning Coalition

Remake learning is bringing together partners from across Maker Education and STEM Ecosystems working groups to design the vision, mission, and goals for a pilot project to spur more maker-centered STEM-driven learning opportunities for underrepresented students. While students across have many opportunities to engage with STEM learning at science labs, 180+ regional makerspaces across Pittsburgh, students of color and young women are not consistently seeing role models in the field that look like them. Through a 1:1:1 mentoring program, the coalition will facilitate deep, meaningful mentorship relationships between adults and students by curating a curriculum that facilitates both to work side by side to complete projects. The Mentoring Partnership and Carnegie Science Center, in collaboration with others, will support the scaling of this programme to Sto-Rox School District, Manchester Academic Charter School, and others across Pittsburgh.

“Remake learning has done a great job of balancing STEM, mentoring, and maker-centered learning. They are embedding quality mentorship into their model working with the Mentoring Partnership of Southwestern PA and putting lasting relationships at the center offers a key asset that will make a real difference in students’ lives.”

David Shapiro, Executive Director, MENTOR

“This smaller community is committed to changing the lives of it students through its partnership between the high school, local library, and corporate partners like Google. Without this learning opportunity, students could miss out on taking up tech jobs in the region.”

Esra Ozer, President, Arconic Foundation
The Bay Area STEM Ecosystem is creating a community where families recognize that STEM is everywhere and for everyone. With an overall goal of bringing equitable access to STEM learning opportunities for all youth in South San Francisco, the Ecosystem began their work with a community listening campaign with local students, caregivers and teachers. They heard that in addition to not understanding what STEM education is, parents feel disconnected from what their children are learning, and unsure of their path to STEM careers. After incorporating feedback from cross-sector network partners, the Bay Area Ecosystem landed on family engagement as a focus their community has a need for, and their network has the potential to address. The Bay Area Ecosystem’s vision is to empower caregivers as mentors, and provide them with tools and resources to help their children develop the STEM skills needed to tackle future school and career challenges: creativity, communication & critical thinking.

The Columbia Memorial Space Center is creating an environment where any adult or child is able to walk through the communities of LA with a feeling that they are surrounded by STEM, while also gaining awareness of and accessing the incredible STEM learning opportunities all around them. The Space Center is decentralizing the museum experience by embedding maker-experiences within high-need neighborhoods. By partnering with local organizations such as Boys and Girls Clubs, low-income housing developers and other non-profits, Downey is bridging geographic and transportation barriers by curating programming that brings opportunity directly to students, making it more accessible.

The United Way of Greater Atlanta is increasing the number of underrepresented youth participating in STEM activities through mentoring and maker spaces, resulting in youth demonstrating mastery of STEM related subjects leading to jobs in technology. The United Way of Greater Atlanta is looking to create a strong partnership model across the areas of STEM education in the Greater Atlanta Region. The Coalition aims to reach 3,000 students through mobilizing 125 mentors. With ambitions to take advantage of its local film and creative industries, the organization has already built partnerships with corporate partners like Delta Airlines and 3M, with ambitions to continue scaling its partnerships to reach students across the region through quality programs.

Pratt Institute is developing a STEAM garden - a unique creative community - to open up maker-centered learning at the intersections of art, design, science, technology, engineering and math (STEAM) to low-income young people in Brooklyn through an engaged, deliberate network of community organizations, public schools and educational institutions, and industry intermediaries. Pratt Institute engages local industries and related businesses to create a network of STEAM mentors, who are willing to open up their businesses for tours, internships and mentoring. To design and begin to develop the network, Pratt set up a convening with local community-based organizations to understand and identify gaps in expertise and resources across the community. This led to the design of pilot programs for middle and high school students on Pratt’s campus and off-site in collaboration with local schools and partners like the Brooklyn Navy Yard. Pratt is mobilizing mentors from unexpected places, including designers and entrepreneurs from local start-ups. Their programs are targeting hundreds of high school students, many of whom attend Title 1 schools.
Cross-sector partnerships

All Challenge communities are engaging a variety of partners to achieve their goals. Across all finalist communities, the social sector — represented by the pink sections of the graph — comprised about half of coalition member organizations, with business and foundations about a third, and government and schools representing only one out of every five partners. In general, applicants identified many more potential funders and mentor-providers than they were currently able to access, meaning that much of the business and foundation sector remains untapped. There is more work to be done in engaging these stakeholders in community-wide making and mentoring efforts, potentially by more clearly defining the unique roles they can play in burgeoning coalitions.

An analysis of coalition partnerships revealed significant variance, implying that there is no one-size-fits-all model for successful partnership. The communities’ contexts are all different — some have a diversity of industry partners who can contribute to local mentorship efforts, such as the Colorado coalition, while others rely more heavily on the social sector. The amount of government involvement also varies from place to place. The Allendale coalition is working closely with local government and school districts from the onset to identify interventions that will scale.
Creating STEM mentorship opportunities through making

Coalitions are experimenting with hands-on programs to bring more learning opportunities to underrepresented students. These programs and activities come in a variety of forms:

- **Making makers**
- **Competitions and challenges**
- **Afterschool programs**
- **Subject and skill-based activities**

### Competitions and challenges

**Design Challenges**
Students find solutions to local challenges + pitch to judges

**First Robotics Competition**
Students grades 3-12 engage in building robots and competing

**Student Race Challenge**
High school students apply mechanical and automotive engineering skills to create innovations

**Future City Competition**
Building real-world problems through technical themes

### Afterschool programs

**Maker Curriculum**
Students engage in hands-on learning experiences with mentors who look like them

**Bicycle Clubs**
Middle school students learn by revers engineering bicycles

**Coding + 3D Design**
Students learn technical skills through activities hosted at Boys and Girls Clubs

**Mathletics Clubs**
Middle school students engage in hands-on activities

**3D Printer Clubs**
Middle school students learn to 3D print

### Subject and skill-based activities

**Maker Discovery Camps**
Hands-on engineering activities for kids

**Exploratory STEM**
Middle school students explore STEM subjects

**STEM Family Days**
Girls are exposed to real STEM environments

**Summer Exhibitions**
Elementary and middle school students showcase their skills

**Maker Faire**
Elementary middle school girls engage in hands-on programs

**Field Trips**
Students engage in hands-on programming and career exploration through field immersions

**Hour of Code**
Students, educators, and mentors code for an hour

**STEMfest Conference**
Students engage in conferences at local universities

**Building new tools**
Disabled youth build braille printers from legos

**Catalyzer**
Students use 3D printers and laser cutters to create games and models

**STEAM Truck workshops**
Students engage in activities to build 21st century skills

### Making makers

Analyzing the array of maker-focused and mentorship activities proposed by the finalist teams revealed that coalitions’ activities vary across a number of dimensions, including the depth of engagement between mentors and students, the knowledge and skills they aim to develop, and the activities’ settings and approaches. How best to measure the impact of these activities is a continued work in progress; practitioners should continue to track their outcomes, with the ultimate goal of coming to a shared understanding of what defines the highest-impact activities and how best to utilize maker-centered learning to drive student achievement and wellbeing.
Driving forward collective action

Finalist coalitions are pursuing a variety of collaborative strategies to further their making and mentoring work. StriveTogether, a national leader in collective impact, outlines a Theory of Action that includes four types of core activities, or “pillars,” for social impact coalitions: shared community vision, evidence-based decision-making, collaborative action, and investment and sustainability. Finalists’ planned activities were mapped to these pillars to understand how they plan to pursue their goals. As this visual demonstrates, finalists focused much of their attention on collective action, from launching a maker-residency pilot to training teachers on how to utilize mentors. There were fewer shared community visioning activities, perhaps reflecting that many coalitions in the finalist pool have already been working together for some time, and already have relatively established visions for success. Most striking was the lack of planning for investment and sustainability activities. This may also reflect the maturity of most finalists’ efforts -- rooted in established community partnerships and visions, but with the specific making and mentoring-centered activities a more nascent focus. However, many applicants named sustainability as a significant concern. There may be a role for funders and field-builders to play in coaching coalition leaders around developing financial partnerships for maker-centered and mentoring learning opportunities.
Reflections

We are so proud to support 18 cities across the country, including our eight US2020 STEM Challenge winners and newest City Network members, in bringing STEM mentorship and making to life for their students. These cities recognize that every child deserves to have a learning day rich with opportunity and supportive adults. They also realize that student voice and creativity may be the most powerful assets a city has in solving its most pressing challenges. The city coalitions in the US2020 network, which this year will serve ~50,000 students, are models of both innovation and investment.

We want to thank the staff of US2020, especially Colin Lacy, Rachel Alexander, and Puja Parekh, our expert panel of judges, our extraordinary partners in the STEM Coalition Challenge, including Schmidt Futures, Arconic and Genentech, and our role models in the maker space, including Maker Media, Maker Ed and Nation of Makers.

-Emily McCann
Chief Executive Officer
Citizen Schools

When we started Citizen Schools in 1995, we knew talent was equally distributed among children in a city, but that access to resources and role models was not. Our founding premise was that all students - especially underrepresented students - thrive when their environment is rigorous, relevant and rich with relationships. And over the past 23 years, we have helped re-imagine the learning experience for over 100,000 students, in partnership with nearly 25,000 volunteers who have helped bring math, science and ELA lessons to life. We hoped that this combination of mentorship and making - hands-on, real world problem solving - would build creative confidence, collaborative problem solving skills and academic proficiency. And our data indicates that it has had a profound effect on student persistence and performance. What we didn’t quite expect was the ways in which the relationships between students and volunteers would knit together a city and begin to transform the social mobility within it.

US2020’s expanding Community of Practice

The Challenge resulted in 8 additional communities winning $1 million in prize value to continue building upon their work and their induction into US2020’s Community of Practice.

STEM Coalition Challenge winners
City Network members
References


