THE ESSENTIAL FUNDERS' GUIDE TO STEM-FOCUSED FAMILY ENGAGEMENT

Seven Strategies to Support Families in Advancing Young People's STEM Interest, Persistence, and Achievement

February 2020

stemnext OPPORTUNITY FUND

family engagement PROJECT

Photo

PowerMyLearning

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Family Code Night

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About STEM Next Opportunity Fund

STEM Next Opportunity Fund is taking a leading role in raising awareness and advancing promising practices on family engagement. Through a multi-year project that leverages research, convenings, publications, and a national social media campaign, STEM Next is pursuing an ambitious agenda on family engagement in the informal realm with application to formal education. Our objectives include convening foundations, corporations, national youth-serving organizations, community-based organizations, and policy makers to reform, elevate, and scale family engagement and catalyze investments in family engagement. Please visit our website or reach out to us for a conversation about our work. We hope you will join us in making family engagement a game changer in attaining #STEM4All.

AUTHORS

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Linda Kekelis, PhD, is the lead advisor for STEM Next Opportunity Fund's Family Engagement Project. Linda advises numerous informal STEM providers and STEM Ecosystem leaders. Parent engagement has been part of Dr. Kekelis' life's work. As the Founder and former CEO of Techbridge Girls, Dr. Kekelis made family engagement one of the vital elements of the program and throughout her tenure committed resources to measure impact and better understand how to serve the needs of families.

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INTRODUCTION

In April 2019, the STEM Next Opportunity Fund published a report detailing the vital role of family engagement in supporting young people's interest, persistence, and achievement in the science, math, engineering, and technology (STEM) disciplines. ***Changing the Game in STEM With Family Engagement*** explained that family support – particularly for girls and young people from populations underrepresented in the STEM professions – can determine whether or not these future innovators and problem-solvers start down the path that leads to careers in STEM.[1]

To close the gender, race, and income gaps in the STEM workforce and provide opportunities for all young people to develop essential STEM literacy and skills, we must invest in effective and culturally responsive family engagement.

Changing the Game followed a comprehensive analysis and call to action offered by the ***Carnegie Challenge Paper: Joining Together to Create a Bold Vision for Next Generation Family Engagement***, which was commissioned by the Carnegie Corporation of New York and completed by the Global Family Research Project in October 2018. This paper emphasized the importance of "prioritizing and investing in efforts to empower families to support their children's learning as a key strategy in achieving greater educational equity and social justice – goals that are now more urgent than ever."[2] The authors frame the shift to "next generation family engagement" as "moving from where we are now – a scattered, marginal, and unaligned set of programs and policies – to more strategic and systemic approaches to family and community engagement in and out of school and from birth through young adulthood."[3]

This funders' guide, commissioned by STEM Next, draws inspiration from these important works to issue a call to action specifically to foundations and corporations that invest in STEM education.

Grantmakers focused on closing gender, race, and other gaps in the STEM workforce should consider investing in effective and culturally responsive family engagement as part of their portfolios.

We issue this call because we recognize that despite decades of publicly and privately funded initiatives focused on diversifying the STEM workforce, as a country we are still falling short.[4] Many barriers prevent girls, Latinx, African American/Black, and Native American young people – as well as English language learners, young people with disabilities, and young people growing up in economically marginalized communities – from the STEM professions. We recognize that the challenges are complex and multi-layered, but we know that family engagement is a key piece of the puzzle. Young people are more likely to succeed in STEM with family support, and family support is especially important for girls and young people from underrepresented communities.[5] However, many families are not aware of how they can support their children in STEM, and many programs do not understand how to support families in culturally competent ways. Philanthropic leadership and resources have the potential to close these gaps.

This guide is focused on STEM family engagement, but we do not mean to silo these efforts from the broader community of family engagement funders. Because young people need good K-12 STEM instruction to enter and succeed in postsecondary STEM programs, and because they deserve opportunities to develop essential STEM literacy and skills regardless of their future career choices, we also address the importance of philanthropic support for parent-led advocacy to ensure children have access to high-quality public schools and out-of-school time opportunities.

We look forward to your collaboration as we deepen our commitment to meaningfully engage families as supporters and advocates for their children's development into the STEM leaders of the next generation.

A note on terms: family structures vary, and when we refer to parents, we mean to be inclusive of all guardians and caregivers who play an integral role in young people's development and their access to opportunities. We recognize that aunts, uncles, grandparents, godparents or surrogate family members may take on the role of encourager, facilitator, mentor, and curator of opportunities.

ABOUT THE STEM NEXT OPPORTUNITY FUND FAMILY ENGAGEMENT PROJECT

From 1990 until its sunset, in 2015, the Noyce Foundation was devoted to helping the nation's students become curious, thoughtful, and engaged learners in the fields of mathematics and science. The foundation was established by the family of the late physicist, inventor, and computer industry pioneer Dr. Robert N. Noyce, co-founder of Intel and inventor of the integrated circuit.

A key principle of grantmaking for the Noyce Foundation – and its successor, the STEM Next Opportunity Fund – is actively identifying gaps in the field and leveraging investments to fill those gaps. For example, the Noyce Foundation and STEM Next have invested more than $85 million in building the capacity of the out-of-school time field to offer high-quality STEM learning to young people, with a focus on those from populations underrepresented in the STEM fields. Investments in program and curriculum development, capacity building, research, assessment, staff training, field building, policy development, and advocacy have resulted in millions of young people – mostly children in grades 4-8 – accessing engaging STEM learning opportunities in out-of-school time.

In 2017, STEM Next launched the Family Engagement Project to empower families to support their children's engagement in STEM and to activate the untapped talent of their children.

STEM Next is pursuing an ambitious agenda of family engagement in the informal learning space that also has applications for formal education. The Family Engagement Project will result in more parents and families understanding and communicating the promise of STEM to their children, as well as more parents and families taking action to support their children's participation and persistence in STEM.

THE FAMILY ENGAGEMENT PROJECT IS:

◊ ***Elevating the critical role of families in STEM.***

Through a series of publications, presentations, speaking engagements and a robust social media campaign - #STEMfamilies - STEM Next is building public awareness of the value of family engagement to improve STEM learning outcomes for young people, as well as to increase equity and inclusion in STEM.

◊ ***Building the capacity of STEM-focused organizations to include families.***

STEM Next is working with its grantees, partner organizations, STEM networks, and ecosystems to build their capacity to incorporate and deliver effective family engagement strategies that are culturally responsive and research-based.

◊ ***Creating tools for funders and practioners.***

STEM Next is creating practical guides and tools focused on implementing effective family engagement strategies in STEM. This effort includes the creation of a rubric for practitioners and funders that is scheduled for release in mid-2020.

RESEARCH BACKGROUNDER:
Family Engagement Advances STEM Interest, Persistence, and Achievement

Families are among the biggest influences on youth outcomes and career choices.

The research is clear and consistent: *families are among the biggest influences on young people's outcomes and career choices*.[6] Importantly, families don't need to be STEM experts themselves, or have a STEM background, in order to support young people in STEM. Families can play a variety of roles as learning partners who support young people's interest, skill building, and persistence in STEM. Young people benefit when families encourage them to pursue STEM, act as brokers for STEM experiences, and help them navigate pathways to STEM studies and careers.

Nearly 50 years of research has documented the effects of parent influence on the educational, career, and overall life trajectories of children. Family engagement is a major predictor of young people's learning, development, interests and aspirations, and educational and career outcomes. Sustained family engagement from early childhood through high school shows a lasting return on investment in the form of higher graduation rates and college attainment.[7]

Building on family engagement research on literacy, language, and social-emotional development, recent studies show the positive influence of parents on young people's interest, persistence, and success in STEM, particularly for girls and young people from racial, ethnic, and cultural backgrounds underrepresented in STEM. Studies show that focused interventions with parents can result in positive STEM-related outcomes for young people, including improvement of subject performance, reduction of subject-related anxiety, increased mathematics and science course-taking, and improved scores in mathematics and science on college preparatory exams.[8]

Research by Microsoft found that girls who have the combined support of parents and teachers are three times more likely to say they will study computer science in college than those who have no encouragement from either a parent or a teacher. More than half of middle and high school girls report receiving encouragement in STEM from their mothers and teachers, but fewer than half said their fathers offer encouragement.[9]

A study by the Girl Scouts Research Institute found that "parental encouragement plays a key role in supporting girls with prior knowledge and exposure to STEM," and that "African American and Hispanic girls have high interest in STEM, high confidence, and a strong work ethic, but have fewer supports, less exposure, and lower academic achievement than Caucasian girls."[10]

Although parents want to be supportive, when it comes to STEM, many parents feel anxious and unqualified. This can be especially true for parents who have less formal education. Research shows there is a disconnect between what parents think they need to do and what really matters in their children's STEM journey. This is where targeted strategies for family engagement in STEM can truly make a difference.[11] Programs can guide parents in how best to support their children, such as by helping them find opportunities and resources and by promoting STEM skills, concepts, and identities.[12]

Photo right

Oregon Association for the Education of Young Children

Photo right

Oregon Association for the Education of Young Children

GUIDE TO INVESTING
IN STEM FAMILY ENGAGEMENT

The following sections detail practice, research, narrative, policy, and systems change investment strategies that together can result in families who are more supported and empowered to help their children succeed in STEM. It's unlikely that any one foundation will invest in all these strategies; however, the totality of the philanthropic community's support has the potential to accelerate substantial advancement in the field.

PRACTICE

Strategy 1a. Invest in the capacity of organizations to effectively engage families in supporting their children's interest, persistence, and achievement in STEM.

There are many ways foundations invest in STEM learning opportunities for young people. Some support programs run by STEM-expert institutions or STEM-focused community-based organizations, while others support the integration of STEM into comprehensive early childhood, afterschool or summer programs.

Photo above

PowerMyLearning

Foundations also support programs that introduce young people to STEM professionals who reflect their racial and ethnic identities as role models and mentors. Within formal education, support is often given to schools and school districts for professional learning, curricula adoption, materials, or programs, such as early college or career pathways that bolster students through transitions between high school and postsecondary STEM. In each of these cases, with funder assistance, grantees can also build the capacity of families to provide critical support to their children.

As a first step in considering how to support family engagement, we recommend funders gather baseline data from their grantees. Drawing on what we learned through the STEM Next Opportunity Fund Family Engagement Project, we developed the following set of questions that can be used to guide the data gathering process. This list is intentionally comprehensive and aspirational. Funders and grantees in the beginning phase of this work should focus on listening and learning to better understand how to meet families' needs in culturally affirming ways.

HOW ARE YOUR GRANTEES ENGAGING FAMILIES?

Questions for Funders to Ask

1. LISTENING AND LEARNING FROM FAMILIES

- ☑ Have you asked parents of young people enrolled in your program what they need to support their children in STEM?
- ☑ Are you designing engagement activities that respond to what parents have said they need?
- ☑ Do activities take place at a location where families feel safe and comfortable?
- ☑ Are you building relationships with parents that will be sustained over time?

2. BUILDING FAMILIES' CAPACITY TO ENCOURAGE & SUPPORT

- ☑ Do you include activities to help families overcome their fears and anxieties and tap into their existing knowledge and skills about STEM?
- ☑ Are you giving parents specific ideas and suggestions for how they can support their children in STEM?
- ☑ In your interactions with families, do you ensure that parents understand that STEM knowledge is not necessary to engage and support their children in STEM?
- ☑ Are you explaining the concept of growth mindset to families and emphasizing the importance of communicating to young people that they all have the potential to grow and succeed in STEM?
- ☑ Are you engaging in inquiry-based and reflective STEM activities with parents and children together, instead of “show and tell” activities?
- ☑ Are you providing parents and their children opportunities to build skills together?
- ☑ Are you showing parents how to integrate STEM into their everyday routines and suggesting activities with accessible materials so that parents can repeat them at home?

Photo above

The 50 State Afterschool Network

3. UNDERSTANDING THE CONTEXT: RACE/ETHNICITY, GENDER, ABILITY

- ☑ Do you engage families in ways that are culturally responsive? For example, have you investigated the connections to STEM inherent within families' cultures and traditions to identify the strengths families bring – particularly if the families do not belong to white and economically advantaged cultures?
- ☑ Have you asked about the STEM interests of the community you are serving and do the activities you offer respond to these interests?
- ☑ Have you identified ways that inherent bias and your organizational culture may disadvantage or alienate families from participating?
- ☑ In STEM areas that are stereotypically identified with boys, such as engineering and computer science, have you created marketing and content that appeal to and dispel these stereotypes for parents of girls? How have you intentionally designed environments that feel emotionally safe for girls and their families to explore STEM, using activities specifically designed to be interesting to girls? Have you created or considered all-female (eg, girls and moms) programming?
- ☑ Do your program materials include photos of youth with disabilities and language that explicitly welcomes all youth and signals that their parents will be supported in the program? Is the content and location of your program accessible for youth with disabilities and their families?

4. SHARING INFORMATION ABOUT STEM PATHWAYS

- ☑ Are you providing information to families and young people on the STEM resources available in your community, including STEM or magnet schools, summer camps and out-of-school time programs, tech 'boot camps,' STEM role models, paid internships and scholarships, etc.?
- ☑ Are you helping parents and young people untangle the jargon of the STEM field to understand available resources, and navigate a set of learning experiences that build on each other and strengthen over time?
- ☑ Are you providing connections to STEM role models and introducing families and their children to STEM professionals who reflect their racial, ethnic, gender, and other identities?

5. SUPPORTING STEM ACADEMIC ACHIEVEMENT

- ☑ Are you ensuring parents know how to productively engage with their children's teachers to monitor and support their children's in-school STEM learning?
- ☑ Are you ensuring that young people and families understand the academic pathways necessary to prepare them for entrance into postsecondary STEM programs and what families need to do to ensure that their children have completed the pre-requisites to take their desired next step?

6. EMPOWERING PARENTS

- ☑ Are you introducing parents to one another and creating a supportive peer community?
- ☑ Are you connecting parents with organizations and resources advocating for improved access to rigorous STEM curriculum and STEM programs?

7. ORGANIZATIONAL DEVELOPMENT

- ☑ Do the recruitment, professional development, and staff evaluation practices at your organization emphasize skills necessary for effective family engagement?

When parents learn together with their children, they shift their perspective and begin to see themselves and their children as creators using technology.

Photo

Technovation

SPECIFIC WAYS TO SUPPORT FAMILY ENGAGEMENT PRACTICES

Once grantees and funders establish a baseline using questions like those provided, investments to advance grantees' capacity to engage families will likely include:

- **Increased staff capacity,** recognizing that effective family engagement takes time and staff are already over-burdened. If grantees do not already have staff members who reflect the diverse communities they serve, then they may consider additional hiring to build their organization's capacity in designing culturally competent outreach.
- **Educator professional development**, to ensure staff can employ a variety of listening strategies, including one-on-one and group conversations with parents, and effectively facilitate STEM activities for inquiry and reflection with parents and young people. Professional development may also include sessions that address implicit and explicit bias and misperceptions staff may have about parents' ability and willingness to engage.

Photo right

STEM Learning Ecosystem Community of Practice

- **Leadership development and coaching** to ensure an expanded emphasis on family engagement is effectively supported by organizational leadership.
- **Facilitators** with the skill set to mediate conversations about race, ethnicity, class, ability, and other power disparities.
- Other costs associated with **family events and resources**, including food, child care, space, materials, translations, outreach/awareness, and recruitment costs.
- **Partner support**, if needed, so that grantees can partner with community-based organizations possessing expertise about the cultures of the parents that the grantee is serving. Partners should be directly compensated for their contributions and involvement.
- **STEM information resource development and dissemination** so grantees, parents, and young people have access to up-to-date, comprehensive, and culturally and linguistically accessible information about STEM resources. Funders can also support grantees to build the capacity of parents to become expert navigators to help others in their community.
- **Cross-sector collaboration** among schools, community-based organizations, STEM-expert organizations, and other stakeholders around family engagement. If these partnerships do not exist, foundations can use their convening power and funds to catalyze them; if they do exist, foundations can support the backbone organization and other coordination costs.
- **Collecting data** to drive continuous improvement and evaluation of family engagement efforts.

In addition to providing financial support, foundations can also convene peer funders, grantees, and other stakeholders to promote awareness about STEM family engagement, share effective practices, and emphasize the importance of listening to and learning from families.

Photo
Technovation

THE IMPORTANCE OF CULTURALLY RESPONSIVE FAMILY ENGAGEMENT

Non-dominant communities have traditionally been expected to assimilate into the white-dominant cultures of formal K-12 institutions and many organizations in the informal STEM learning space as well – including museums, science centers, outdoor and tech-focused afterschool programs, and other organizations. Culturally-responsive STEM family engagement recognizes and attempts to intentionally dismantle historical disparities of power and privilege – fueled by race, class, ethnicity, language, religion, and geography – among providers and program participants.

As noted by the Carnegie Challenge report, practitioners must develop an understanding of the context in which families live: "Poverty influences family investments in their children's learning. Many families living in poverty reside in neighborhoods where safety issues, social isolation, noise, and the presence of lead paint are not conducive to learning. Neither do poor families have the discretionary income to buy books and educational toys, or to expose their children to enrichment activities in the after-school hours. Jobs performed by poor families often involve long hours and little flexibility, making it difficult for them to participate in school activities. Immigrant families often face the additional challenges of limited English proficiency and differences in cultural expectations regarding families' roles in both school and out-of-school learning."[13]

Ricarose Roque heads the ***Family Creative Learning*** team at the University of Colorado Boulder, partnering with community-based organizations and libraries to run workshops where parents and children use creative technologies together. “For people from non-dominant groups coming into a STEM space, the message is often clear that you cannot bring your whole self. It’s usually more about meeting a standard or mastering a skill. Our approach is different. We know that people have been marginalized from STEM and it is important to create a space where they are welcomed. Our overall message is: we care about who you are and your family. We welcome your whole self. We invite families to share their interests, backgrounds and cultural resources. We share food together, provide child care, and hire facilitators who can speak the preferred languages of the participants.” Creating that welcoming space is critical, explains Roque, because “parents are often unsure of their abilities with new technologies and not confident about what they can do to support their children. When they learn together with their children, they shift their perspective and begin to see themselves and their children as creators using technology.”

Successfully designing programs with a culturally responsive approach requires expertise, notes Dr. Ann Ishimaru of the University of Washington, co-PI of the ***Family Leadership Design Collaborative***. “There is a danger that as funders focus on family engagement in STEM, programs that have not been engaging families will quickly move to do so without the necessary relationships and understanding of the terrain. If they default to conventional approaches to family engagement, such as those practiced in many schools, their efforts will stay on the surface and not result in the impacts we need.”

Family engagement can’t be an add on, it must be integrated into the core work. We need to approach families as partners and co-designers.

Dr. Ishimaru says that, “To avoid this trap, funders should first examine the practices developed by people who are doing this work in deep ways. Family engagement can’t be an add on, it must be integrated into the core work. We need to approach families as partners and co-designers."

"If a STEM-focused organization needs a partner to guide them in effectively serving the community, funders should *directly* resource that partner for the experience and expertise they bring to the table. Build the capacity of small, grassroots organizations led by people of color to partner on more equitable footing with the larger, white-led organizations," said Ishimaru.

MORE RESOURCES ON CULTURALLY RESPONSIVE STEM FAMILY ENGAGEMENT

- ***Expanding Access and Inclusion in STEM Through Culturally Responsive Family Engagement,*** by the STEM Next Opportunity Fund
- ***Cultivating a Community of Champions for Children Through Transformative Family Engagement***, by the W.K. Kellogg Foundation
- ***Families and Communities in Curriculum Co-Design***, by the ***Learning in Places*** Initiative (University of Washington Bothell Goodlad Institute, Northwestern University, Tilth Alliance and Seattle Public Schools)
- ***Family Creative Learning***, by the Family Creative Learning Team at University of Colorado Boulder

Photo
Techbridge Girls

FUNDER SPOTLIGHTS

Remake Learning

Benedum Foundation,
Carnegie Corporation of New York,
Chevron, Grable Foundation and others

Created in 2007 to advance STEM and STEM-related learning across Pittsburgh, **Remake Learning** is a cross-sector regional network committed to providing engaging, equitable learning that impacts tens of thousands of families, young people, and educators in southwestern Pennsylvania and West Virginia.

Remake Learning has become its region's go-to resource for all things STEM, STEAM, maker, technology-enhanced, arts-integrated, and computational learning. The network launched a regional "open house" of innovative learning in 2016 that has now taken root elsewhere; **Remake Learning Days Across America (**RLDAA) is a festival of locally-designed, parent-friendly events hosted by schools, museums, libraries, afterschool organizations, early child care centers, universities, media centers, faith-based organizations, makerspaces, tech startups, and more in 14 regions across the United States. RLDAA events offer families innovative experiences and opportunities for young people to develop their sense of creativity, perseverance, and curiosity.

For Remake Learning, a commitment to equity is a priority. Results from 2018 show that chronically marginalized racial populations are overrepresented in participation data. Gregg Behr, Executive Director, Grable Foundation says that "Our mission is to help children and youth become independent, caring, contributing members of society by supporting programs critical to a child's successful development. We understand that every child develops in the context of their family and community. We support children and families with easy and frequent access to innovative learning and play spaces, to spark their imaginations, help them build innovative skills, and understand how to help chart a course forward for their children to navigate what's ahead."

Photo above

Remake Learning

Photo above

New York Hall of Science

New York Hall of Science NYSCI Neighbors

Carnegie Corporation of New York, Deutsche Bank Americas Foundation, Simons Foundation

The **New York Hall of Science** (NYSCI) is in Queens, New York City, one of the most diverse communities in the world. NYSCI is in the Corona neighborhood of Queens, where nearly two-thirds of the community is foreign-born (mostly from Ecuador, Colombia and Mexico, as well as other countries in Central and South America) and 90% speak a language other than English. Poverty rates in Corona are higher than in the rest of Queens, with more than 24% of households below the poverty line.

Four years ago, NYSCI initiated an effort to use the museum's assets to broaden participation in STEM, build pathways for young people for career and academic awareness, and connect the community's cultural assets with STEM. Museum leaders first listened to the community through a series of interviews and focus groups before **NYSCI Neighbors** launched in 2015. The initiative was designed to respond to what families said they wanted: a safe and welcoming learning environment that engaged the entire family. Parents were eager to learn English to help them pursue jobs and navigate their day-to-day lives. Conversations with the community revealed that parents were too intimidated to ask questions about their children's future and trajectory in schools. Building parents' knowledge of the school system and their agency in supporting their children was a critical component of NYSCI Neighbors.

Since the initiative launched, more than 2,300 families have participated, accessing the museum for free in the afternoon; engaging in parent/child activities that build skills in problem solving, teamwork, and critical thinking; and participating in sessions focused on navigating the school system and STEM academic coursework, internship opportunities, paid summer programs, and pathways to STEM careers in New York City.

In 2016, NYSCI launched **Parent University**, a program within the NYSCI Neighbors initiative, to specifically serve parents and to further engage and empower them to advocate for education and STEM within their families and communities.

According to Alessandra DiGiusto, Executive Director of Deutsche Bank Americas Foundation and Head of CSR for Deutsche Bank Americas, "We were involved from the beginning, supporting the pilot. NYSCI Neighbors is an exciting model of how you go deep in a community, providing many resources and entry points and continuing over time. So many efforts are one-offs without any chance of having long-term impact – when we know that STEM experiences need to build on and connect with one another, creating a ladder to STEM engagement over time."

"With STEM skills ever more critical for success in our rapidly transforming economy, it's important to offer learning opportunities for parents and children together. The careful design, attention to cultural alignment, and programming in participants' preferred languages has broken down barriers between the museum and its community. The museum has transformed itself into a place where its neighbors feel at home. They can bring their whole selves and truly engage. NYSCI has managed to do all of this in a deep way, but also work at scale, involving thousands of families," says DiGiusto.

With STEM skills ever more critical for success in our rapidly transforming economy, it's important to offer learning opportunities for parents and children together.

-Alessandra DiGiusto
Executive Director, Deutsche Bank Americas
Foundation,Head of CSR for Deutsche Bank Americas

She Will Connect
Intel Foundation

She Will Connect, Intel Foundation's signature STEM education effort, focuses on increasing the number of middle school girls from underserved communities pursuing technology, engineering, and computer science education and careers. Family engagement is emphasized in the core design of *She Will Connect*. The initiative has four pillars: empowering, exciting, encouraging, and engaging girls. The *encouraging* pillar focuses on the role of parents, family, peers, educators, and counselors in encouraging and supporting girls to persist in tech and engineering. A recent evaluation found that 90% of parents indicated increased understanding of the importance of their children pursuing technology, engineering, and computer science education and careers.

Gabriela A. González, Deputy Director of the Intel Foundation, explains that "A student's persistence in STEM is stronger when they have family support. In the Latino community, sometimes parents may discourage girls from pursuing tech or engineering because they consider these to be more traditionally male careers, so building parental and extended family support for girls is key. The secret sauce is how you do it. The approaches must be culturally sensitive and savvy."

"Middle school girls from low-income communities often face barriers to joining a STEM afterschool program. They are caring for siblings, doing chores, helping prepare meals because their parents are balancing multiple jobs and responsibilities. Some of our grantees pay for child care, meals, transportation, and other wrap-around services to help overcome these barriers. We know that impacts program duration or scale and we are okay with that."

"To funders who haven't yet incorporated or prioritized family engagement that truly sees and helps overcome the barriers young people from underserved communities are facing, we would ask, 'what is your objective?' For 25 years we have not made enough progress in diversifying the future STEM workforce. If we want to help only the top 10% of kids get into STEM, we need only to keep doing what we are doing. If we want a different result that is more inclusive of all youth, regardless of life circumstances, we need to understand that it all boils down to equity. We must find ways to break down the systemic, institutional, policy, socioeconomic, and cultural barriers that are holding young people back – particularly those who have the least access to STEM educational opportunities."

If we want to help only the top 10% of kids get into STEM, we need only to keep doing what we are doing. If we want a different result that is more inclusive of all youth, regardless of life circumstances, we need to understand that it all boils down to equity.

-Gabriela A. González
Deputy Director, Intel Foundation

Photo
Greene Scholars Program

Family Math Roadmap Implementation Project
Bill & Melinda Gates Foundation, CME Group Foundation, Heising-Simons Foundation, Overdeck Family Foundation, Robert R. McCormick Foundation

Research shows that entering kindergarten with early math skills is the best predictor of eighth grade performance, regardless of race, gender, or family socioeconomic status. The **Family Math Roadmap Implementation Project** seeks to close opportunity and achievement gaps by promoting "family math," defined as activities that happen outside the classroom and within the context of family relationships, the community, and everyday life that support young children and families to strengthen their math awareness, understanding, and confidence.

"The Heising-Simons Foundation is excited to collaborate with our colleagues on the Family Math Roadmap Implementation Project. Our earlier investment supporting the integration of mathematical thinking into five programs serving young children and their caregivers laid some of the groundwork for the Family Math Roadmap. With the Roadmap, we are taking the lessons we learned into our collaboration with other grantmaking colleagues and, together, supporting a movement around Family Math. The Roadmap takes an expansive approach, with practice, research, communications, and policy components, and, most importantly, a decision-making structure that elevates the expertise and voices of parents," says Kimberly Brenneman, Program Officer, Education, Heising-Simons Foundation.

The Roadmap for Supporting a Family Math Movement is a three-year plan guided by a commitment to engage families systematically and meaningfully by building on what families are already doing and addressing cultural and structural barriers that prevent them from doing more.

The Roadmap takes an expansive approach, with practice, research, communications, and policy components, and most importantly, a decision-making structure that elevates the expertise and voices of parents.

-Kimberly Brenneman Program Officer, Education, Heising-Simons Foundation

The leadership group is facilitated by Education First and includes Abriendo Puertas/Opening Doors, New America, the Tulsa Regional STEM Alliance, Math Talk, EDC, the Erikson Institute Early Math Collaborative, PBS SoCal, Washington State Department of Children and Families, and Zeno.

According to Kassie Davis, Executive Director of CME Group Foundation, "CME Group Foundation has invested in the early math area for ten years. Over time we realized, along with many of our grantees, that family engagement is necessary to move the needle in addition to teacher professional development and educator pre-service training."

As the project enters its second year of implementation, the partners will:

- Design and implement a **public relations campaign and communications strategy** for the Family Math movement (including branding, messaging, and strategy development);
- Continue to support the Roadmap's deep engagement of families in the design and infrastructure of the movement by engaging the **Parent Advisory Council** (PAC), a group of 10 parents from across the nation, coordinated by the United Parent Leadership Action Network (UPLAN);
- Develop a **community and parent-focused advocacy toolkit** to build parent and community leadership for Family Math;
- Create a **Family Math Interactive Resource**, an interactive map identifying partners, networks, activities, and resources in the Family Math Movement;
- Begin sustainability planning by finding a **"home(s)" for the movement**, supporting organizations to lead the Family Math Movement into the future; and
- Kick off the **Family Math Practice Network**, a learning community of leading Family Math organizations working together to improve their current and ongoing Family Math practices through communication and collaboration, sharing tools and guidance on monitoring success, and elevating and resolving implementation challenges.

> *Over time we realized, along with many of our grantees, that family engagement is necessary to move the needle in addition to teacher professional development and educator pre-service training.*
>
> ***-Kassie Davis***
> ***Executive Director, CME Group Foundation***

Libraries Ready to Code Initiative
Google

The American Library Association's ***Libraries Ready to Code Initiative*** is designed to build capacity among child- and youth-serving librarians to engage young people and families in computer science and computational thinking. Initiative planners first gathered input on the goals, needs, and interests of library staff and communities to integrate a focus on computer science and computational thinking into their existing services. Informed by the field, and in collaboration with a cohort of librarians, they developed and curated games, websites, and lesson plans for librarians to integrate computer science and computational thinking into their literacy programs. Nicky Rigg, Community Engagement Manager at Google, notes that "including families in the focus of our programs has effects beyond a one-time investment. By engaging families, we acknowledge the skills, resources and constraints they bring to encouraging their children's education. This, in turn, increases program success and sustainability, and families transfer learnings to other children and families."

> *Including families in the focus of our programs has effects beyond a one-time investment. By engaging families, we acknowledge the skills, resources and constraints they bring to encouraging their children's education.*
>
> ***-Nicky Rigg***
> ***Community Engagement Manager, Google***

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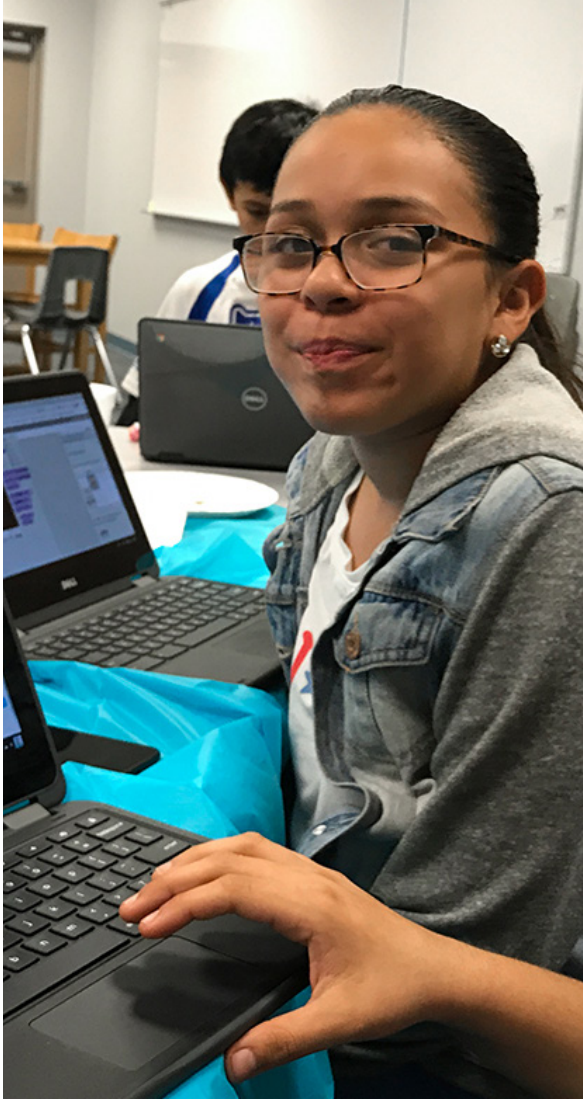
Google



Technovation Families

NVIDIA and others

Technovation Families is a multiweek course that immerses young people and their families in learning to understand artificial intelligence (AI) and how AI can be used to solve community challenges (Technovation is formerly Iridescent). More than 10,000 people signed up for the course in 2018.

Tonie Hansen, Senior Director of Corporate Social Responsibility for NVIDIA notes in an explanatory **video**, "the adoption of AI is happening so quickly there is the potential to leave people behind, especially communities without access to the latest technologies. Could we leapfrog that gap? The number of countries and positive response has been a sure sign for NVIDIA that this is something everyone around the world is clamoring to learn more about. Technovation is future focused and moving quickly, like NVIDIA. We hope the work will be an inspiration to other companies to come on board."

National PTA's STEM + Families Initiative

Bayer USA Foundation

The National PTA's ***STEM + Families Initiative*** reaches more than 6,200 families in 250 schools across 24 states and is designed to increase access to STEM education and careers, especially among young people from backgrounds underrepresented in STEM. The initiative develops, evaluates, and shares effective ways to engage families in STEM experiences. It also works with partners to improve access to STEM school and community learning environments. STEM + Families provides grants, tools, videos, and information to local PTAs and supports science festivals to increase opportunities for families and students to engage in STEM together.

Photo above

Technovation

Photo top right

Remake Learning

Photo bottom right

New York Hall of Science

Strategy 1b. Invest in information and tools designed to help families support their children's interest, persistence, and achievement in STEM.

Many funders are supporting the development of tools and information designed to increase families' capacities to encourage their children in STEM. Funders can ensure that they are fully resourcing program developers and organizations to understand what information families need, how to engage families of all backgrounds and economic status, and how to overcome barriers to full participation by all families.

FUNDER SPOTLIGHTS

Family Playlists

Robin Hood, Morgridge Family Foundation, Overdeck Family Foundation, Chan Zuckerberg Initiative and others

Robin Hood and Morgridge Family Foundation were early investors in the development of **Family Playlists** by **PowerMyLearning**. Students use Family Playlists to teach family members skills and content – including STEM content – they have learned at school. The Family Playlist app also encourages families to communicate with teachers. According to PowerMyLearning CEO and cofounder Elisabeth Stock, when the Family Playlist launched, more than 84% of families offered a comment. "Their writing was filled with emotion. It's amazing stuff. The principal told us it was almost as if families had come out of hiding," said Stock.

The Overdeck Family Foundation and Chan Zuckerberg Initiative supported the development of science-focused playlists that are aligned with the **Next Generation Science Standards**. PowerMyLearning is building a resource hub to enable teachers to create their own Family Playlist assignments or tap into existing ones.

"Family Playlists provide a simple solution to multiple stakeholders. Teachers quickly access engaging, standards-aligned STEM content and resources, and districts see a boost in student achievement and social emotional development. Parents move beyond asking 'what did you learn in school?' to understanding and collaborating, and 96% of kids say Family Playlists help them have better conversations at home about STEM," says Gemma Lenowitz, Program Analyst, Overdeck Family Foundation.

> *Parents move beyond asking "what did you learn in school?" to understanding and collaborating, and 96% of kids say Family Playlists help them have better conversations at home about STEM.*
>
> ***-Gemma Lenowitz***
> ***Program Analyst,***
> ***Overdeck Family Foundation***

Photo above

PowerMyLearning

Bedtime Math

Laura Overdeck

Laura Overdeck is the founder of **Bedtime Math Foundation**, a nonprofit organization that inspires young people's curiosity by unleashing the fun in math. It offers free, playful online math problems in English and Spanish for parents and children to solve together, as well as lively hands-on games featured in its afterschool Crazy 8s Club. Research has shown that both offerings reduce children's math anxiety, increase their love of math, and lay the groundwork for greater math achievement.

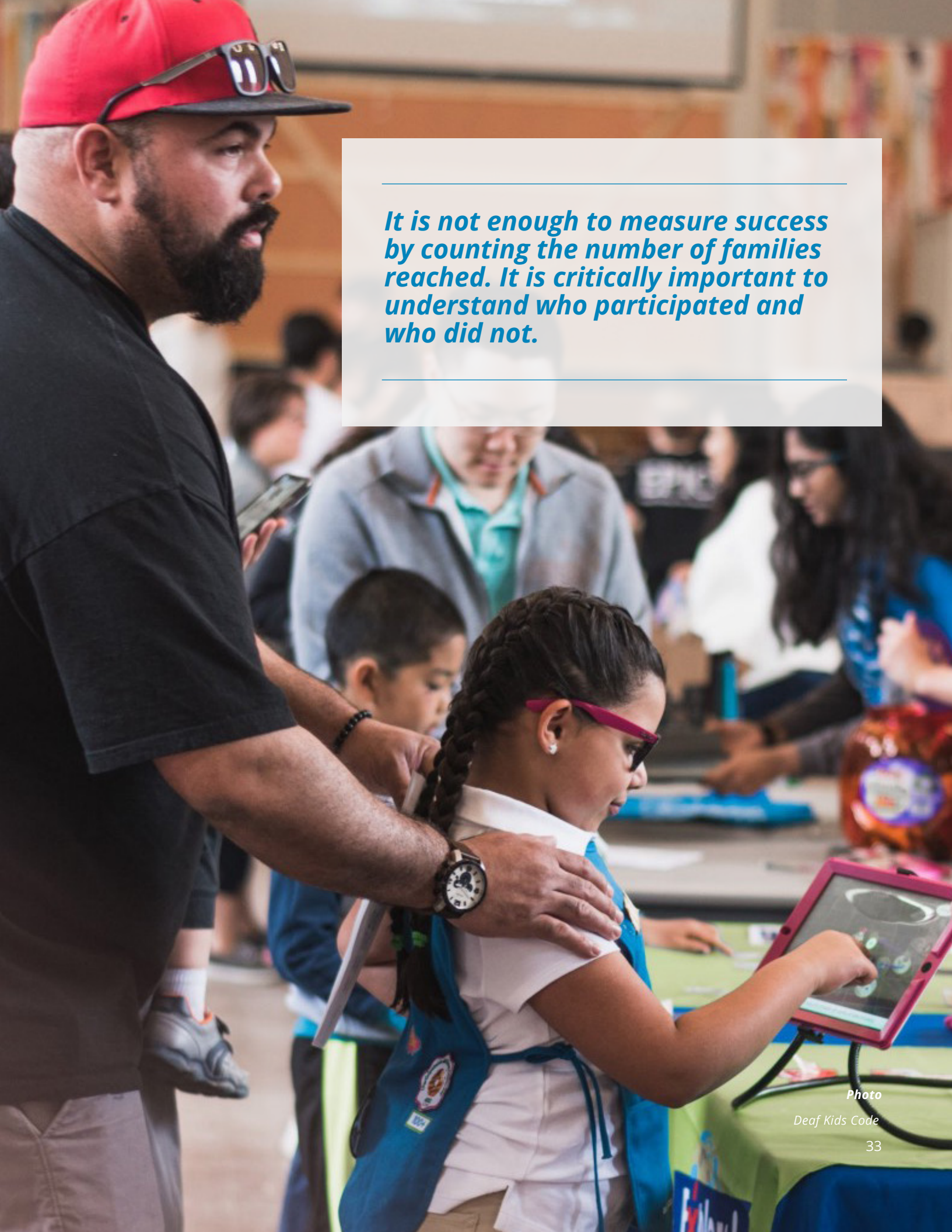
"Despite all the focus on STEM, schools have made little change in how we teach math – or how we ignite kids' curiosity for the subject," says Overdeck. "The fact is, in a given year, kids spend three to four times as many waking hours outside school as in it, so their parents have huge potential to affect their learning. Philanthropic funding can give every parent access to simple, proven ways to stoke learning at home, enabling parents to change their children's academic trajectory."

> *Philanthropic funding can give every parent access to simple, proven ways to stoke learning at home, enabling parents to change their children's academic trajectory.*
>
> ***-Laura Overdeck***
> ***Founder,***
> ***Bedtime Math Foundation***

Learning Heroes

Bill & Melinda Gates Foundation, Bloomberg Philanthropies, Carnegie Corporation of New York, Charles and Lynn Schusterman Foundation, and others

Though not specifically STEM-focused, Learning Heroes is included here because the organization's **parent-focused resources** are designed to equip parents with information about academic expectations (by grade level, including math), advice on interacting with teachers, how to support academic, social and emotional development, and plan for college. The mission of **Learning Heroes** is "to support parents and guardians as their children's most effective education advocate." Learning Heroes also conducts **national research** on K-8 parents and guardians' beliefs and knowledge about supporting their children in school. Learning Heroes has recently incorporated educators, principals, and parents of high school-age youth in its research to better understand how to **strengthen home-school partnerships**.



It is not enough to measure success by counting the number of families reached. It is critically important to understand who participated and who did not.

Photo

Deaf Kids Code

Photo above

PowerMyLearning

EVALUATION AND RESEARCH

Strategy 2a. Use formative evaluation and provide grantees with flexibility to pilot and refine STEM family engagement efforts over time.

Funders who require quantitative outcome data in strict time-bounded grant cycles should consider providing grantees with flexibility to pilot and refine STEM family engagement efforts over time. As grantees try new approaches to working with families, it is likely that not all findings will be positive.

Early evaluation efforts should be formative, providing feedback that grantees can use to iterate their approaches.

Strategy 2b. Invest in researchers who partner with practitioners and communities to learn more about and disseminate effective family engagement strategies.

There is much yet to discover about STEM-focused family engagement. For example, the impact of parent participation in STEM-focused family engagement on the long-term STEM trajectories of young people is not known. Other important focus areas for a research agenda include identifying effective interventions for specific goals and populations, understanding the impact of cultural competence on desired outcomes, and how family engagement can help young people access a series of connected STEM learning opportunities across settings and over time. At STEM Next Opportunity Fund, we would like to see researchers and practitioners across the communities funded by National Science Foundation and private/corporate philanthropy meet to uplift and share knowledge, and continue to connect in sustained and substantive ways that increase the chances that effective, evidence-based STEM-focused family engagement practices take root and inform policy. We were pleased to see that a recent National Science Foundation-funded convening on research and assessment in out-of-school STEM learning resulted in a call for researchers and practitioners to create a research agenda focused on family engagement in STEM. We also believe that funders must play a catalyzing role in addressing the complex inequities that have resulted in the underrepresentation and under-resourcing of researchers of color in the field.

Photo below

New York Hall of Science

FUNDER SPOTLIGHTS

Family Leadership Design Collaborative

W.K. Kellogg Foundation

The W.K. Kellogg Foundation has provided multi-year support to the **Family Leadership Design Collaborative** (FLDC). FLDC brings researchers, parents, educators, community members, and young people together to co-design a set of principles and enact a research and practice agenda for family engagement centered on racial and educational justice. FLDC members are developing a community of practice in pursuit of educational justice and fostering solidarities across different racial, cultural, and geographic communities.

The Metrics that Matter project emerged as one strand of this work. "Funders often base their evaluations on achievement test scores, yet these are narrow measures that are neither relevant nor sufficient to capture the impacts of culturally-based program activities. They are not useful for people on the ground who are trying to improve their practice," says Dr. Ann Ishimaru, co-PI of the FLDC and Associate Professor at the University of Washington. "For example, we know that identity and engagement is crucial for math and science persistence, but we do not have adequate measures to capture these dimensions, either qualitative or quantitative. We also need more metrics that are focused on environments, adult capacities and access to opportunities. Right now, most metrics are focused on individual youth outcomes."

FLDC also sees the conversation about metrics as an opportunity to expand thinking about the ultimate goals of family engagement from the perspective of communities.

> *We must listen to the aspirations that families and communities have for their children: for example, solidarity, well-being, justice and dignity. What are the upstream measures that can get us there? Communities have goals beyond just getting children into STEM jobs; we need to expand the conversation about what this means for shaping our future.*
>
> ***-Dr. Ann Ishimaru***
> ***co-PI, FLDC,***
> ***Associate Professor,***
> ***University of Washington***

Early Math Skillbuilding/Family Engagement

The Heising-Simons Foundation

The Heising-Simons Foundation commissioned Mathematica Policy Research to conduct a process evaluation of an initiative launched in 2013 to support several family engagement providers to develop, test, and integrate research-based early math projects within their existing family engagement programs. The evaluation methodology included interviews, observations, document review, and a literature scan. The resulting **brief**, published in 2017, synthesized the findings.[14]

INTEGRATING MATHEMATICAL THINKING INTO FAMILY ENGAGEMENT PROGRAMS: TIPS FOR THE FIELD

1. Build on successful family engagement approaches and ensure staff buy-in
2. Focus on developmentally appropriate math concepts
3. Tailor early math projects to a caregiver's language and culture
4. Offer practitioners opportunities for professional development
5. Provide families with early math activities they can use in their everyday lives
6. Help families overcome their anxiety about math
7. Use data for learning and improvement

In January 2020, Mathematica published a follow-up brief examining the scale-up efforts of Reach Out and Read and the YMCA of Silicon Valley as they refined their early math projects and scaled them up in new sites. The new **brief** includes questions and recommendations to gauge readiness for scale-up.

Photo above

Family Code Night

NARRATIVE, POLICY, FINANCING, AND SYSTEMS CHANGE

Strategy 3a. Support initiatives that use popular media and public discourse to inspire girls and young people from populations who have been historically underrepresented in the STEM fields, and their families, to engage, persist, and achieve in STEM.

The cultural narratives that dissuade girls and marginalized young people from envisioning themselves as successful in STEM also impact parents and narrow their dreams for their children's futures. Stereotypes reinforced through popular media, gender-based cultural norms, and the lack of role models from backgrounds similar to those of underrepresented young people are all powerful influencers on young people and families. Many funders are supporting efforts to change these narratives, for young people and their parents.

TECHNOLOchicas

Televisa Foundation

I'm a father of two girls. Like most parents, I'm doing my best to provide them with great opportunities in life. I've always been very concerned about them being limited by stereotypes, by the lack of inspiration, and positive role modeling, and by barriers that are beyond their own talent and interest.

I was visiting companies and research centers in Silicon Valley and I was thinking, wouldn't it be amazing for my girls to be here and to be inspired to learn and to not lose their curiosity, their interest in math and science and technology, because they didn't find the right role model or the right inspiration to follow?

In our **TECHNOLOchicas** *campaign, we are featuring the stories of nine young Latinas that have been incredibly successful, that have exciting and very emotional stories about how they became engineers or became connected to a technology career. This is very important for us and how we inspire young Latinas and their families.*

-Alejandro Villanueva,
Televisa Foundation Executive Director,
on the origins of the TECHNOLOchicas campaign

IF/THEN®
Lyda Hill Philanthropies

"**IF/THEN®** launched in 2019 after many years of research and contemplation about what Lyda Hill is uniquely positioned to support," said Matt Crommett, Director, Lyda Hill Philanthropies. "The goal of IF/THEN® is to shift the way our country and the world think about women in STEM. To close the gender gap in STEM we must inspire parents to see STEM careers as possible for their girls, and one way to do that is to raise the profile of successful female STEM professionals."

IF/THEN's newest initiative, in partnership with the American Association for the Advancement of Science (AAAS), are the AAAS IF/THEN® Ambassadors – **125 STEM professional women** working in academia, business, sports, fashion and entertainment selected in September 2019. The Ambassadors connect with students in person and through various media platforms, including television, social media, and the AdCouncil's She Can STEM campaign. For example, *Mission Unstoppable* is a Saturday morning series on CBS that features women in science, including AAAS IF/THEN® Ambassadors.

The IF/THEN® Collection, a digital asset library of photos and content available to media, educators, and nonprofit organizations, is designed to increase the number of accurate and powerful images of women and girls in STEM.

The IF/THEN coalition comprises 30+ organizations committed to promoting women in STEM, including AAAS, Girl Scouts of the USA, National Geographic, Teach for America, U.S. Soccer, and the World Wildlife Fund.

> *To close the gender gap in STEM we must inspire parents to see STEM careers as possible for their girls, and one way to do that is to raise the profile of successful female STEM professionals.*
>
> ***-Matt Crommett***
> ***Director,***
> ***Lyda Hill Philanthropies***

Strategy 3b. Support the creation and implementation of local, state, and federal policies and funding mechanisms to scale and sustain STEM family engagement.

Funders can help support and advance policies at the local, state, and federal levels to sustain and expand family engagement focused on STEM.

STEPS TO ADVANCE POLICIES AND FINANCING TO SUPPORT STEM FAMILY ENGAGEMENT

- Support **statewide afterschool networks, citywide expanded learning intermediaries**, the **Afterschool Alliance**, **STEM learning ecosystems** and others to advocate for:
  - Increased funding for program quality, access, and professional development
  - Policies that encourage partnerships among schools, out-of-school time organizations and informal STEM institutions to engage families in STEM
  - Expanding the focus and resources devoted to family engagement within existing initiatives such as Career and Technical Education (CTE) and the 21st Century Community Learning Centers program
  - Supporting existing grantees to engage in advocacy and build the capacity of families and young people to take a leadership role in advocacy
- Support family engagement organizations to increase their attention to family engagement in out-of-school time and STEM. Organizations such as the **National Association for Family, School and Community Engagement** (NAFSCE), the **National Center for Families Learning**, **Statewide Family Engagement Centers**, and the **National PTA** and local PTAs can be powerful allies in this work.
- Leverage implementation of the Next Generation Science Standards or similarly aligned science standards to anchor a new approach to STEM family engagement.

Because the Next Generation Science Standards were developed with recognition of how the cultural practices, knowledge, and epistemologies that children bring are integral to learning, the standards could be a policy anchor to expand and support a deep and substantial approach to family engagement.

-Dr. Ann Ishimaru
co-PI, FLDC,
Associate Professor,
University of Washington

Photo
Family Code Night

Photo right

The 50 State Afterschool Network

Strategy 3c. Support families in organizing and advocating to address racial and other inequities denying young people access to high-quality STEM learning in and out of school.

No matter how well STEM programs engage families, if children and families are living in under-resourced communities without access to high-quality and rigorous STEM education in-school, or engaging STEM programs out-of-school, it is extremely difficult for young people to succeed in STEM. Out-of-school learning spending disparities are increasing, and poverty and racial discrimination leave marginalized children in school systems without the advanced math, science, engineering and computer science courses available to middle and upper class and white communities.[15] In addition, immigration policies are making it increasingly difficult for families and communities to build equitable learning pathways for their children.

If we are to realize our goal of expanding STEM opportunities to children and young people who have been historically denied access, we must address the systemic problems, biases, and inequities holding us back from doing so.

Parents are key drivers of these solutions. Funders can support parent leadership and advocacy for educational equity and change.

CALL TO ACTION

Young people – particularly girls and young people from underrepresented communities – benefit when families encourage them to pursue STEM, act as brokers for STEM experiences, and help them navigate pathways to STEM studies and careers. Yet families are often unsure about what they should do, and many STEM-focused organizations do not have the resources or know-how to engage them effectively.

This guide is intended to raise awareness and build knowledge to increase grantmaker support for practice, research, and policy solutions to address these gaps. We look forward to working with you and hope you will continue to use the resources and tools available from the **STEM Next Opportunity Fund Family Engagement Project**. Together, we can help empower families to support their children's learning, close opportunity gaps in STEM, and ensure access to high-quality schools and learning opportunities that every child deserves.

We hope you will share this guide with your funder colleagues in person, at conferences, through email, on social media, and in blogs. We are interested in how you use it and how we can improve it.

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STEM Next has a growing collection of resources, promising practices and tips for practitioners, case studies, and more on our website.

Photo

PowerMyLearning

ENDNOTES

1. Kekelis, Linda and Kara Sammet. *Changing the Game in STEM with Family Engagement: A White Paper for Practitioners and Field Leaders to Empower Families in STEM*. STEM Next Opportunity Fund, 2019. **https://stemnext.org/changing-the-game-in-stem-with-family-engagement/** .
2. Weiss, Heather B., M. Elena Lopez, and Margaret Caspe. *Joining Together to Create a Bold Vision for Next-Generation Family Engagement: Engaging Families to Transform Education.* Global Family Research Project, 2018, 3. **https://globalfrp.org/Articles/Joining-Together-to-Create-a-Bold-Vision-for-Next-Generation-Family-Engagement-Engaging-Families-to-Transform-Education** .
3. Ibid, 4.
4. Khan, Beethika, Carol Robbins, and Abigail Okrent. *Science and Engineering Indicators 2020: The State of U.S. Science and Engineering.* Alexandria, VA: National Science Board and National Science Foundation, 2020. Retrieved from **https://ncses.nsf.gov/pubs/nsb20201/**.
5. National Center for Women & Information Technology. “Bridging the Encouragement Gap in Computing.” National Center for Women & Information Technology, 2019. **https://www.ncwit.org/sites/default/files/resources/ncwit_bridgingthegap_researchsummary_0.pdf** .
6. Castro, María, Eva Expósito-Casas, Esther López-Martín, Luis Lizasoain, Enrique Navarro-Asencio, and José Luis Gaviria. "Parental Involvement on Student Academic Achievement: A Meta-Analysis." *Educational Research Review* 14 (2015): 33-46; Hill, Nancy E., and Diana F. Tyson. "Parental Involvement in Middle School: A Meta-Analytic Assessment of the Strategies that Promote Achievement." *Developmental Psychology* 45, no. 3 (2009): 740; Jeynes, William H. "The Salience of the Subtle Aspects of Parental Involvement and Encouraging that Involvement: Implications for School-Based Programs." *Teachers College Record* (2010),112(3), 747-774; Wilder, Sandra. "Effects of Parental Involvement on Academic Achievement: A Meta-Synthesis." *Educational Review* 66, no. 3 (2014): 377-397.
7. Weiss, Heather B., M. Elena Lopez, and Margaret Caspe. *Joining Together*, 3.

8. Harackiewicz, Judith M., Christopher S. Rozek, Chris S. Hulleman, and Janet S. Hyde. “Helping Parents to Motivate Adolescents in Mathematics and Science: An Experimental Test of a Utility-Value Intervention.” *Psychological Science* 23, no. 8 (August 2012): 899–906; Canning, Elizabeth A. and Judith Harackiewicz. “Teach It, Don't Preach It: The Differential Effects of Directly-Communicated and Self-Generated Utility Value Information.” *Motivation Science* 1, no. 1 (2015): 47-71; Rozek, Christopher S et al. “Utility-Value Intervention with Parents Increases Students' STEM Preparation and Career Pursuit.” *Proceedings of the National Academy of Sciences of the United States of America* 114, no. 5 (2017): 909-914; Dabney, Katherine P., Devasmita Chakraverty and R. Bui Huu Tai. “The Association of Family Influence and Initial Interest in Science.” *Science Education* 97 no. 3 (2013): 395-409; Linda G. Kimmel, Jon D. Miller & Jacquelynne S. Eccles. “Do the Paths to STEMM Professions Differ by Gender?” *Peabody Journal of Education*, 87, no.1 (2012): 92-113.

9. Microsoft. *Closing the STEM Gap: Why STEM Classes and Careers Still Lack Girls and What We Can Do About It.* Microsoft, 2018. **https://query.prod.cms.rt.microsoft.com/cms/api/am/binary/RE1UMWz** .

10. Modi, Kamala, Judy Schoenberg, and Kimberlee Salmond. Generation STEM: What Girls Say about Science, Technology, *Engineering and Math: A Report from the Girl Scouts Research Institute.* Girl Scouts Research Institute, 2012. **https://www.girlscouts.org/join/educators/generation_stem_full_report.pdf** .

11. Schaeffer, Marjorie W., Christopher S. Rozek, Talia Berkowitz, Susan C. Levine, and Sian L. Beilock. "Disassociating the Relation Between Parents’ Math Anxiety and Children’s Math Achievement: Long-Term Effects of a Math App Intervention." *Journal of Experimental Psychology: General* 147, no. 12 (2018): 1782.; Bayer. *Bayer Facts of Science Education XVII*. Bayer, 2015. https://s3.amazonaws.com/rdcms-pta/files/production/public/Images/Bayer_Facts-Exec_Summary-2015.pdf; Silander, Megan, Todd Grindal, Naomi Hupert, Elisa Garcia, Kea Anderson, Philip Vahey, and Shelley Pasnik. "What Parents Talk About When They Talk About Learning: A National Survey About Young Children and Science." Education Development Center, Inc. and SRI International, 2018. **https://www.edc.org/what-parents-talk-about-when-they-talk-about-learning** .

12. Dou, Remy, Zahra Hazari, Katherine Dabney, Gerhard Sonnert, and Philip Sadler. "Early Informal STEM Experiences and STEM Identity: The Importance of Talking Science." *Science Education* 103, no. 3 (2019): 623-637; Roque, Ricarose, Karina Lin, and Richard Liuzzi. ""I'm Not Just a Mom": Parents Developing Multiple Roles in Creative Computing." Singapore: International Society of the Learning Sciences, 2016; Barron, Brigid, Caitlin Kennedy Martin, Lori Takeuchi, and Rachel Fithian. "Parents as learning partners in the Development of Technological Fluency." *International Journal of Learning and Media 1* no. 2 (2009): 55-77; DiSalvo, Betsy, Parisa Khanipour Roshan, and Briana Morrison. "Information Seeking Practices of Parents: Exploring Skills, Face Threats and Social Networks." In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems.* ACM, 2016. 623-634. ACM; Rozek, Christopher S., Janet S. Hyde, Ryan C. Svoboda, Chris S. Hulleman, and Judith M. Harackiewicz. "Gender Differences in the Effects of a Utility-Value Intervention to Help Parents Motivate Adolescents in Mathematics and Science." *Journal of Educational Psychology* 107, no. 1 (2015): 195.

13. Weiss, Heather B., M. Elena Lopez, and Margaret Caspe, *Joining Together*, 13.

14. Harris, Barbara, Dana Petersen and Claire Smither Wulsin. *Integrating Mathematical Thinking Into Family Engagement Programs*. Mathematica Policy Research, 2017. **https://www.mathematica.org/our-publications-and-findings/publications/integrating-mathematical-thinking-into-family-engagement-programs** .

15. Deruy, Emily. "Where Calculus Class Isn't an Option: Students of color are less likely to have access to advanced courses." *The Atlantic,* June 7, 2016. **https://www.theatlantic.com/education/archive/2016/06/where-calculus-class-isnt-an-option/485987/** .

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The 50 State Afterschool Network

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