STEM Family Engagement: A Planning Tool

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A planning tool to support programs in uplifting and empowering all youth and families in STEM

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Introduction

Families play an essential role in their children's science, technology, engineering, and mathematics (STEM) education. It has been established through research studies and practical experience that children are more likely to engage in STEM learning and see the value of STEM when their caregivers have positive attitudes toward STEM. Further, children are more likely to achieve in STEM when their caregivers are empowered in shaping their child's STEM learning. While family engagement is important in all learning environments, caregivers who engage in informal programming outside of school are more likely to get involved in their children's learning at home and in school, leading to more meaningful STEM learning and better outcomes for their children. This Planning Tool is only one of many resources for programs seeking to increase Family Engagement – additional resources are provided throughout the document, and a glossary of terms is available here. This tool is a living document. Throughout, we have provided examples from programs that have worked in collaboration with us. We recognize that there are many programs that are doing excellent work as well, and we look forward to updating this tool to add more examples as we continuously learn from the field.

C.A.R.E. about STEM Family Engagement

This Planning Tool is designed to increase the capacity of out-of-school time (OST) STEM providers to engage families in equitable and effective ways, building upon the promising practices described in Changing the Game in STEM with Family Engagement. The key ideas, practices, and examples that inform this guide and our organizing framework known as "CARE" (Connect, Act, Reflect, and Empower) were developed with participation from researchers, practitioners, caregivers, state network leads, and others with expertise in STEM, family engagement, and equity. Inspired by ideas from multiple disciplines, including social, emotional, cultural, and developmental theories, the CARE framework was designed to create more connected STEM learning communities by helping OST programs grow the confidence and capacity of staff and families, especially in areas important for STEM teaching and learning.

Commitment to Diversity, Equity, Inclusion, and Access (DEIA)

The role of DEIA in education, STEM innovation, and workforce development is clear: we must create more fair, just, and inclusive STEM learning environments, especially for families and staff who are underrepresented and underserved in STEM, including girls and women, people of color, and people with disabilities. All areas of this Tool intentionally consider ways of increasing diversity (attracting and retaining families with different backgrounds and experiences), equity (ensuring all families are treated fairly and justly in STEM), inclusion (welcoming, respecting, valuing, and supporting families in STEM), and access (providing all families equitable entry to all STEM opportunities and experiences).

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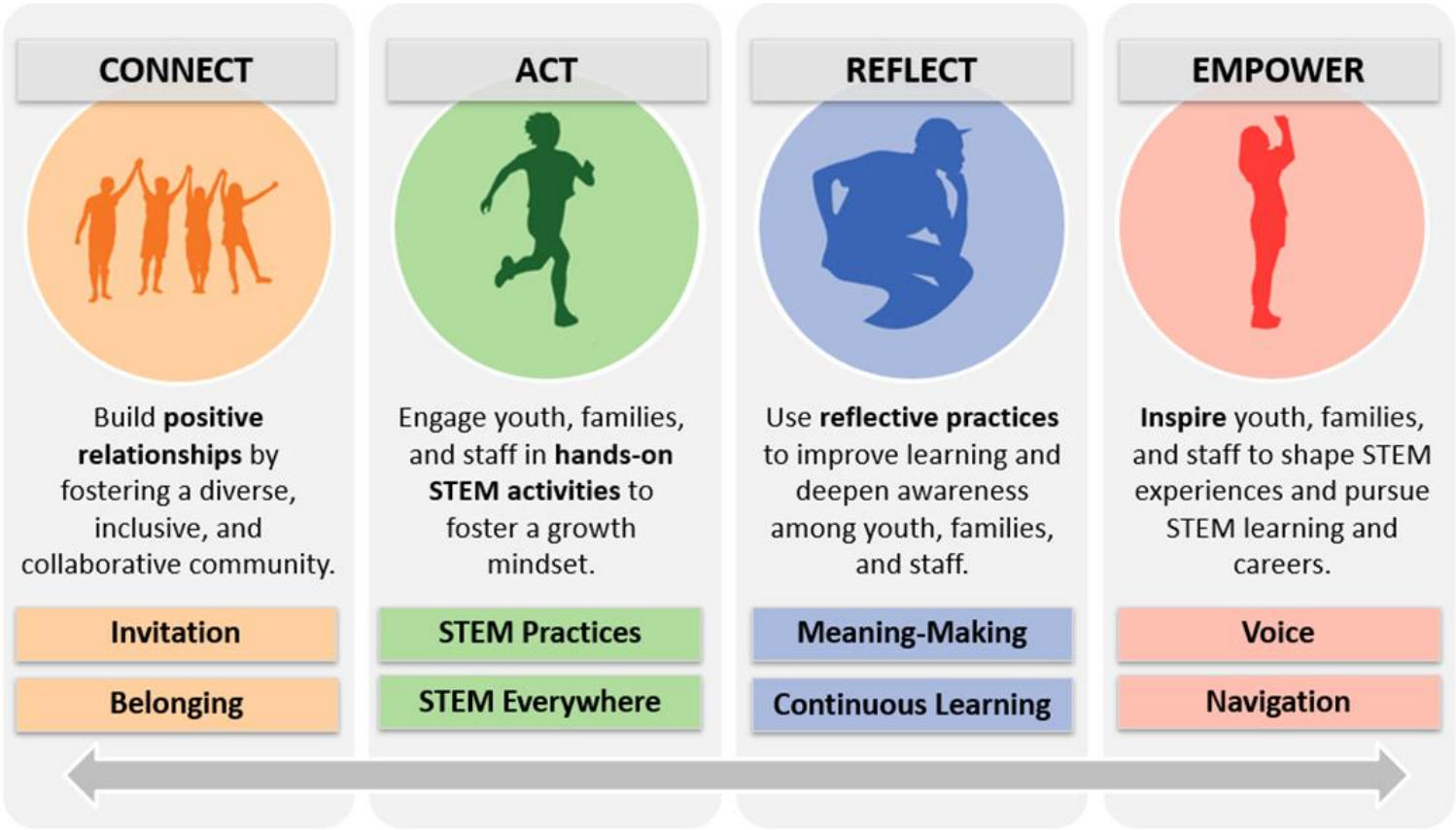
Framework Overview

This STEM Family Engagement planning tool aims to promote effective and equitable family engagement in STEM. The key ideas, strategies, and examples are organized around the new framework **CARE: Connect, Act, Reflect, and Empower**. The framework can be used to support and improve the capacity of program staff, families, and youth, with focus on the areas most important for STEM teaching and learning, including knowledge and skills, values and beliefs, and networks of support.

The CARE Framework: Caring about Family Engagement in STEM



How to Use this Planning Tool

This Planning Tool was developed by researchers in partnership with programs and families. As we created the current version, we received feedback, questions and suggestions from practitioners and caregivers, included here for readers on the journey toward effective and equitable family engagement. We recommend reviewing this section before moving on to the four CARE domains.

Who is the audience for this Planning Tool?

We hope this Planning Tool will be of use to everyone interested in family engagement for STEM programs; it was designed for immediate use by program leaders and front-line staff. Using this document, leaders will be better equipped to facilitate relevant professional development, and guide staff to improve their family engagement activity plans. The Tool will also help anyone who seeks to understand best practices and learn about programs that are effectively engaging families in STEM learning. Some strategies are more appropriate for program leadership and others will be of immediate use to practitioners. Ideally, the Tool will prompt reflection and discussion among program teams as they explore the suggestions and consider the strategies that best fit their circumstances.

What is this Tool's purpose?

This STEM family engagement planning tool is a resource for learning, not a tool for accountability. The Tool was designed to foster a shared vision of STEM family engagement. Practitioners can select from among the practices included here according to their needs, goals, and capacity. Funders can use this tool to work with grantees who wish to build or improve family engagement, and to assess grantees' organizational capacity to provide high-quality family engagement in STEM. Researchers can use this tool to develop new measures, or refine existing measures, to support continuous improvement efforts and system-level work. As defined here, the goal of family engagement efforts is true partnership with families, in which knowledge and respect flow both ways.

What level of effort is needed?

Family engagement takes time, planning, and determination. The work will be ongoing and requires continuous reflection and improvement. As an example, this Tool is a living document that will be continuously updated as more programs and families provide feedback and examples from their own experiences. This tool can be read by staff with different roles and experiences, including frontline staff as well as Executive Directors. It provides a variety of ideas and examples that anyone can implement right away, but meaningful change will require more sustained efforts.

Getting Started with Family Engagement in STEM

Where and how do we start?

The CARE framework is flexible, and programs will have different starting points based on the capacity, resources, interests, and needs of program staff and families. After your first pass through the Tool, we recommend completing the workbook at the end of this guide. The workbook is designed to help programs plan for family engagement, including building a team, identifying strengths and barriers, setting goals and priorities, and creating a roadmap. The CARE elements can happen in any order; most programs begin by **Connecting** with families and then **Reflecting** on successes and areas for improvement. Strong relationships are needed to develop inclusive STEM learning communities, so that caregivers are **Empowered** to engage in their child's learning and the program in more significant ways. Then, caregivers are more involved with STEM learning **Action** and partner with programs to support their child's STEM experiences.

What does success in family engagement look like?

Success should be defined by the goals and expectations that your program sets and should vary across the different types of family engagement—for example, it's more reasonable to set a goal of making welcome calls to all caregivers with children enrolled in the program, but it is less reasonable to set the goal of having all families attend an event. When goalsetting, it will also be important to consider factors such as the age of the child, which makes a significant difference in the type and level of caregiver/family involvement. Caregivers of younger children are more likely to be present during an activity and engage hands-on with activities. Caregivers of older children are less likely to be engaged in activities, partly because the child has more independence and autonomy.

Why is messaging important when doing family engagement work?

Families come in all forms, with parents, grandparents, aunts and uncles, guardians, siblings and other adults filling the roles of supporter, nurturer, and mentor. Throughout this tool, the term "caregiver" applies to any adult who plays a central role in the child's development. When communicating about family engagement, it is important to reflect the situations of all the young people in your program. In this tool we have avoided the word "parent," given the unfortunate reality that some children do not have living parents, are not living with their parents or have poor relationships with them. Additionally, not all caregivers have equal capacity for involvement. Given this, programs have recommended making language more inclusive. For example, instead of saying "your mom or your dad," say "whoever you live with" or instead of saying "family" consider "your caregiver(s)" or "your support system." Programs have shared that youth should be centered in family engagement efforts to better understand their preferences for caregiver involvement, and that staff should be mindful of children who do not have caregivers during family activities/events.

Select messaging that is welcoming and inclusive for all youth, caregivers, and staff. Although some families have positive associations with the term "STEM," it was often cited as a barrier to reaching families. "STEM" has been described as "scary" and "intimidating" or associated with "stigma" and "too much work" by caregivers. While some programs have chosen to avoid the word "STEM" and others have embraced it, all agreed that it is helpful to highlight the connections between STEM activities and families' everyday life. Other tips included showing the value of STEM learning for families and communities, and making explicit the importance of diversity. Ultimately, it will be important for your program to spend time reflecting—with staff, youth, and families—on the most effective messaging for your community.

What are important considerations when working on Diversity, Equity, Inclusion, and Access (DEIA)?

We designed this Planning Tool to prioritize DEIA throughout all domains of CARE. It is essential to acknowledge that STEM has a history of exclusion, bias, and injustice (such as unequal access to resources and opportunities, negative stereotypes, and hostile learning environments or institutions). To ensure that all youths, families, and educators are equally valued and included in STEM, the Planning Tool supports building a program culture that actively works against all forms of bias. Commitment to DEIA requires understanding the barriers that affect nondominant groups in STEM. In our work on this Tool, programs noted the need to be mindful of who is carrying the responsibility. One program cautioned that even the best intentions can go awry—such as prioritizing DEIA but assigning this work to families or staff from groups that are underserved and underrepresented in STEM (especially women, people of color, people with disabilities, people fluent in languages other than English). Programs must ensure that everyone is held accountable for DEIA work, staff's regular duties are balanced with new DEIA-focused work, and efforts are compensated or recognized.

Barriers to family engagement are often rooted in structural inequality, especially within the STEM education system that has historically supported an imbalance of power between educator and caregiver (see a list of resources here). Integrating DEIA may require reframing how staff view families. Prioritize the creation of welcoming and inclusive STEM learning environments to attract and retain diverse families and staff. Work with diverse youth, families, and staff to identify strengths and challenges, and leverage assets. Establish a mutual definition of positive family engagement in STEM and stay open to feedback. For more best practices, see Mapp & Bergman's 2021 report "Embracing a New Normal: Toward a More Liberatory Approach to Family Engagement".

What if we don't have the budget or capacity?

Quality family engagement does not require a big budget. We recommend starting with a focus on what you can do with your current staff, resources, and time. Programs have advised that it's important to avoid the "need more money/need more time" mindset. Look for incremental changes that will make interactions with caregivers more meaningful. Additionally, partnerships are a good way to build engagement without exhausting your resources or capacity.

CONNECT

Connect is about building positive relationships between people (youth, families, and staff) to make STEM learning environments more welcoming and inclusive.

It is also about developing partnerships between organizations (STEM programs, museums, libraries, businesses, and others) to increase program capacity and better support families.

ATTRIBUTE 1: INVITATION

Key Idea: Reach out to diverse families and staff *– To increase diversity and access in STEM programming, refine your STEM messaging and outreach strategies to reach families and recruit staff who are underrepresented in STEM.*

- **Create messaging that explains STEM in simple and meaningful ways**
  - Explain what children will be doing related to STEM using examples of hands-on activities (e.g. building, coding, gardening, baking, problem-solving)
  - Make STEM relatable for families by connecting STEM activities to families' everyday lives (e.g. growing vegetables, baking cookies, repairing a leaky faucet)
  - Highlight the value of learning STEM:
    - For families: developing skills for success in life (e.g. having better relationships with others through teamwork), school (e.g. learning technical skills), or work (e.g. obtaining a high-earning career)
    - For communities: supporting the local economy, addressing local challenges like contaminated drinking water or global challenges like climate change

- **Tailor communications to make information more accessible**
  - Keep written communications brief, using simple language with images if appropriate, and avoiding complicated words or phrases, including expressions that may not translate well to other languages or cultures (e.g. "raining cats and dogs")
  - Translate all communications into the languages commonly spoken in the community (in Boston, MA, the most spoken non-English languages include Spanish, Haitian Creole, Chinese, Portuguese/Cape Verdean Creole, Vietnamese, and French)
  - Use different methods, like making phone calls, creating narrated PowerPoints, using text messaging platforms, or posting pictures/videos from real STEM activities to reach caregivers who have difficulty reading or cannot read in English

- **Reach out to diverse communities directly**
  - Advertise job opportunities widely in traditional and non-traditional ways, such as by sharing on social media, publishing in community and ethnic newspapers, and posting flyers in neighborhood stores – for a model, see Young Entrepreneurs of the Future's Facebook Page

- Raise awareness of STEM opportunities through outreach, for example hosting live demonstrations of STEM activities in local parks, sharing garden produce with neighbors, or holding open-house events, like the Pop Up STEM events Project Exploration holds in different neighborhoods around Chicago, IL

- **Make it easier for caregivers to find, enroll, and join programming**
  - Create a family-facing calendar that includes dates, times, and expectations for all family engagement activities and events, and update this calendar regularly - the "Parent Stuff" section curated by SPARKS is a great example
  - Ask what caregivers consider the most convenient way to sign-up, such as virtual office hours, tables at community centers or school lobbies, and then offer as many as possible
  - Help caregivers complete applications if they need assistance with reading or writing, or find the paperwork difficult
  - Provide transportation, meals, free activities, childcare, or other resources that can make it possible for children and families to learn about or join programming.

ATTRIBUTE 2: BELONGING

***Key Idea: Nurture connections**—Build positive relationships to ensure STEM programming is welcoming and inclusive for all youth, families, and staff, and develop partnerships with organizations that can contribute knowledge, experience, resources, or other assets that build capacity.*

- **Dedicate time and space for staff and families to build a caring and compassionate culture**
  - Welcome families to the program by sharing "get-to-know-us" introductory letter from staff and inviting families to share back their own "get-to-know-us" letter on a STEM topic (Tech Tales provides "About Us" and "About Me" cards), then creating an "Our Families" bulletin board.
  - Show appreciation for families by allocating a few extra minutes to drop-off/pick-up times, and using the time to interact and listen to build trust and respect- for more information see "Effective Family Engagement Starts with Trust"
  - Make relationship-building routine so that youth, caregivers, and staff learn about one another at every opportunity, such as by:
    - Making home visits, welcome calls, and check-in calls, ideally having the same facilitator or coordinator calling every time
    - Using STEM-themed icebreakers at the start of family events – Techbridge Girls has shared theirs online

        - Hosting STEM-related events with a family-style or "potluck" meal – Family Creative Learning reserves time to get to know youth and families, and launches programming by sharing with families a meal from a local restaurant and doing an introductory activity to build connection.
    - Contact caregivers with positive news about child's participation in STEM learning, not just when there are concerns or challenges, such as:
        - Chatting during drop-off/pick-up, regular check-in calls, or casual conversation during a family event
        - Sending an email/note home with a photo of the child participating in an activity—calling out what STEM practice they learned during the activity.
    - Support families to ensure their basic needs are met, such as by creating "feel better" baskets for sick family members and providing information on where to find free meals, internet access, childcare services, or educational resources – for a Detroit-area example YouthQuest's website
    - Highlight positive interactions between staff-family, youth-family, and family-family by calling them out in the moment and saying why they are important for STEM learning.
        - For example: "Hey, [caregiver and child's names], you're all working so well together by doing *X* and *Y*. Teamwork makes for better science because everyone brings different strengths and ideas."

- **Acknowledge, respect, and celebrate diversity in STEM**
    - State clearly the program's commitment to diversity, equity, and inclusion in STEM on a family-facing website (program's description, mission statement, and/or staff bios),
        - See Project Exploration's "About" Page beginning with "With equity at our core…"
        - See CitySprouts' open letter to the community (published in Cambridge Day, April 24, 2021) that describes how their summer programming is prioritizing kids with fewer opportunities, including "applicants of color, youth who qualify for free/reduced lunch, whose primary/home language is not English, who come from a single-parent household, and youth who have experienced some form of deep stress in the family."
    - Show that your program values diversity by providing examples of STEM pioneers and achievers from under-represented groups, e.g. girls and women (see IF/THEN Collection® for free images of girls and women of different ethnic backgrounds engaged in authentic STEM)
    - Share real stories that highlight the variety of ways that families can engage in their child's STEM learning, including culturally and linguistically diverse examples; options include posting pictures or videos from a virtual STEM learning class, such as a cooking class, on social media (with permission from youth and caregivers) and providing a note of encouragement about the accomplishment of one or more families

- Build strengths-based mindsets and approaches (as opposed to problem-seeking) that center hopes, assets, and opportunities to solve problems and transform the lives of staff and families in positive ways.
  - Check out the strengths-based strategies for STEM learning described by the 2012 National Research Council report (see the chapter on "Equity and Diversity in Science and Engineering Education").
- Encourage diverse points of view in STEM to increase belonging among youth, caregivers, and staff from underrepresented groups; e.g. hosting a professional development about DEIA-related topics using popular resources such as Zaretta Hammond's (2014) blog that focuses on culturally responsive teaching.
- Avoid assumptions about families, as these can be negative even when made with good intentions, e.g. believing families do not participate in STEM because they do not have enough time (for suggestions see our section on Continuous Learning, p. 19 and Linda Kekelis' "Listening: The 'Secret Sauce' for Impactful Family Engagement")

- **Develop partnerships with schools, businesses, and other organizations to grow capacity to better support families**
  - Find partners that can increase the relevance of STEM content, like field trips with local businesses so that youth and caregivers can learn about local STEM jobs and see real STEM practices and workers in action; asking businesses to fund programming or provide materials for STEM kits
  - Connect with organizations that can increase family access to STEM learning opportunities outside of school, e.g. asking a local science museum to donate coupons or tickets that can be gifted to families.
  - Collaborate with schools, businesses, universities, youth groups, etc. in the area to host events: read more about the Tulsa Regional STEM Alliance's successful partnership efforts in Tulsa, OK in Partnerships to Transform STEM Learning
  - Join established networks, such as a STEM Learning Ecosystem or Statewide Afterschool Network, which provide technical assistance, STEM resources, trainings, networking opportunities, etc. at no cost

ACT

Act involves engaging caregivers **in hands-on STEM activities** with their children, to build caregivers' confidence and capability by **learning and doing STEM practices alongside their children**.

Bringing caregivers into the educator-student dynamic changes the focus from individual learning to collaboration and **shows caregivers that they do not need STEM expertise** to impact their child's learning or success.

ATTRIBUTE 3: STEM PRACTICES

Key Idea: Provide opportunities to practice STEM*—Engage youth and families in authentic practices used in STEM-related jobs to develop practical workforce skills and challenge negative stereotypes around who "counts" as a STEM professional.*

- **Design activities that engage youth and caregivers in hands-on STEM activities together**
  - Practice skills commonly used in STEM-related jobs (i.e. collecting data, making predictions, using scientific models, building explanations, addressing design problems, etc.), through activities like:
    - Making materials available for children and caregivers to use together while in the space (e.g. at drop-off/pick-up, during open-houses), like cardboard, fabric, straws, yarn, scissors, tape, and a simple prompt like "Make a Robot" or "Make a Boat"
    - Mailing home "STEM kits" that include instructions and all materials necessary to complete the task; and when possible, sending home two kits (one for child, one for caregiver).
    - Hosting tables at family events* with fun, hands-on activities for children and caregivers to do together (*regardless of whether they are advertised as "STEM-related"): YouthQuest hosts a drive-in movie night with free admission, and runs STEM tables with hands-on activities and raffles off STEM activity gift baskets
  - Create programming for caregivers and children to explore STEM phenomena together: the New York Hall of Science has a 10-week Parent Ambassadors program that engages youth and caregivers together in hands-on activities throughout many of their 450 interactive science displays
- **Ensure that all youth and families can fully understand and engage in the activity**
  - Provide virtual programming as an accessible option for caregivers, like the Virtual STEM night hosted by Martin Luther King, Jr. Elementary School in Tuscaloosa, AL, and ensure that the accessibility features for virtual platforms such as Zoom or Google Hangout are turned on. Deaf Kids Code list these settings on their website.
  - Provide live or pre-recorded demonstrations (with captions/subtitles) and/or visual "IKEA-like" instructions
  - Use bi/multilingual STEM facilitators to help youth and caregivers who are not fluent in English participate fully
- **Show that experience or expertise is not a requirement to learn or succeed in STEM**
  - Enlist role models, such as caregivers or youth who have participated in the program before, to provide examples of what helped them grow and succeed in STEM regardless of prior knowledge, experience, or ability
  - Normalize mistakes as part of the STEM teaching and learning process by showing and discussing examples of how major STEM discoveries or breakthroughs happened despite setbacks or without rewards

- Encourage adults, including staff and caregivers, to model vulnerability by discussing failures that shaped them and how they learned from these experiences
- Provide workshops, resources, or tools that encourage a growth mindset; e.g. template language, vignettes, video clips, workbook can be created with caregivers and staff to share with others (for anyone engaged in the program: staff modeling for other staff, caregiver modeling for their child, children modeling for their peers) – for more about how caregivers can learn to support their child's learning with a growth mindset, see Technovation's (2021) blog about "Shifting from Fear to Fun"

- **Broaden understanding of what the modern STEM skills are and what the workforce looks like**
  - Invite guests/role models from local universities or businesses (including STEM professionals from underrepresented groups and potentially even caregivers) to talk about what "real" STEM people look like and do, and also to talk about what it takes to get a STEM job. These can be presented in-person, virtually, or using pre-recorded video. For more information on how to find a role model, see Techbridge Girls' (2014) report on "Creating Connections with Role Models: The Power of Collaboration." Techbridge Girls also provides a training directed towards role models, which can be located here
  - Enhance STEM activities with examples of the range of STEM professions, from traditional jobs (scientists, engineers, doctors, mathematicians, etc.) to nontraditional jobs (automotive technician, chef, construction worker, heating and air conditioning mechanics, laboratory technician, manufacturing worker, welder) – the SPARKS program provides a career and technical education program for middle and elementary schools so families can learn about and pursue more nontraditional STEM jobs, and successful completion of the program includes state or national certification and college credit. For more on nontraditional STEM jobs, see Rothwell's (2013) report on "The Hidden STEM Economy"
  - Share examples of local STEM jobs and workers using email, social media, or the program website (e.g. try googling "a day in the life of a… [insert job]" or similar), including caregivers engaged in programming

ATTRIBUTE 4: STEM EVERYWHERE

Key Idea: Promote STEM anywhere, at any time*—Show families how and why to engage in STEM during everyday life where there are people, places, and activities that can increase opportunities for families and youth to learn about STEM together, make STEM more universal and accessible, and support the development of a family STEM identity. Options allow families to decide how and when they engage with STEM at home and with their communities.*

Provide free or affordable resources designed to encourage child-caregiver collaboration at home

- STEM kits, including instructions and all materials needed to perform the activity, which can be sent home or made available for pick-up (as described in STEM practices), like the at-home activity guide for caregivers created by the SPARKS program, with links to activity guides for projects "such as "Cloud Dough", and materials provided to families based on their interests with a simple request form
- Virtual STEM programs or design challenges, such as those offered at no cost by Technovation Families (like the Artificial Intelligence Design Challenge for families) and Youth Code Jam's Jam at Home, which includes workshops and resources in English and Spanish
- STEM activity guides (that include material lists, instructions, and ideally reflection questions) – NASA provides activities that connect to what children are learning in the program, like how to make a straw rocket,and SPARKS (@ Clarewin-Gladwin Regional School District, MI) curates a STEM-at-home caregiver guide with a menu of activities

Encourage engagement in STEM beyond your program and outside the home

- Advertise free admission days, and offer free or reduced-price tickets, for local science museums and children's museums
- Arrange field trips to local museums, businesses, and universities (youth with their caregiver)
- Bring STEM to underserved neighborhoods through activities like Project Exploration's "STEM Bus" or the Fab Foundation's "Mobile Fab Lab"

Provide activities that fit with families' everyday lives

- Design relatable activities that fit youth and caregivers' daily routines, tasks, or hobbies – at one SPARKS site in a farming community, children planted, grew, and studied vegetables that were later sent home in baskets for them to finish growing and cooking with their caregivers

REFLECT

Reflect is about dedicating time to **thoughtful reflection and analysis.**

It can include practices that **help caregivers make sense of their children's STEM learning** experiences, as well as practices that help programs identify strengths and areas needing improvement.

Bringing staff and family members together allows everyone to identify problems and **design and implement solutions together**.

ATTRIBUTE 5: MEANING-MAKING

Key idea: Promote deeper learning*—Include frequent opportunities for families and staff to make sense of STEM in ways that are relevant to their everyday lives to make STEM learning more meaningful and valuable.*

- **Provide opportunities for youth and caregivers to reflect jointly on STEM activities**
  - Create a list of ‘‘wh-” questions (i.e. who, what, where, when, why) for caregivers and children to discuss throughout activities or events, by including reflective questions with the instructions for STEM kits or online activities, placing print-outs on tables, or posting prompts in key areas throughout an event space.
  - Model how to ask questions that connect activities with what children have learned or experienced before
  - Guide youth and caregivers to consider STEM in relation to who they are as a person, e.g. how they see themselves in STEM (STEM identity), what they think and feel while doing STEM, what their hopes are for learning STEM, etc.
  - Provide multiple ways for youth and caregivers to reflect on questions, such as visually (written/illustrated reflections), through movement (hand signals to indicate agreement/disagreement), and/or verbally (via group discussion, partner conversations)- as a model, the New York Hall of Science’s Parent Ambassadors program asks caregivers to keep journals “to capture their reflections and help guide their thought process during each of the sessions,” including questions that connect the science theme of the day to their children’s lives, school work, and past experiences

- **Create opportunities for youth and caregivers to think critically about STEM education and the workforce**
  - Recruit diverse role models from the community to demonstrate what “real” STEM people look like and do—and also to discuss their STEM career paths, e.g. Project Exploration hosts a Black History Celebration partners with different STEM professionals in Greater Chicago area to honor black scientists and mathematicians and highlight the achievements of Black women in STEM
  - Find opportunities to discuss examples from history related to the exclusion of various groups from STEM education and workforce and efforts to increase inclusion (for girls/women, people of color, and people with disabilities, among other groups) – the following collection of resources authored and peer-reviewed by students or recent college graduates in STEM fields is intended to promote anti-racism action in STEM
  - Lead discussions with examples of how diversity in the STEM field has been crucial for discovery and innovation in the STEM fields (like Kizzmekia Corbett, one of the lead scientists who developed the COVID-19 vaccine, Mario J. Molina, a chemist from Mexico who discovered the Antarctic ozone hole, and Florence B. Seibert, a woman with physical disabilities due to Polio, who contributed to the development of the standard tuberculosis test)

- **Connect STEM learning to the culture, language, interests, and lived experiences of families**
  - Design activities or events that have personal meaning for families; e.g. The Family Math program started by PBS SoCal (Southern California's local public broadcasting station) engages its predominantly Latino families with a modified lotería activity. Lotería is a traditional Mexican game of chance similar to the American bingo game, which can be used as a math activity to encourage learning about counting and cardinality (see Re-imagining the Role of Families as Equal Partners in STEM Learning)
  - Use themes or lessons from multicultural children's books to showcase success and/or combat negative stereotypes – Tech Tales, a community of families, informal educators, and staff from Native American serving organizations, provides families with STEM resources and STEM activity backpacks with culturally relevant books that are centered in family storytelling, art, and indigenous knowledge; other resources include the Multicultural STEAM Books list curated by the Colours of Us

ATTRIBUTE 6: CONTINUOUS LEARNING

Key Idea: Listen and learn continuously—*Make reflective practices part of program culture by listening and learning alongside youth, caregivers, and staff, and provide learning opportunities to address needs and strengthen staff and caregiver capacity to engage in STEM programming.*

- **Collect and analyze data to learn about the attitudes, interests, hopes, and needs of the program community**
  - Create a data collection plan that makes it easier for all youth, caregivers, and staff to provide input on their interests, wants, needs for STEM programming, using different methods, such as by:
    - Providing physical suggestion boxes
    - Emailing anonymous survey links
    - Mailing paper surveys to families' homes
    - Offering one-on-one discussion time (via virtual conferencing, at a family event, or at drop-off/pick-up)
    - Inviting small groups of caregivers (6-8) to attend a focus group or listening session
    - Observing interactions between youth, caregivers, and staff during STEM activities
  - Provide staff with training and practice on different methods of listening and learning with families and other staff, including formal and informal focus groups, listening sessions, surveys, observations (see Empower, pp. 22, for suggestions on involving families in data collection)

- Use surveys developed and tested by researchers with input from programs and families, and consider resources like the survey templates provided by Harvard Graduate School of Education on topics such as caregiver support, self-efficacy, roles and responsibilities, climate, which can be adapted for OST STEM (see Empower, p.22)
- Determine whether your data represents staff and families from backgrounds that vary by race, ethnicity, socioeconomic status, primary language, gender, immigration status, education level, etc.,
  - Examine data on family enrollment and re-enrollment and staff recruitment and retention using demographic information (what % of families are from underrepresented groups participate in STEM programming, what % of these families return)
  - Solicit input from staff and families whose voices are less well-represented than other staff or families
- Communicate all data collection opportunities widely, such as by posting on program website, event calendar, social media posts, newsletters, etc. (see Connect, p. 8)

- **Make reflection an essential routine to support continuous improvement of STEM family engagement**
  - Dedicate time for staff to reflect on all program activities, including at staff meetings, board meetings, data reflection meetings, staff supervision, informal conversations, and professional development
    - During staff meetings, ask: What was the goal/plan? What is going well? What more can we try? How is family engagement in STEM going, for both families and staff? How is family engagement going for different groups? What can we improve?
    - Inside or outside team meetings, encourage staff to take time to reflect on their own STEM family engagement goals, plans, skills, beliefs, biases, and progress (e.g. journaling exercises, informal "brown-bag" lunch discussions, one-on-one conversation with supervisor)
    - Check staff members' beliefs and assumptions about families to build more equitable relationships, such as:
      - Four questions offered by Mapp & Bergman in "Embracing a New Normal: Toward a More Liberatory Approach to Family Engagement" (2021, p. 12), which guide reflection on four key elements for relational trust:
        - 1. Respect: Am I seeking input from, and do I listen to and value, what all families have to say?
        - 2. Competence: Am I demonstrating to all families that I am competent and that I see them as competent and valuable caretakers?
        - 3. Integrity: Do I keep my word with families?
        - 4. Personal Regard: Do I show families that I value and care about them as people?

        - Flamboyan's Challenging Assumptions Reflection Tool to "spark a conversation about how our assumptions can influence our actions and to examine ways in which we can question ourselves or others when biased or negative beliefs about families emerge."
    - Use data to inform updates to program policy, management, or communications, including changing or adding information to family-facing website, updating staff guidebooks or checklists for facilitating family engagement
    - Provide research, resources, trainings, and/or workshops to support learning interests and needs of staff and families, as they relate to STEM family engagement (and as identified through reflection process) – YouthQuest provides staff 40 hours of professional development each year on topics related to community and family engagement, STEM, DEIA, among other relevant topics
        - Share information from studies showing how family engagement impacts STEM outcomes, or how broadening participation among underrepresented groups impacts STEM education and workforce, studies showing the value of including diverse perspectives in STEM, or studies showing how culturally-competent strategies increase sense of belonging in STEM
        - Share free trainings or resources focused on essential topics such as collaborating with families from groups that are typically underrepresented in STEM. The IRIS institute at Vanderbilt University provides this free training for engaging families of students with disabilities.
        - Bring in partners when outside expertise required to improve specific skillsets, such as when helping staff learn more about designing culturally sensitive or culturally responsive STEM programming or constructive ways of addressing deficit-based beliefs about caregivers and youth
    - Choose trainings and professional development based on information shared by staff and families, which:
        - Have clear learning goals informed by staff
        - Are facilitated by experienced trainers, **staff, or caregivers, who can be experts in their children, language, and culture. For more information, see Ann Ishimaru's (2019) report, *Families in the Driver's Seat: Catalyzing Familial Transformative Agency for Equitable Collaboration.***
        - Provide hands-on and minds-on engagement opportunities
        - Build in meaningful reflection time
        - Use practices that are responsive to different cultures and languages
        - Include practices that develop social and emotional abilities, including relationship-building and active listening
        - Are updated when new evidence becomes available.

Family Creative Learning

EMPOWER

Empower means to give caregivers agency to support their children's STEM learning.

Making families partners and putting them in the "driver's seat" by including them in decision-making processes can promote trust, respect, and morale, leading to more engagement and support for the program.

Agency can also increase caregivers' **self-confidence and self-esteem**.

Project Exploration

ATTRIBUTE 7: VOICE

Key Idea: Empower families to lead*—Supporting families as partners in shaping their children's STEM education and inspiring families to put STEM skills and experiences into action at home and in the community to work toward a positive future for all.*

- **Support families as partners in their children's STEM education**
  - Name families as essential partners in child's STEM learning success in all program documents (e.g. website, program description/mission, newsletters, job postings, employee handbook)
  - Identify the critical roles that caregivers play in shaping the program and their children's STEM learning, including:
    - *Teachers* sharing new skills or concepts;
    - *Encouragers* providing positive support and language to help youth persist
    - *Promoters* sharing out youth's work
      - See Digital Youth Divas' Parents as Learning Partners for the full list of 11 roles and supporting research
  - Educate staff about the need for, and value of, youth and family voice and choice when making decisions about STEM programming, e.g. summarizing and sharing research literature (links to our references and resources are on p. 26)
  - Provide caregivers with names and contact information for all staff who make decisions about what their children are learning
  - Advertise all opportunities for families to provide feedback to guide decision-making, through sources like your program calendar or a family-facing website
  - Use feedback from families to guide decision-making, and be responsive to families' interests and needs
  - Recognize and celebrate families' contributions to their children's STEM learning, such as by summarizing what the program has learned from families and sharing what changes the program is making for the next session based on families' input – this can include posting a link to a brief memo on the program website, social-media, or via email
  - Be honest about which pieces of feedback from families was or was not used to make changes and explain why
  - Invite family input on program planning and decision-making, including:
    - Goal setting – caregivers weighing-in on strategies to increase family engagement in STEM
    - Evaluation – caregivers co-designing surveys or focus group questions
    - Programming – caregivers co-designing or co-leading STEM activities
      - As an example, Creating Science Learning Environments in Which Indigenous Students Can Thrive describes efforts of educators who have "worked to co-design intergenerational learning environments with community elders, children's caregivers, and other community members to collaboratively decide

what and how children should learn, a process that centers on family and community expertise, needs, and hopes."

- As another example, both Project Exploration and SPARKS have hired caregivers to join staff to lead STEM activities with youth

- **Make space for families' and staff's cultural practices and traditions as part of the STEM learning environment**
  - Seek input from families and staff from underrepresented groups about their personal and program experiences to better support diverse families and address negative experiences, such as through check-in calls, informal conversations at family engagement events, or at staff/family meetings
  - Welcome families and staff to share their interests or expertise in cultural practices or traditions, such as through cooking, music-making, or farming/gardening
    - Ishimaru's 2015 article Centering Family Knowledge to Develop Children's Empowered Mathematics Identities shares a vignette about empowering indigenous families as "knowers and doers" of mathematics (p. 11)
    - Young Entrepreneurs of the Future helps families in Omaha, NE learn to launch their own small businesses by empowering them to create products or services that connect with community interests and cultural identity, such as launching a mobile braiding salon that supports the cultural significance of hair braiding for Black and African American families
  - Help families use STEM knowledge and skills to take action and work toward justice, for example through community and citizen science and engineering projects (see Focusing Science and Engineering Learning on Justice-Centered Phenomena across PK-12)

ATTRIBUTE 8: NAVIGATION

Key Idea: Help families navigate STEM pathways*—Building families' skills and confidence to nurture their children into and through STEM pathways by fostering connections between families and the broader STEM community.*

- **Make it easier for caregivers to find and access resources**
  - Ensure staff stay up-to-date on STEM resources available to families so they can share as needed, e.g. free museum days, free STEM kits, computer labs, kitchens, transportation
  - Help families find books, articles, and other resources related to children's STEM learning
  - Share information about other local organizations that can support child's STEM interest
  - Provide tip sheets that help families understand education acronyms or jargon
  - Show families how to find and enroll their youth in programs, schools, courses, and career-oriented learning opportunities: the New York Hall of Science (NYSCI) is launching a program called Parent University, part of the NYSCI Neighbors initiative that makes it easier for parents to find and use available resources "to engage and empower our local parents and have them serve as advocates for STEM within their families and communities."

- **Help connect caregivers with other families interested in STEM**
  - Establish a recruitment committee comprised of youth and caregivers with prior program experience
  - Invite caregivers to co-establish or co-moderate a family-focused social media page or network, like a [Name of STEM Program] Families page for caregivers to discuss interests and share resources
  - Connect caregivers with contacts at organizations that can help the caregiver further pursue STEM interests and goals

- **Help families build STEM skills and abilities to better balance educational inequities**
  - Host caregiver-only social events or trainings, such as a workshop that provides caregivers with STEM skills that connect to what their child is learning in the program or in school
  - Provide trainings, resources, materials, activities, and events that empower youth, families, and staff to maneuver through barriers in STEM education, for example developing skills for uncomfortable social situations, like interactions with unwelcoming institutions, educators, colleagues, peers, as modeled in the "Creative Parent's Toolbox" created by Technovation Families with content such as "Gender Biases & Electricity" (with the goal "to learn how to encourage girls beyond gender biases")

Closing

Congratulations on finishing your review of this Planning Tool! We hope that this document has inspired new ideas for engaging families in ways that are both meaningful and equitable. You may be left with the sense that there is a lot of work ahead, and you're right—but it will be easier with a clear plan and your efforts will pay off. Celebrate every step forward as a win (making it through this document counts as one!). We wish you luck on your journey to enhance family engagement in STEM!

What's Next?

Supplemental Workbook

Transforming family engagement is a longer-term effort that involves building a team, crafting a vision, identifying strengths and barriers, setting goals and priorities, and creating a roadmap. To help you get started, we have created a supplementary workbook that maps to the CARE framework, which you can access online **here**.

Learn More

If you're interested in deepening your understanding of family engagement, STEM, or DEIA, please explore the references and resources used to develop this Planning Tool.

Share Ideas

We would love to hear from you about how you're using this STEM Family Engagement Planning Tool. What did you like, and what changes can we make to improve it? We would also love to hear real-world examples of how you have implemented the CARE framework or practices in your own work. Share this information with Patty Allen at ISRY at pallen@mclean.harvard.edu.

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About

Institute for the Study of Resilience in Youth (ISRY) at McLean Hospital and Harvard Medical School was created to promote innovation in youth resiliency and education research. Based on a belief that high-quality programming can build youth social-emotional resiliency and contribute to school and life success, Dr. Gil Noam founded the institute in 1999 as a collaboration between the Harvard Graduate School of Education and Harvard Medical School before relocating to McLean Hospital. ISRY develops innovative ideas, theories, and research methods. The Institute prioritizes translational research and evidence-based tools. ISRY's focus on social-emotional development (SED) and STEM encompasses formal and informal education settings, professional development, and family support.

STEM Next Opportunity Fund

STEM Next Opportunity Fund is a national leader, strategic guide, policy advocate, and investor that is bringing about a transformative expansion of high-quality and inclusive STEM learning. STEM Next is spearheading efforts to raise awareness and advance promising practices for STEM 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. Their objectives include convening foundations, corporations, national youth-serving organizations, community-based organizations, and policymakers to reform, elevate, and scale family engagement and catalyze investments in family engagement.