

Organizational Background/Mission/Goals: The mission of Science Club for Girls (SCFG) is to foster excitement, confidence, and literacy in science, technology, engineering, and mathematics (STEM) for girls from underrepresented communities by providing free, experiential programs and by maximizing meaningful interactions with women mentors in STEM fields. Our goals are to reduce barriers of access to/improve girls' attitudes toward STEM, increase their academic confidence through engaging curriculum, and bolster adolescent girls' resilience through programs that support their socio-emotional development and strengthen their network of caring adults.

Founded in 1994 by two mothers who were concerned about gender equity in science education, SCFG has become a leader in experiential STEM learning and girls programming, and a respected school and community partner. After a period of rapid expansion over the past decade, SCFG faced wait lists of over a year and a half for participants and wait lists of over a year for adult mentors. In response, during the spring of 2018, SCFG partnered with the City of Cambridge to run some of our Cambridge sites for our girls in order to undergo a comprehensive strategic planning process to create a more sustainable, enhanced operational and development model. As part of this 'Smart Growth Initiative', we have implemented our fall 2018 and spring 2019 Cambridge SCFG program, underwent board regeneration, hired a new Executive Director, instituted infrastructure to work with new and long-time funders and sharpened programmatic focus. This plan will ensure SCFG's future as an innovative provider of STEM and girls leadership development programming as we expand our services in Cambridge to add partners in Boston and Somerville.

SCFG operates a continuum of high-quality, engaging STEM programming that begins in the earliest years and continues through high school graduation. SCFG creates an environment designed to unlock girls' potential and broaden their imaginations, enabling them to identify as scientists and engineers. With programs that start in kindergarten, science clubs engage girls in STEM learning before negative self-perceptions and stereotypes can take hold. Volunteer mentor-scientists serve as role models, and allow girls to see themselves in STEM careers. As girls progress through SCFG programming, they develop close connections with mentors, gain leadership opportunities, and deepen their STEM learning.

SCFG programs are designed as clubs to reinforce concepts of collaboration and teamwork, the ways in which girls generally learn best. To help build both skills and confidence, curriculum and club structure are designed to foster inquiry: activities are hands on, rather than demonstration or lecture, with opportunities to experiment, to fail in safe and supportive settings, and to be resourceful and persistent. SCFG programs are organized by age and grade level: 1) Science Clubs: 8 to 10 weeks of hands-on explorations for girls in kindergarten through fifth grade led by volunteer mentor scientists and Junior Mentors in weekly afterschool and Saturday settings; 2) STEMMinistas: Inquiry and project-based team learning Science Clubs for middle school girls, centered on the core concepts of engineering and the design process; and 3) Junior Mentors: Leadership development and employment program for girls in grades 8 to 12 who also serve as near peer mentors and co-teach with adult mentors in the elementary grade clubs. Through the Science Clubs for elementary school age girls, SCFG is building an internal pipeline of future STEMMinistas and Junior Mentors who develop long-term relationships with the organization, mentors, and peers.

Adult mentors, undergraduate and graduate students, postdoctoral fellows in STEM disciplines, and STEM professionals in academia and industry lead Science Clubs. SCFG mentors help build confidence and agency among participants. Mentors and girls commit to weekly participation for a full academic semester. Clubs are held after school and on the weekend at schools and community centers. They are intentionally kept small in size to have a low girl to mentor ratio. Typical clubs have 10-12 girls with two women mentors and one or two Junior Mentors. Girls engage in fun, experiential hands-on projects, and learn different perspectives on how scientists think, what questions they ask, and how they solve problems. Each semester the girls explore different STEM topics such as chemistry, engineering, computer science, environmental science and physics to name a few. Through the unique Junior Mentor leadership program, middle and high school girls, many who have been in the clubs, receive leadership training while working as assistants to the women scientist club leaders. They teach club members alongside adult mentors, build relationships with participants, team members, and site managers, lead large and small group activities, attend trainings, teach and facilitate the SCFG curriculum, and attend events to build

community.

In addition to the benefits for our younger and teenage girls, our mentors express the many positive attributes of our mentoring model they themselves experience, especially for our youngest adult mentors, ages 17-22, undergraduates studying STEM. Several of our girls who have gone through our clubs and Junior Mentor programs continue on to serve as mentors themselves. Currently, we engage 35 adult women mentors per semester in Cambridge, 13 of whom are undergraduates. Persistence in STEM is a key issue in increasing the overall number of women in STEM careers and the exposure to and networking with other mentors at various, advanced stages of their careers provide invaluable opportunities and support for these younger women mentors as well as for our girls. Moreover, all of our mentors – teenage girls, young women and women further along their career path - benefit from connections to our Board of Directors with careers in many STEM-related fields and to our academic and corporate partners and funders with regard to career enhancement.

SCFG's target population is girls who are racially, ethnically, or economically underrepresented in STEM fields. They are non-white and non-Asian or live in a family whose income is less than 275% of the U.S. federal poverty guidelines for their family size or are the first generation in their family to be college-bound. To meet its organizational goals, in the current fiscal year (FY19) SCFG will engage 35 volunteer adult mentors and serve over 150 girls, ages five to 18, per semester in 12 Science Clubs at three sites in Cambridge. This includes the Junior Mentors program for 15 high school girls per semester who work alongside women mentors, learning STEM concepts, teaching younger girls, and developing confidence, communication, and leadership skills. In FY20, we plan to expand to Boston and Somerville where we will run four clubs each (eight total) and serve an additional 80-100 girls and 20-22 adult women mentors in addition to our Cambridge programming.

Need Being Addressed: SCFG has built its programming on a solid foundation of independent research that highlights the demand for STEM and mentoring programs for low-income and racially marginalized populations of girls and young women. Employment and academic achievement data point to the need for intensive interventions that can build opportunities for girls in STEM education and careers. Many of our families have few, if any, interactions with scientists and engineers, and are not necessarily aware of the academic and economic opportunities open to their girls should they continue with their STEM education. Women currently represent 47% of the total U.S. workforce but only 24% of the STEM workforce.¹ Racial disparities are even starker: black and Latino women comprise only 4% of working scientists and engineers.² The earning gap for women – particularly non-white women – will continue to widen as growth of STEM jobs outstrip available graduates in STEM fields with U.S. graduates in STEM fields filling only 13% of available STEM jobs.³ In Massachusetts, job openings for graduates with a biotech-related Associate's degree grew by more than 100% but the number of graduates rose only 56% since 2010. Similarly, job openings requiring a biotech-related PhD grew 43% but the number of PhD graduates in these fields only rose 16%.⁴ Equalizing access to STEM opportunities in this economic landscape is critical.

Furthermore, ongoing research identifies a persistent achievement gap between well-resourced and economically disadvantaged children that begins early, and continues to widen throughout the elementary and middle school years.⁵ Research on how children learn shows that informal education, such as experiential learning that happens outside of the traditional classroom, helps students see the relevance of academic subjects and leads to deeper interest, which in turn directly impacts their achievement.⁶ The academic achievement gap between black and Latino students and their white and Asian peers was evident in the state's 2018 Next Generation math MCAS scores. The number of white students whose scores exceeded the standards was four times higher than black and

¹Women in STEM: 2017 Update Office of the Chief Economist Economics and Statistics Administration, <http://www.esa.doc.gov/sites/default/files/womeninstemagaptoinnovation8311.pdf>.

² National Science Foundation 2017, <https://www.nsf.gov/statistics/2017/nsf17310/digest/occupation/overall.cfm>.

³ US News/Raytheon STEM Index, <https://www.engineering.com/JobArticles/ArticleID/13883/The-Future-of-the-STEM-Workforce-in-America.aspx>.

⁴ Massachusetts Biotechnology Education Foundation 2018 Job Trends Forecast, <https://www.massbioed.org/news/174-massbioed-releases-2018-job-trends-forecast-for-life-sciences-industry-in-massachusetts>

⁵Economic Policy Institute 2015.

⁶National Research Council 2009, 2011.

Latino students, and the number of black and Latino students who did not meet the standard was almost three times as high as white students.⁷ Moreover, research shows that girls begin to associate boys with science and math as early as grade two,⁸ and middle school is often when stereotypes and harmful associations cause many girls to avoid STEM subjects. While this negative association is true of all STEM fields, it is especially true with computer science and engineering, two fields where women are still significantly underrepresented at both the college and professional levels.⁹ These discrepancies can be traced back to middle school, a pivotal point of disconnection for girls and STEM, and a time when SCFG focuses on deeper engagement in programming through the Junior Mentors. SCFG is committed to addressing the lack of diversity in STEM fields and increasing opportunities for young girls, especially those from economically disadvantaged households, to see themselves as scientists, engineers, and mathematicians, beginning in their earliest school years and continuing through the vulnerable period of adolescence and young adulthood.

Our participants mirror the demographics of the cities we serve: students that are eligible for free/reduced lunch make up 50% of the public school population in Cambridge, over 60% in Somerville and over 80% in Boston. Although the Greater Boston and Cambridge areas are rich with high-quality programs offered through world-class institutions, especially in STEM, the associated expenses and logistics often present insurmountable obstacles for most of the families we serve. According to Ron Ottinger of STEM Next, “The wealthiest 20% of families devote almost seven times the resources to their children’s enrichment activities outside of school than do the poorest 20%, leading to a significant learning and opportunity gap.” Other tuition-free options are likely to be less structured, less supported, and less focused on academics as compared with the high-quality, academic, free programs at SCFG.

Program to be Funded: Science Club for Girls respectfully requests a grant of \$10,000 from Framingham State University and the Learning by Giving Foundation for operating funds to implement the Smart Growth Initiative. This initiative supports our Cambridge programs and expands programming to four clubs in Somerville and four clubs Boston in FY20, fiscal year 2020 (SCFG’s fiscal year runs from July 1st-June 30th). SCFG is currently partnering with the City of Cambridge and Cambridge Public Schools to offer programming in 12 clubs to over 150 K-12 girls, including 15 Junior Mentors, at three Cambridge sites. We will continue our partnerships in Cambridge in FY20 and will partner with the Mother Caroline Academy in Dorchester and the Community School program in the Somerville public schools in the fall of 2019. We also engage in partnerships with other educational institutions and corporations (such as Dell) to provide programming that augments our girls’ experiences in STEM such as corporate-sponsored STEM summer camps and STEM-related workplace activities at our partners’ sites.

SCFG programming is currently run by our Executive Director (Bonnie Bertolaet), Program Director (Cristina Ullmann) and 35 adult women mentors who study and work in STEM-related fields (many who have volunteered with SCFG for years). Bonnie Bertolaet is an accomplished scientist with a broad background in scientific research (in both academia and biotech) and education. She has served on the Board of Science Club for Girls since 2017, served as its Chair in 2018 and, in that role, was the major force behind the current strategic plan, the operational restructuring of SCFG, and a reinvigorated focus on development. Cristina Ullmann has extensive experience working in education and with nonprofit organizations focused on environmental issues and STEM. She has been with SCFG for over three years. The Board of Directors consists of individuals with backgrounds in nonprofit governance, STEM and STEM education, development, venture capital and professions in law and law enforcement in the communities we serve.

SCFG is currently hiring a new Program Manager to manage our geographic expansion and a Director of Development. One factor that necessitated the organization’s restructuring with the Smart Growth Initiative was the previous lack of a sufficiently mature development infrastructure during a period of rapid expansion in 2015-2017. With this new strategic plan in place, SCFG is operating with a sustainable expansion plan and a commitment to developing its fundraising mechanisms. Our hiring is conducted by our staff and vetted by our Board of

⁷ Department of Education 2018 profiles <http://profiles.doe.mass.edu/statereport/nextgenmcas.aspx>

⁸ Cvencek, D., Meltzoff, A.N., and Greenwald, A.G., *Child Dev.* 2011 May-Jun; 82(3):766-79.

⁹ National Science Foundation, Science & Engineering Indicators, 2016.

Directors. Our Board of Directors is composed of eight individuals: seven women and two persons of color. We are in the process of onboarding two new Board members who are women of color and first generation college-bound. Women of color make up 50% of our mentors and volunteers with over 30% being from the racial groups underrepresented in STEM. In hiring our new staff members, our current staff and Board are committed to hiring individuals with demonstrated commitment to our mission, expertise not only in education and STEM programming but experience with underrepresented and underserved communities and whole child development. SCFG is working with individuals and educational and community organizations, other nonprofits, foundations and for profit businesses committed to our mission to diversity our candidate pool, identify and hire candidates that reflect and can best serve our target populations.

In addition to support from our partners and our large number of volunteers and mentors, SCFG has received support, both financially and in-kind, from a variety of sources over its 25 year-history. SCFG seeks and receives funding from foundation grants (40% of the budget), individual donations (37%), corporation grants (13%) and government grants (10%). Our funding supports our Clubs and Junior Mentor programs including supplies, salaries to run and administer programs, overhead and occasionally events.

In FY20, in collaboration with partners, SCFG will engage 250 girls in all three cities per semester from communities that are underrepresented in STEM education and careers, provide mentoring from women role models in STEM fields, and support participants' academic goals and future employability. Correspondingly, we plan to increase the number of adult women mentors by 22 per semester in Boston and Somerville including 9 undergraduate mentors in the 17-22 age range. Grant funds will support a portion of salaries focused on running and administering our programs and a portion of overhead costs. Funding will allow SCFG to provide our girls with mentoring, opportunities for authentic learning experiences in STEM fields, and the confidence to see themselves as capable of attaining a fulfilling and engaging career in STEM.

Program Alignment with Framingham State University Nonprofit Giving Course: SCFG is perfectly aligned with the mission of the Nonprofit Giving Course for creating equal opportunities in that SCFG serves girls who are underrepresented in STEM by race or by income, meets their need for mentors and role models who can build their confidence and their competence and provides them with the support they need to thrive. SCFG helps girls and young women see themselves as scientists, engineers, and mathematicians with hopeful futures and the knowledge and skills to succeed in fulfilling careers.

One of the many ways in which SCFG creates equal opportunities for our participants is through our Junior Mentor program. Upper middle and high school aged JMs – frequently former SCFG club members – serve as assistant club leaders. Research shows that near-peer mentorship is especially important for girls in STEM fields. Exposure to role models mitigates the negative impacts caused by stereotyping, which undermine girls' confidence and persistence.¹⁰ By connecting mentors to younger girls, as well as to each other, SCFG clubs increase the participation, retention and advancement of women in STEM, while providing supportive communities for professional growth through intentional role modeling, group and individual mentoring, networking, and information sharing. Researchers have found that students enlisted to teach others work more diligently to understand the material, have better recall of the material studied and apply it in more meaningful, accurate and effective ways.¹¹ This 'protégé effect'¹² is supported by research that shows student tutors and teachers perform better than other students who are not engaged in teaching others. Moreover, being a leadership program, the Junior Mentors develop employable skills including enhanced communication skills, the ability to work with a variety of people, organizing and implementing a project, managing people, and leading others. The Junior Mentor program allows teenage girls to augment their understanding and aptitude of the foundation of many 21st century technologies while developing college readiness and skills for the workplace including effectively engaging in teamwork, problem solving and taking initiative. In such a way, this program provides economic mobility to part of our target demographic, girls from low-income backgrounds.

¹⁰ Marx, D.M. & Roman, J.S. *Personality and Social Psychology Bulletin* 2002; 28 (9): 1183-93.

¹¹ Chase, C. C., Chin, D. B., Oppezzo, M. A., & Schwartz, D. L. *Journal of Science Education and Technology* 2009; 18(4), 334-352.

¹² Kristensen, P. & Bjerkedal, T. *Science* 2007; 316 (5832):1717.

In 2017, STEM Next reported the results from a collaboration of several institutions including the PEAR Institute and McLean Hospital¹³ that showed that STEM afterschool programs are an effective part of solving the problem of increasing jobs faster than employment in STEM fields. Their studies showed that 80% students in grades 4-12 grade who participated in after school STEM programs reported positive gains in their STEM career knowledge, 78% showed a positive change in their reported interests, 72% in their perseverance and critical thinking skills and 73% reported an increase in STEM identity, the belief that he or she can do well and succeed at STEM subjects. Routinely, SCFG participants report similar outcomes: in summer 2017, 90% of our girls reported increased confidence with STEM, 97% demonstrated indicators of STEM persistence, 93% expressed interest in doing well in STEM in school and 80% of girls expressed desire to have job in STEM.

More than ever there is a need to fill the increasing number of jobs in STEM-related fields and address the lack of representation from the communities we serve in STEM. According to the latest report from The Boston Foundation,¹⁴ 'Getting It Right: Progress and Problems in Raising Science Achievement in Boston', it is clear that the public schools cannot take on this task alone due to a number of factors including budget concerns, lack of adequate training of teachers in STEM and lack of access to the culture of STEM. SCFG is uniquely suited to take on these challenges by augmenting in-school STEM curriculum with out-of-school time programming focused on mentors with the training, comfort-level and enthusiasm towards STEM subject matter because our mentors work in these fields and exemplify careers in a variety of STEM-related professions. No other program in Greater Boston is targeting young girls from communities underrepresented in STEM by race and income for multi-year, free STEM mentoring education. As such, SCFG has become highly respected as a model program.

Impact Measurement: In addition to using research to inform programming design and implementation, SCFG is committed to a rigorous evaluation to measure outcomes for girls and progress toward organizational goals. SCFG staff uses the Assessing Afterschool Program Practices Tool (APT) to assess program quality. The APT evaluates the participants' engagement level with the curriculum in live settings. This tool is designed to assess program practices that have been shown to correlate strongly with positive youth outcomes, in the following five categories: program climate, relationships, approaches and programming, partnerships, and youth participation. Program participants complete post-program surveys to track program quality and youth-level changes (see question 4 for some examples). Currently, we collect data on participants':

- Satisfaction with program quality
- Change in STEM engagement
- Increase in STEM skills
- Indicators of STEM persistence
- Interest in pursuing STEM in post-secondary education
- Increased willingness to take more challenging or advanced STEM courses

SCFG's Junior Mentor program also has the following youth development outcome goals:

- Increased civic and social ability: the ability to work collaboratively with others
- Expanded intellectually ability: the ability and motivation to learn in school and in other settings, to gain the basic knowledge needed to graduate from high school, to use critical thinking, to be creative, to use problem solving and expressive skills, and to conduct independent study
- Improved employability: the ability and motivation to gain the functional and organizational skills necessary for employment, including an understanding of careers and options, and the steps necessary to reach goals.

All participants' survey responses are registered in our database. They will be asked to share demographic information, as this information helps us to determine if we are meeting our institutional benchmarks for

¹³ STEM Next, http://stemreadyamerica.org/wp-content/uploads/2017/02/AfterschoolSTEMEvaluation_Overview_Final.pdf

¹⁴ The Boston Foundation, https://www.tbf.org/-/media/tbf/reports-and-covers/2019/getting-it-right_2018_final.pdf

increasing access for underserved girls. Survey results will provide qualitative and quantitative data regarding the curriculum's clarity of objective, ease of instruction, and the degree to which the activities are engaging, inspiring, and foster opportunities for relationship building among girls and mentors.

Over the past nine years, 92% of high school juniors and seniors who have participated in Science Club for Girls have gone on to college, with 55% of them majoring in science, engineering, or allied health. By comparison, only 23% of Massachusetts' high school seniors who take the SAT intend to study STEM in college. SCFG has designed STEM programs that develop girls' curiosity and inspires them with role models who are excelling in STEM.

SCFG has designed K-12 programs that develop the curiosity of girls. We believe that it is never too early to connect and inspire them with role models who are excelling in these fields and help young girls dream big dreams. Here's a testimonial from one of our girls:

'In my sophomore year at Cambridge Rindge and Latin, I was invited to take AP chemistry, and even though I had earned my spot through good grades and test scores, I was hesitant to take the class. I wasn't sure of myself, and most of the adults in my life were worried I wouldn't be able to handle it. I started the class and it was hard; I considered dropping it. But I stuck with it and ended up succeeding. I finally saw myself as one of the "smart" kids whom I'd always placed in a category that didn't include me. I'm not sure I'd be where I am if I hadn't had mentors and peers in Science Club who encouraged me to pursue what I wanted and helped me build the confidence to get there. I am now a junior mentor for Science Club for Girls and help run a club for 4th- and 5th-graders in the hope that I can help them build confidence in their abilities. I'm currently taking upper-level science and math classes.'
Sophie, Junior Mentor