

**Boys & Girls Clubs of America**

# **GREAT THINK**

**STEM**

**Advancing Underrepresented Youth in STEM  
During Out-of-School Time**



**BOYS & GIRLS CLUBS  
OF AMERICA**

# Boys & Girls Clubs of America thanks the participants and sponsors who made the STEM Great Think possible

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| Bay Area Science Festival                     | The Dow Chemical Company               | Oracle  | U.S. Army Child & Youth Services                               |
| Boys & Girls Club of Fitchburg and Leominster | Education Arcade at MIT                | Project Lead The Way  | U.S. Coast Guard   |
| Boys & Girls Clubs of Edinburg RGV            | Educational Testing Service            | RightMagic  | U.S. Navy  |
| Boys & Girls Clubs of Greater Washington      | The Entertainment Software Association | Samsung Telecommunications America  | University of California 4-H Youth Development Program         |
| Boys & Girls Clubs of the Peninsula           | Exploratorium                          | SEM Link  | University of California, Berkeley                             |
| Boys & Girls Clubs of San Francisco           | ExxonMobil Foundation                  | Silicon Valley Community Foundation   | University of California, San Francisco                        |
| California STEM Learning Network              | Google                                 | Silicon Valley Education Foundation   | University of Michigan Minority Engineering Programming Office |
| The Children's Aid Society                    | Institute of Play                      | Sony  | University of Nevada, Las Vegas                                |
| Comcast Foundation                            | Intel Computer Clubhouse Network       | STEM NOLA   | University of Phoenix  |
| Dell  | Khan Academy                           | Symantec  | University of Wisconsin-Madison                                |
|   | KIPP Bay Area Schools                  | Time Warner Cable   | University of Wisconsin-Madison, PEOPLE Program                |
|   | Learn Fresh                            |   | XL Academics   |
|   | National Math and Science Initiative   |   |  |

## SUPPORTING PARTNERS



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# Introduction

Every child in America deserves a great future. STEM education is critical to the ultimate success of our young people as STEM jobs in the United States are expected to grow nearly twice as fast as other fields by 2018. Unfortunately, there is a shortage of both interested and adequately prepared K-12 students in STEM subjects, especially among minority youth and young women.

Gaps in science and math achievement for African-Americans, Latinos and American Indians/Alaska Natives start as early as the fourth grade. Additionally, only 15 percent of female high school students express an interest in STEM fields, as compared to 40 percent of male high school students. This opportunity gap in STEM education is likely to widen unless organizations develop pathways for more underrepresented youth to succeed in STEM careers.

To meet the demands of the changing world, and develop the leaders of tomorrow, we must help our youth build the necessary competencies and skills to pursue STEM degrees and careers. We can elevate our nation's workforce by closing the opportunity gap that prevents underrepresented youth from reaching their full potential in fast-growing fields. Additionally, to cultivate leaders with these 21<sup>st</sup> century skills, we must place an increased emphasis on STEM education combined with innovative and creative thinking.

Research has shown that the out-of-school environment—after school and summer—advances STEM knowledge and increases interest in STEM-related careers. Out-of-school providers like Boys & Girls Clubs of America have an opportunity and responsibility to help more young people, especially those who need us most, develop passion for and aptitude in STEM. As a complement to the traditional academic environment, out-of-school STEM programs provide youth with a safe place to fail and persevere. These programs also foster creative exploration in project-based learning environments, offering activities that relate to real-world experiences, which are needed in STEM careers.

While out-of-school providers alone cannot inspire the next generation in STEM, they can bring together schools and educational institutions, corporations and government to build greater capacity and support for innovative STEM programs. This model would also provide our nation's young people with access to cutting-edge technology and resources, as well as high-skill experts who can serve as mentors.

For this reason, Boys & Girls Clubs of America convened key stakeholders from higher education, government, corporations and nonprofit organizations at the STEM Great Think, the first national thought leadership forum to combine innovation and creativity with STEM programming in the out-of-school time environment. The purpose of the STEM Great Think was to develop a plan for establishing strategic partnerships that advance STEM education during out-of-school time, which will engage more underrepresented youth in these disciplines and set them on the path to successful careers.

We hope that you enjoy reading the resulting white paper from the STEM Great Think discussion on how out-of-school providers can inspire more underrepresented youth to become the innovators and problem-solvers of tomorrow. We welcome your feedback on the ideas outlined as this is only the beginning of an ongoing discussion to secure more strategic partnerships in STEM. You can reach us at [greatthink@bgca.org](mailto:greatthink@bgca.org).

Sincerely,



James L. Clark  
President and CEO  
Boys & Girls Clubs of America



Dr. Damon A. Williams  
Senior Vice President, Program, Training &  
Youth Development Services  
Boys & Girls Clubs of America



**Boys & Girls Clubs of America**

**GREAT THINK**  
STEM

**Great Thinks for Great Futures**

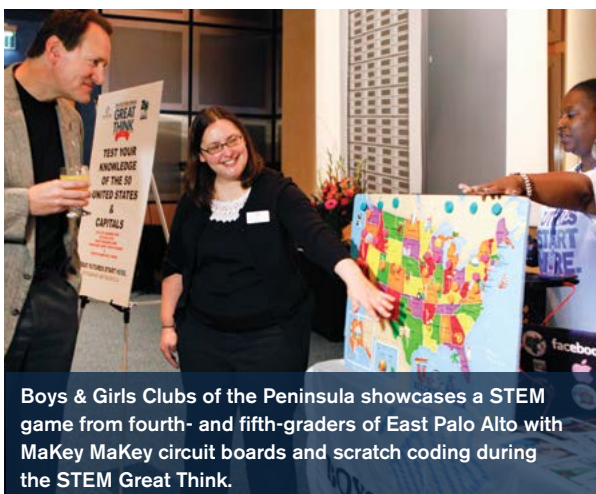
On July 31, 2014, Boys & Girls Clubs of America (BGCA), a national leader in expanded learning, launched the Great Futures Campaign—the Campaign for America’s Kids. The vision of this Campaign is to assure that success is within reach of every young person who enters Club doors, with all members on track to graduate from high school with a plan for the future, demonstrating good character and citizenship, and leading a healthy lifestyle.

The Great Futures Campaign has two primary goals:

- 1. Redefine the opportunity equation: School + Out-of-School = Great Futures.**  
Through advocacy and collaborative partnerships with public education, non-governmental organizations (NGOs), government agencies and the private sector, BGCA will amplify its collective voice to increase access and funds for critical out-of-school time (OST) programs.
- 2. Empower Clubs to serve more members, more often.**  
The Great Futures Campaign will help grow the capacity of more than 4,100 Boys & Girls Clubs to serve more kids and teens, and deliver increased impact through outcome-driven programs that foster globally competitive graduates, 21<sup>st</sup> century leaders and a healthier generation.



Robert J. Bach, retired president of Microsoft’s Entertainment & Devices Division and a member of BGCA’s Board of Governors, leads a panel discussion at the STEM Great Think with Dr. Michael Nettles of Educational Testing Service, Pat McCarthy of ExxonMobil Foundation, Dr. Damon A. Williams of BGCA and Babette Allina of Rhode Island School of Design.



Boys & Girls Clubs of the Peninsula showcases a STEM game from fourth- and fifth-graders of East Palo Alto with MaKey MaKey circuit boards and scratch coding during the STEM Great Think.

BGCA’s Great Think series is a part of the Campaign’s national thought leadership agenda. The series convenes key influencers and stakeholders to examine critical issues affecting America’s youth, such as meeting the increasing challenges facing military families; providing science, technology, engineering and math (STEM) educational opportunities to underrepresented youth; strengthening child protection and safety practices nationwide; and reversing the childhood obesity epidemic.

The series’ inaugural event, BGCA’s Military Great Think, was held in Arlington, Va., in September 2013. It was the nation’s first convening of military experts from the academic, business, government, media and nonprofit sectors to address the significant challenges facing

military youth. The STEM Great Think took place in May 2014 in Redwood City, Calif. Thought leaders representing higher education, government, corporations and nonprofit organizations joined the first national thought leadership forum to combine innovation and creativity with STEM programming in the OST environment. Two more events—discussions about youth safety and health—are planned for fall 2014 and spring 2015, respectively.

The purpose of convening the STEM Great Think was to develop a plan for establishing strategic partnerships to advance STEM education in the OST space, which will engage more underrepresented youth in these disciplines and set them on the path to successful careers. This white paper summarizes key insights from STEM Great Think participants; recommends actions that OST providers can apply to their work with youth across America; and outlines BGCA's position on advancing STEM education in Clubs nationwide.

## The Opportunity Gap in STEM Education

The global economy is quickly changing. Countries with high concentrations of STEM occupations are poised to innovate in areas that improve well-being and create long-term strength in their economies (Rothwell, 2013<sup>i</sup>). STEM jobs in the United States are growing nearly twice as fast as other fields (My College Options & STEMconnector, 2013<sup>ii</sup>). To meet the demands of the changing world, and develop the leaders of tomorrow, youth must have the necessary competencies and skills to pursue STEM degrees and careers. These skills extend beyond the content knowledge needed in the past (National Science Foundation, 2013<sup>iii</sup>); 21<sup>st</sup> century skills center on the ability to analyze data, think critically and solve problems in teams and as individuals. Cultivating youth with these types of skills requires an emphasis on STEM education paired with the breakthrough possibilities that come from the journey of ideas and exploration. Without this foundation, young people will struggle as they move through secondary and higher education, and ultimately enter the workforce.

Young people's ability to access high-quality STEM education and succeed in STEM careers is a national priority (President's Council of Advisors on Science and Technology, 2010<sup>iv</sup>). Among the high school seniors who took the ACT in 2013, only 23 percent expressed interest in STEM majors and fields (ACT, 2014<sup>v</sup>). Only half of the students who pursue STEM majors graduate with a STEM-related degree (Carnevale, Smith, & Melton, 2011<sup>vi</sup>). As a result, there is an estimated shortage of 1 million STEM graduates needed by U.S. industries over the next decade, according to the President's Council of Advisors on Science and Technology. It is essential to boost young people's confidence in these disciplines, so they can become the next great American inventors and problem-solvers.

Many underrepresented youth aspire to academic and career success. Unfortunately, there is a shortage of both interested and adequately prepared K-12 students in STEM subjects, especially among minority youth and young women (My College Options & STEMconnector, 2013). Thirty percent of African-Americans, Latinos and American Indians/Native Alaskans in the fourth grade tested below the basic proficiency in math, compared with 8 percent of Asian-American/Pacific Islander and 9 percent of Caucasian fourth-graders (Malcolm, 2012<sup>vii</sup>).

These gaps are attributable, in part, to a vast inequity of resources. African-American and Latino youth are less likely than other students to have access to advanced courses in math and science (Hill, Corbett, & St. Rose, 2010<sup>viii</sup>). Given this disadvantage, it is no surprise that these populations earn just 15 percent of STEM bachelor's degrees, 12 percent of STEM master's degrees and 8 percent of STEM

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*“The real challenge is getting our kids to understand careers in STEM exist—that you can see beyond what’s at the end of your own block and your own street.”*

**Pandit F. Wright**

*President & CEO, Boys & Girls Clubs  
of Greater Washington*

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doctorates (Malcolm, 2012). The opportunity gap must be closed, so more underrepresented youth can reach their potential in fast-growing STEM fields. All young people deserve the opportunity to compete in the 21<sup>st</sup> century economy.

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*“If I had to narrow STEM down to one focus, it would be math. In Wisconsin, you start seeing the inequity gaps in math as early as second and third grade.”*

**Jackie DeWalt**

*Executive Director, University of Wisconsin-Madison,  
PEOPLE Program*

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## THE ISSUE BY THE NUMBERS

- STEM jobs in the United States are expected to grow nearly twice as fast as other fields by 2018 (My College Options & STEMconnector, 2013).
- Among the high school seniors who took the ACT in 2013, only 23 percent expressed interest in STEM majors and fields (ACT, 2014).
- While 77 percent of middle-income 12<sup>th</sup> grade students scored at the “basic” level of proficiency or better in math, only 44 percent of low-income 12<sup>th</sup> grade students met basic math standards (National Science Foundation, 2011).
- Thirty percent of African-Americans, Latinos and American Indians/Native Alaskans in the fourth grade tested below the basic proficiency in math, compared with 8 percent of Asian-American/Pacific Islander and 9 percent of Caucasian fourth-graders (Malcolm, 2012).
- While African-Americans, Latinos and American Indians/Native Alaskans make up 27 percent of the U.S. population, these populations were awarded only about 15 percent of STEM bachelor’s degrees, 12 percent of STEM master’s degrees and 8 percent of STEM doctorates (Malcolm, 2012).
- Only 15 percent of female high school students express an interest in STEM fields, as compared to 40 percent of male high school students (My College Options & STEMconnector, 2013).

## Closing the Opportunity Gap: STEM Education During Out-of-School Time

BGCA's STEM Great Think focused on the unique role that the OST environment—after school and summer—plays in closing the opportunity gap within STEM education because the organization has successfully operated in this space for more than 150 years. While every aspect of students' *learning ecosystem* (school, family/peer support and community resources) is critically important to teach and find inspiration in STEM, OST plays an essential—yet often overlooked—role in engaging underrepresented youth in STEM subjects.

Research has shown that after school and summer learning actually advance STEM knowledge and increase interest in STEM-related careers (McCreedy & Dierking, 2013<sup>x</sup>). Roughly 8.4 million children participate in these programs each year, many from populations that are underrepresented in STEM fields and careers (Krishnamurthi, Ballard & Noam, 2014<sup>x</sup>). In fact, African-American, Asian-American and Latino households are most likely to participate in OST STEM programs (Change the Equation, 2012<sup>xi</sup>), and data from the Department of Education's 21<sup>st</sup> Century Community Learning Centers program suggest that girls attend after-school programs in equal numbers to boys (Krishnamurthi, Ballard & Noam).

As a complement to the traditional academic environment, OST STEM programs provide opportunities for trial-and-error. They give youth a safe place to fail and persevere, to excel through free-form learning in areas where they might be struggling. Youth learn 21<sup>st</sup> century skills that are not bound by discipline or evaluated by grades, increasing their passion and aptitude in STEM subjects. This point was made powerfully by one STEM Great Think participant who noted:

**“Youth are not coming to these spaces to rehash school. The OST space can complement or supplement school, but it cannot be ‘School 2.0.’ We must ensure that OST learning environments are spaces to inspire and engage youth. Youth don’t fail in creating. At the end of the day, we are inspiring and engaging youth to create something beautiful from their minds. When youth leave the OST space, they were able to communicate, collaborate and think critically through a process of creating. When we put this all together, that’s how we get innovation that we know is needed.”**

OST providers can enhance the development pathway from elementary school to higher education, providing youth with essential experiences in STEM from an early age. Programs are designed to expand young people's horizons during the elementary school years, connect them to passions during the middle school years and embrace mastery of STEM subjects during the high school years. They foster creative exploration and experimentation in a project-based and group-learning environment, using activities that relate to real-world experiences (Change the Equation, 2012) (Bevan, et al., 2010<sup>xii</sup>) (Agrawal & Donner, 2014<sup>xiii</sup>). This continuum of support sets the context for long-term STEM success—from school and OST programs to career and beyond.

Additionally, OST providers are unique in their ability to convene communities working to expand STEM learning. They are a natural connection point among K-12 schools, higher education institutions and employers, and a trusted partner to the public and private sectors. The nation needs OST providers like Boys & Girls Clubs to develop solutions and clear pathways for underrepresented young people to enter and succeed in STEM fields. Otherwise, the skills gap in America's emerging workforce will likely continue to widen. BGCA is ready to influence and support collective, national action on this important issue.



*“OST learning should be complementary to the school day. First, it can offer young people the opportunity to excel in areas where they might be struggling within the traditional academic setting. Second, OST can offer the space and programs to help young people explore STEM in areas of most interest to them.”*

**Leah Gutstadt**

*Senior Manager, Strategic Philanthropy, Time Warner Cable*



An innovative project at Boys & Girls Clubs of Venice uses underwater robots to teach STEM and prepare students for technical careers.



Two Boys & Girls Club youth attended the White House Science Fair and met STEM luminary Bill Nye as representatives of Time Warner Cable's Connect a Million Minds initiative. Both youth participate in BGCA's DIY STEM program, which is supported by Time Warner Cable.

## SPOTLIGHT

### Leading STEM Programs within the “Learning Ecosystem” of Youth Development

- Northwestern University and Boys & Girls Clubs of Chicago**—Through a partnership between Northwestern University and Boys & Girls Clubs of Chicago, youth work alongside scientist mentors each week in an after-school program called “Science Club.” After participating in this program, 100 percent of youth participants viewed science as important for their future careers.
- Techbridge**—In California, Techbridge, a girl-focused after-school and summer program, focuses on hands-on projects and career exploration. Following the program's completion, 81 percent of female participants envisioned themselves working in science, technology and engineering.
- NASA and Boys & Girls Clubs of Columbus**—In Ohio, middle school and high school age Club members participated in a robotics and coding program. As a result, the participating members competed in a national competition to create code that would move an actual NASA satellite.
- STEM Mobile Learning Lab**—The Institute for Advanced Learning and Research provides a STEM Mobile Learning Lab for K-12 students. The Lab has served more than 26,500 learners and is equipped with state-of-the-art equipment providing participants hands-on STEM experiences that inspire further exploration.

# Ingredients for Success: Positioning OST Providers to Expand STEM Learning

Participants in the STEM Great Think offered the following guidance for OST providers to inspire more underrepresented youth to become the innovators and problem-solvers of tomorrow.

## A. Develop Strategic Partnerships Across the Youth Development Ecosystem

There was consensus at the event that OST providers cannot inspire the next generation alone. It is through collaboration with cross-sector, STEM-rich partners that they can clear pathways for underrepresented young people to enter and succeed in STEM fields. These partners include science centers, museums and cultural institutions, colleges and universities, private sector organizations, government agencies, NGOs, national youth organizations and K-12 school districts (Dabney, et al., 2011<sup>xiv</sup>) (Afterschool Alliance, 2013<sup>xv</sup>). Together, they can provide expertise and resources on STEM subjects, curriculum assistance, funding and professional experiences for teens (Afterschool Alliance, 2013).

OST providers have an important role to play in convening these public-private partners and encouraging their investment in STEM education. BGCA envisions a model, with youth at the center, in which OST providers collaborate with schools and educational institutions, corporations and government to determine their collective impact on the issue. Providers like BGCA have the advantage of national reach and local impact; they can convene national discussions, like the STEM Great Think, and support Clubs in replicating the model locally. These discussions should include decision-making on governance and operation.

A collective impact strategy on STEM will only be as successful as the OST providers behind it. They must step into their role as conveners that can rally new and existing partners in support of America's youth. OST providers can lead public-private partners in discussion to identify gaps in service to underrepresented youth and develop high-quality programs to address them. Partners enter these collaborations with confidence, trusting the providers' long history and their standing relationship with them. They leave with a clear understanding of how community assets will come together in support of STEM education.

## B. Embrace the Identities of Digital Natives and Expand Access to Cutting-Edge Technology and Resources

It is clear that technology plays a major role in exciting youth about STEM and preparing them for success in related fields. Today's young people are *digital natives*, born into a world where technology is ubiquitous and their lives are, in many ways, defined by their interactions with computers, handheld devices, social media and video games (Palfrey and Gasser, 2008<sup>xvi</sup>). They are a different generation, programmed to interact and engage in dynamic learning environments, where they can access information, move at their own pace, communicate socially and find purpose in what they are doing. This generation is vastly different from older generations of what some have referred to as *digital immigrants*, who are teaching themselves how to use technology in ways that are neither intuitive nor natural.

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*“The great part about OST programs is the opportunity to instill in youth that they can own their own learning pathway.”*

**Naomi Davidson**

*Education Partnerships, Higher Education, Khan Academy*

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Technology can be a means of harnessing the passion and interests of youth and introducing them to STEM-centered learning experiences in a fun and informal setting. This is not to suggest that OST providers have unlimited access to cutting-edge technologies and resources. Rather, it is the responsibility of these organizations to embrace the reality of digital natives and curate the best available technologies that can be incorporated into programming and scaled to youth across the country, whether online videos, mobile applications, games, social media channels or 3-D printers.

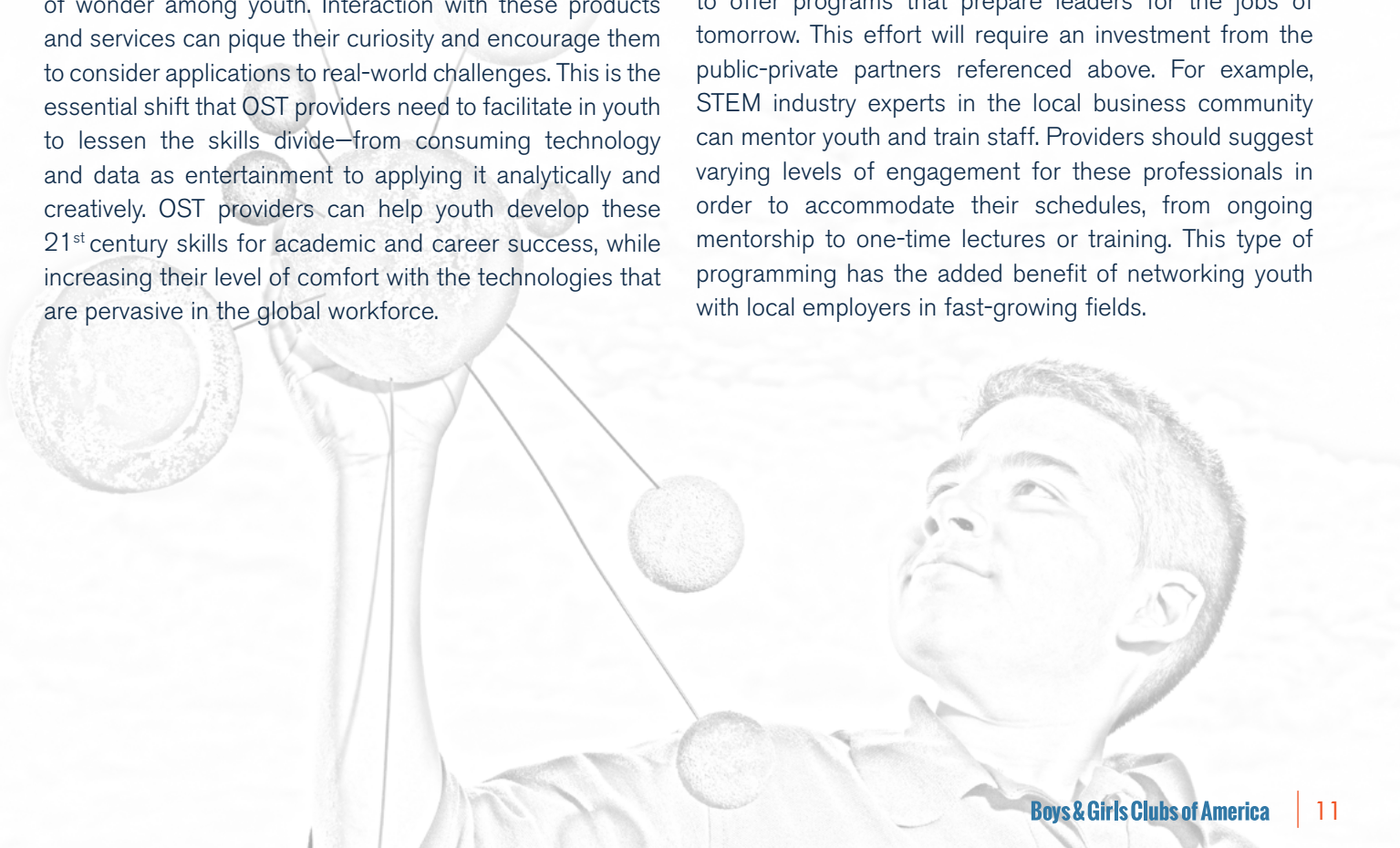
In addition to these tools, providers have at their disposal an array of free virtual learning and mentoring resources online, whether through the Khan Academy or another content provider. These resources are fundamentally changing the way young people learn about STEM subjects by providing extra challenges, videos and assessments, and enabling them to advance through lessons at their own pace. Online resources are also enhancing the OST environment, supplementing national and local programming with high-quality educational experiences.

The introduction of new technologies can develop a sense of wonder among youth. Interaction with these products and services can pique their curiosity and encourage them to consider applications to real-world challenges. This is the essential shift that OST providers need to facilitate in youth to lessen the skills divide—from consuming technology and data as entertainment to applying it analytically and creatively. OST providers can help youth develop these 21<sup>st</sup> century skills for academic and career success, while increasing their level of comfort with the technologies that are pervasive in the global workforce.

### C. Invite High-Skill STEM Volunteers and Experts to Become Part of the OST Community

Widely recognized at the STEM Great Think was the need for OST providers to train and mentor youth and staff for success in STEM education. Participants spoke of the importance of creating a high-skill volunteer model that would bring stronger STEM/technical/quantitative abilities to OST environments. They also talked of a need to leverage the undergraduate and graduate students and faculty of neighboring colleges and universities, as well as creating a powerful network of engineers, scientists, social media experts, graphic designers, physicians, pharmacists and others to become involved with OST providers, particularly Boys & Girls Clubs. The involvement of these high-skill volunteers is essential to developing a labor force that can handle mathematics and scientific concepts that may rest outside of the comfort zone and skill set of many youth development professionals.

Only when both parties are comfortable with the subject matter and related technology will OST providers be able to offer programs that prepare leaders for the jobs of tomorrow. This effort will require an investment from the public-private partners referenced above. For example, STEM industry experts in the local business community can mentor youth and train staff. Providers should suggest varying levels of engagement for these professionals in order to accommodate their schedules, from ongoing mentorship to one-time lectures or training. This type of programming has the added benefit of networking youth with local employers in fast-growing fields.





There is power for youth in meeting leaders who come from similar backgrounds, whether professionals or peers, who can demonstrate how they made a successful journey into STEM careers. The role models and mentors who partner with youth in OST STEM programs are especially influential for engaging minority youth and girls in STEM fields (Afterschool Alliance, 2013). This is where the education institution partners referenced earlier can add value. Colleges and universities should offer faculty and students to mentor and train local youth, akin to what was suggested for STEM professionals. The added benefits of these partnerships are the opportunities for youth to interact with role models and familiarize themselves with the higher education environment; both experiences can motivate underrepresented youth to pursue higher education and compete in the workforce.

In-person interactions and trainings are important for staff as well. OST providers are staffed by individuals with deep experience in youth development, but who are not necessarily conversant in modern technology and STEM disciplines. If youth sense that staff is uncomfortable, it can have the ripple effect of reinforcing their discomfort in those areas. Trainings by local professionals, whether ongoing or one-time, would serve to increase staff confidence in their ability to implement STEM programming effectively. This type of professional development has been shown to improve staff's ability to facilitate inquiry-based science learning, even for those without STEM experience (Afterschool Alliance, 2013) (Agrawal & Donner, 2014). Well-trained staff will be eager to implement related programs and share their aptitude with youth.

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*“Club staff should be educated and comfortable in STEM because they can serve as a barrier to kids’ understanding. It’s not just educating young people that STEM is a viable career option.”*

**Tracy Baumgartner**

*Executive Director of Community Investment and Senior Vice President, Comcast Foundation*

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## BGCA’s Response

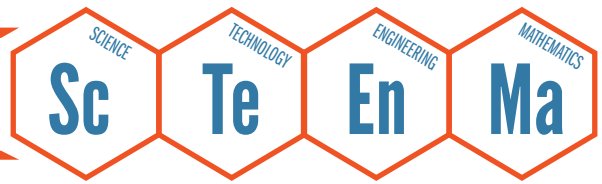
### A. Introduce iSTEM

At BGCA, innovation and creativity form the foundation for our youth development strategy. It is the connective tissue between the science, technology, engineering and math fields, not bound by discipline, or a specific way of thinking and learning.

Called “iSTEM,” our cross-disciplinary approach channels young people’s natural curiosity into the design process inherent in the arts, empowering them to create new solutions to real-world challenges. This project-based approach develops critical thinking, problem solving and other 21<sup>st</sup> century skills critical to success in the STEM workforce and beyond. By introducing design concepts in technical arenas, we help young people to find their voice, make connections with their peers and push the boundaries of what is possible. Rather than isolating content, our vision is to develop STEM skills holistically, spurring innovation and creativity.

By way of example, we recently worked with Disney to develop and pilot the Big Idea Labs in select Boys & Girls Clubs across the country. Leveraging the curriculum and replicating the environment developed by Boston’s renowned ArtScience Prize program, which was founded by Harvard University Professor David Edwards, Big Idea Labs are year-round innovation programs led by paid mentors that foster creative thinking and apply STEM-based classroom content to real-world issues. Reaching high school students through a weekly program, the Big Idea Labs build 21<sup>st</sup> century skills through project-based learning and interdisciplinary activities. The 2013-14 ArtScience Prize curriculum theme was “Energy of the Future,” encouraging big art and design ideas that bring energy to the world today. This year’s participants from Boys & Girls Club of Burbank and Greater East Valley came up with ideas to develop heat energy from bumblebees and capture energy from wastewater by placing a small turbine in household drains.





## B. Leverage STEM-Related Content Providers

Key to our innovation strategy is the ability to connect Clubs with content providers. These tend to be online resources that strengthen the ability for Clubs to create youth-driven learning opportunities in STEM, like the Khan Academy example referenced earlier. Content partners also include institutions like the U.S. Navy, Connecticut Science Center and Smithsonian Institution that develop online STEM curricula and possess impressive digital holdings for incorporation into OST programming.

We envision a Club Experience in which youth watch Sally Ride Science® videos of STEM professionals explaining their career trajectory, take virtual field trips with Google or submit a question to an industry leader from Dell to be answered on Twitter. In addition to driving awareness and interest in the jobs of tomorrow, the content provided by partners must emphasize computational mastery since math is critical to success in STEM. For this reason, BGCA is developing a focused agenda on computational mastery to enhance

the quantitative comfort of Club youth. This is an area that is largely ignored by many OST providers, but must be fundamental to create a new generation of STEM leaders.

The role of BGCA as a connector is as necessary for coordinating content providers as it is for convening public-private partners. After all, it is up to the organizations curating and utilizing STEM educational content to identify gaps in existing resources, suggest areas of improvement and recommend new content that develops 21<sup>st</sup> century skills like adaptability, innovation and creativity. Content providers want to develop materials that will benefit the widest population possible; through partnership with BGCA and support for our innovative youth development strategy, their resources have the potential to be utilized by nearly 4 million youth in more than 4,100 Clubs across the country and on military installations worldwide.

## 5 WAYS TO ENGAGE AS A STEM PARTNER

### Encourage volunteerism at a local Boys & Girls Club as an expression of corporate social responsibility.

STEM experts can be excellent mentors to Club youth after school and during the summer, showing them pathways to success. Expert-in-residence programs, serving as a tutor, volunteering to lead a STEM-related learning activity or training Club staff, can be invaluable in supporting a Club's ability to inspire, excite and prepare young people for careers in STEM.

### Welcome Boys & Girls Club youth into spaces where STEM skills are being applied professionally.

This might include exploratory visits to local research and design facilities, computer animation studios, science museums and industry and industrial complexes where STEM skills are being used in real-world situations.

### Establish real-world internship experiences where Boys & Girls Club youth can have building-block experiences in STEM careers.

This might include paid or unpaid internships or job shadowing experiences where Club members are given an opportunity to engage in immersion

experiences that allow them to gain the knowledge, skills, abilities and credentials associated with a particular career field or industry.

### Expose Boys & Girls Club youth to multicultural STEM professional organizations and societies.

One of the most powerful ways to create this type of connection is by partnering with local and national chapters of organizations like the National Association of Mathematicians, Society of Hispanic Professional Engineers, National Society of Black Engineers, Graduate Women in Science, American Indians in Science and Engineering and other professional organizations whose chapters are commonly found on college and university campuses and in many communities.

### Establish targeted partnerships with STEM faculty and students at neighboring institutions of higher education.

These partnerships can be game-changing for many Clubs, creating a long-term relationship that yields a steady stream of talented and motivated young people and experts with an ability to demystify and strengthen interest in STEM fields.

### C. Change Young People's Relationship with Technology

The earlier section on incorporating cutting-edge technology made the case for putting new products and services into the hands of our youth, particularly during OST when time is less structured, yet still supervised, and exploring new technologies is permitted. It also discussed the need to shift our youth from consuming technology to applying it to real-world challenges. Still, there is yet another shift that BGCA is making at Clubs. We are encouraging youth who are excited by technology to ask questions about what is behind or underneath their favorite applications. We want to train young people to analyze the challenges in their communities and create their own technologies and innovations to address them.

This latest shift—to empower youth to become the makers and drivers of technology—is something we are implementing across the development pathway. Our friends at Discovery Education gave the example that, in a kindergarten lesson about colors, we might take the opportunity to show a video of a color scientist who worked with mathematicians to develop formulas for the various shades of blue. Those individuals, staff will explain, are responsible for the blue colors we see on the television at home. We want to instill this kind of curiosity in our youth during the elementary school years, help them connect it to passions and problems in middle school, and teach mastery of math and science concepts and skills during high school. It is through this STEM continuum that we are cultivating the next generation of innovators in our Clubs.

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*“It’s important to help kids understand what’s underneath the everyday things that they love: what’s underneath the games, the apps and the device. It’s math. It’s engineering. It’s design thinking.”*

**Colleen Cassity**

*Corporate Citizenship Director, Oracle*

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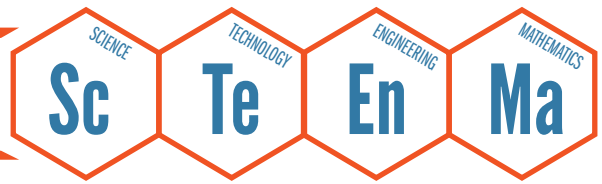
### D. Develop an OST STEM Learning Framework

BGCA is committed to developing a STEM learning model that is highly complementary, yet distinctive from the traditional school day and year. Put simply, Clubs cannot be “School 2.0,” but rather, we want to provide an authentic OST approach to STEM learning that leverages our unique DNA as an organization. Our approach is highly team-centered, real-world focused and supplementary to the school day and academic year. As a result, our STEM strategy is deployed in a variety of ways.

First, we must create a STEM youth development approach that puts Club members on a continuous developmental journey that may begin as early as 6 years old and continue through high school graduation. This builds off Clubs’ ability to establish an ongoing developmental approach to enhancing exposure, awareness and skills development of youth. Indeed, our ability to start early and create an ongoing process of working with Club members throughout their childhood, adolescence and teen years is one of the greatest competitive advantages of our facilities-based, membership-centered and community-located youth development approach, which strengthens the academic and leadership abilities of our youth.

Another hallmark of our approach is an emphasis on 21<sup>st</sup> century skills development through project-based learning, in which youth are tasked with finding innovative solutions to real-world challenges in small working teams. Project-based learning is an educational method in which students gain knowledge and skills by working for an extended period of time to investigate and respond to a complex question, problem or challenge (BIE, et al<sup>[xvii]</sup>). At the core of the project-based learning experience is a focus on real-world issues, asking driving questions, working as a team, choosing pathways to solve problems and ultimately creating solutions.

One example of BGCA’s project-based learning approach, which is also focused on STEM, is our Summer Brain Gain program. Summer Brain Gain was pilot tested in 2013 at more than 200 Clubs and expanded to more than 1,200 Clubs in 2014. Participants in the pilot program



experienced no learning loss, and some Club members made gains, especially in vital 21<sup>st</sup> century skills like critical thinking.<sup>xviii</sup> Supported in part by Disney, the Summer Brain Gain program is made up of one-week modules built around hands-on, themed projects for elementary, middle and high school students. Youth work in teams to solve challenges issued at the beginning of the week and engage in fun activities culminating in final presentations or productions at the end of the week.

We can take programs like this a step further by directly engaging local STEM professionals recruited through public-private partnerships. Clubs should invite industry experts to mentor youth working on Summer Brain Gain modules—or similar project-based learning programs—and evaluate their presentations at the end of the week. Interaction with these individuals will expand young people’s horizons and deepen their knowledge of STEM content. At the same time, this co-teaching model will help to build the confidence of staff leading program implementation.

We hope that STEM professionals who learn about our strategy will be inspired to lend their expertise, experience and time—forming a core of skilled volunteers serving Clubs across the country.

### E. Reimagine Club Spaces as “Centers of Innovation”

Boys & Girls Club spaces are among our biggest assets for expanding STEM learning during OST. With support from our partners, we are reimagining Clubs as “Centers of Innovation” across the country to reflect our emphasis on innovation and creativity. It is no longer sufficient for Clubs to have dedicated technology rooms with yesterday’s equipment. Today’s Clubs should infuse modern technology into every learning space—from classrooms stocked with e-books to high-tech fitness equipment to laboratories designed to spur creative thinking. We are actively experimenting with new technologies and implementations, and scaling best practices to as many Clubs as possible.

## FEATURED STEM PROGRAMS OFFERED AT BOYS & GIRLS CLUBS

| PROGRAM                  | PARTNER                  | OVERVIEW  |
|--------------------------|--------------------------|---|
| My.Future                | Comcast and NBCUniversal | Launched a digital literacy initiative to help BGCA transform the way youth experience technology in the Club. This next-generation technology initiative personalizes the program for each member through engaging project-based activities.   |
| Big Idea Labs            | Disney                   | Piloted the Big Idea Labs in select Boys & Girls Clubs to reach high school students through a weekly program, leveraging the curriculum and replicating the environment developed by Boston’s renowned ArtScience Prize. Big Idea Labs are year-round innovative programs, led by paid mentors who foster creative thinking and apply STEM-based content to real-world issues. |
| Great Futures in Science | NASA                     | Developed a year-round, project-based STEM program to challenge Club youth to solve social or other relevant causes that are specific to their communities as they learn the fundamentals of robotics.  |
| Building Blocks          | Samsung                  | Created a new STEM-enrichment program with Scholastic on Samsung tablets to help kids ages 10-13 develop engineering-based solutions for their communities’ needs and learn about possible careers in STEM. Also, Samsung transformed select Clubs’ learning spaces into state-of-the-art Tween Tech Centers with the latest mobile technologies.                               |
| DIY STEM                 | Time Warner Cable        | Developed an 8-week program to engage Club tweens and teens in the “science of every day,” including lessons in energy & electricity, engineering design and food chemistry, as part of Time Warner Cable’s Connect a Million Minds initiative.   |

To inspire kids' curiosity in STEM and bridge the opportunity gap by providing technology access to underrepresented youth, our friends at Samsung are enabling us to build state-of-the-art Tween Tech Centers at select Boys & Girls Clubs. Club youth—along with TV personality and celebrity designer Carter Oosterhouse—transformed these learning spaces to facilitate engagement with the latest mobile technologies. Additionally, Clubs are receiving custom curriculum and e-books from Scholastic on Samsung tablets. The new curriculum, Building Blocks, challenges youth to develop engineering-based solutions for their communities' needs through gamification techniques to inspire future careers in STEM.

Last year, Disney helped us transform five Boys & Girls Club spaces into Big Idea Labs, as previously highlighted. Youth engage in year-round, project-based creativity programming with guidance from skilled mentors. We are actively working to expand these programs and develop less intensive adaptations that can serve more youth, more often.

## F. Expand STEM Learning Over the Summer

At BGCA, we see a monumental opportunity to expand STEM learning over the summer. Each summer in America, an estimated 43 million kids (3 in 4) miss out on expanded learning programs (Afterschool Alliance, 2010<sup>xix</sup>), putting them at a disadvantage before the school year starts. Students lose about two months' worth of math skills during the summer, but low-income youth also lose more than two months' worth of reading skills (Cooper, et al., 1996<sup>xx</sup>). Summer learning losses can stack up each year, causing many underrepresented youth to fall further and further behind, ultimately endangering their chances of high school graduation. Nationally, these issues also have economic implications, costing as much as \$209 billion in lost taxes and higher government expenditures over the lifetimes of those who fail to graduate (Columbia University, 2007<sup>xxi</sup>).

BGCA is committed to ensuring that America's youth, especially those who need us most, graduate from high

school on time with a plan for the future. We launched the Summer Brain Gain program to fight the detrimental effect of summer learning loss. As highlighted previously, the program is made up of one-week modules built around hands-on, themed projects for elementary, middle and high schools students. While the average low-income U.S. student lost at least two months of learning last summer, the average Summer Brain Gain participant did not. Moreover, some Club members experienced gains—especially in vital 21<sup>st</sup> century skills, like collaboration and critical thinking.

As noted previously, Summer Brain Gain is one example of how we are working to help close the opportunity gap in STEM among underrepresented youth. Our goal is to keep kids on track for the coming school year by focusing our summer programming mainly on STEM education. Summer provides an opportunity to focus more on STEM subjects because youth are less likely to be distracted by competing academic priorities.

Our summer programming is designed to engage youth across the development continuum from ages 6 to 18. By providing opportunities for STEM learning, year after year, we are developing knowledge and nurturing talent in subjects like math and science. Youth who engage in our programs during the summer, and experience gains in 21<sup>st</sup> century skills, are more likely to become long-term members. We seek the opportunity to guide them on the path to Great Futures.

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*“To inspire kids in STEM, show them what careers are possible. STEM does not necessarily mean being a scientist in a white lab coat. It’s important for kids to understand the full range of career options, so when young people are asked what they want to do when they grow up, the answer extends beyond professional athlete. They want to design video games, for instance.”*

**Pat McCarthy**

*Executive Director, ExxonMobil Foundation, and Manager,  
Corporate Citizenship, ExxonMobil*

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## From Great Think to Action Plan: The Next Steps

In response to input from STEM Great Think participants, BGCA will meet with our STEM Advisory Council to develop an outcome-driven plan for securing strategic partnerships that advance “iSTEM” education in the OST space, which will engage more underrepresented youth in these disciplines and set them on the path to successful careers. This plan will execute the recommendations summarized in this white paper.

The conversation about STEM must continue, especially among the many organizations that have expressed the desire and ability to collaborate. BGCA encourages all participants to expand the scope of dialogue by bringing more interested parties into the mix. As we begin our work with the STEM Advisory Council, feedback from participants and all interested parties is encouraged. You can reach us at [greatthink@bgca.org](mailto:greatthink@bgca.org).

With more strategic partnerships, access to cutting-edge technology and resources, and STEM programs with innovation and design thinking, Boys & Girls Clubs will help young people find their voice, make connections with their peers and be prepared for the jobs of tomorrow—as School + Out-of-School = Great Futures.



Jeffrey O. Henley, chairman of Oracle Corporation and a member of BGCA's Board of Governors, delivers opening remarks at the STEM Great Think.



Boys & Girls Club of Fitchburg and Leominster's Donata Martin, left, and Comcast Foundation's Tracy Baumgartner, center, participate in a roundtable discussion on the role that OST providers play in stimulating young people's interest in STEM.



Pat McCarthy

Dr. Damon Williams

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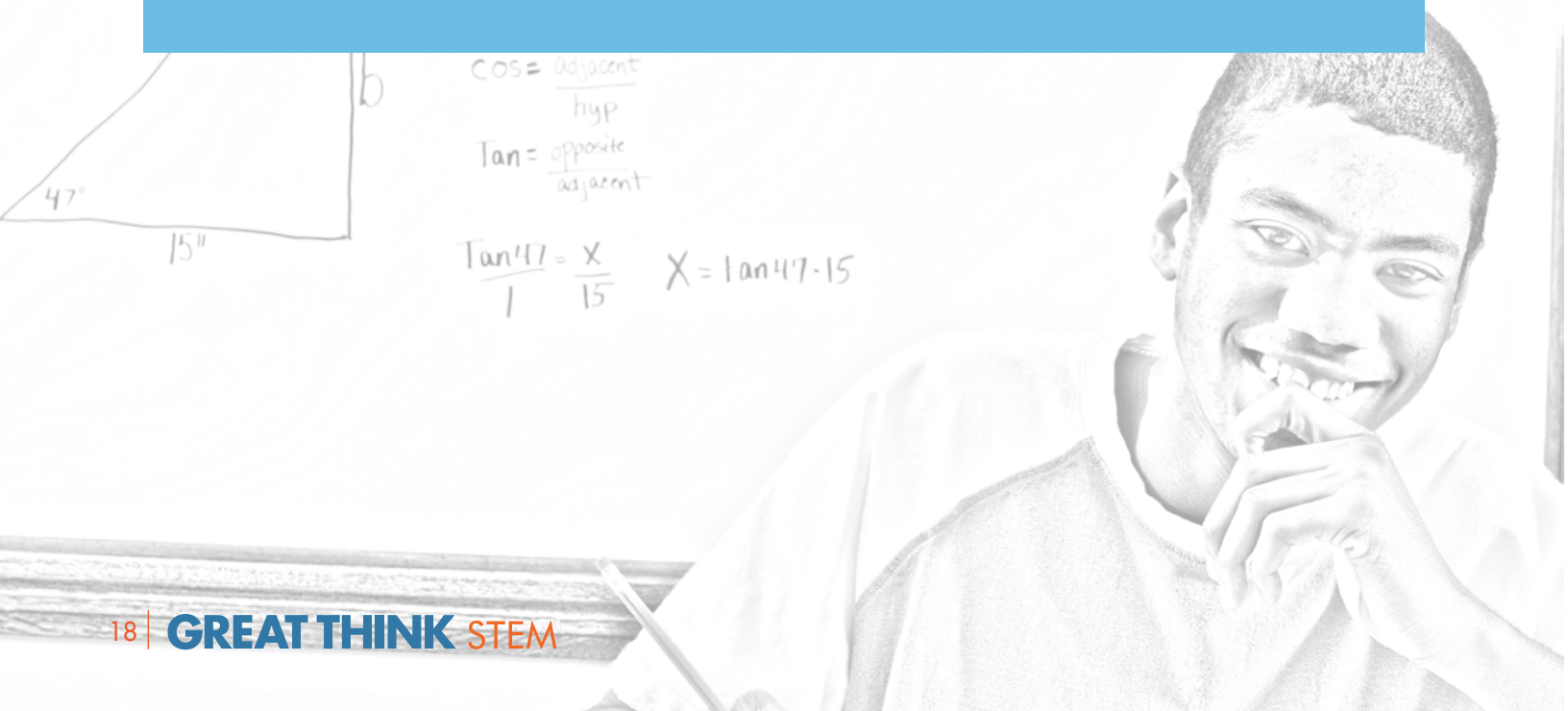
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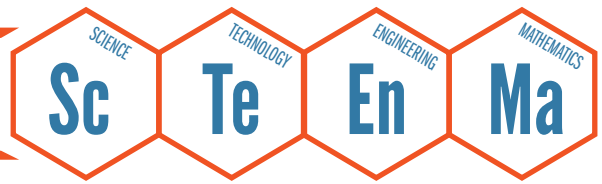
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