AfterSchool Today

The Official Publication of the National AfterSchool Association/naaweb.org | Spring 2013

THE STEM ISSUE

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Inspiring Minds STEM Program

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STEM Education for Girls

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AfterSchool Today

Volume 4 Issue 1

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fromtheexecutivedirector

Gina Warner
Executive Director, NAA
gwarner@naaweb.org

I came across an article a few months back that really got my attention. The headline? "Survey Shows Parents Would Rather Talk Drugs than Science or Math." The key finding of the survey was: While parents may recognize the importance of math and science, they are unable to engage with their children around these subjects due to limited understanding of the topics and scarcity of resources to help. As a parent myself, I could absolutely identify with that!

The article really got me thinking about how we, as afterschool professionals, feel about talking to the students in our programs about STEM—the science, technology, engineering, and math subjects getting increased attention from funders, policymakers, business partners, and the education community. Are we integrating STEM into our programs? Are we finding the resources we need to ensure our STEM programs are high-quality? Are we engaging a variety of community partners to help us in this mission?

In this issue of *AfterSchool Today* you will find an amazing array of information on STEM. You'll hear not only from the leaders in the field, but also from the program providers on the front lines who are using STEM to excite and inspire their students, building their knowledge and skills, and encouraging them to consider degrees and careers in the STEM field. From a 4-H nature program in Arizona, to the Girlstart program in Austin, to a STEM mentoring project in New York City, we guarantee you will be inspired and excited and—hopefully—a little more confident in talking to your afterschool students about STEM.

Go to *http://www.wired.com/geekdad/2012/10/survey-shows-parents-would-rather-talk-drugs-than-science-or-math-2/* if you would like to read the full article I reference above. Maybe it's time we borrowed a page from drug prevention friends and launched a "This is your brain. This is your brain on STEM." campaign!

Until next time …

Gina Warner
Executive Director
National AfterSchool Association

P.S. Check out our new Resources page (to the right), where we've collected some great STEM-related info for you! We're excited to make this page a regular *AfterSchool Today* feature. Designed to give you a handy reference page for the topic at hand, we hope you'll find it a valuable tool in your day-to-day work!

VISIT:WWW

Read more about the people, products, and programs featured in this issue of *AfterSchool Today*!

stevespanglerscience.com

creatinginnovators.com

AfterSchoolScience.org

http://www.afterschoolalliance.org/STEM_Outcomes_2013.pdf

http://www.stemfinity.com/STEM-Education-Grants

summerlearning.org/stemresources

http://www.goodshepherds.org/

http://www.tascorp.org

http://www.horizoneductioncenters.org/

neighborhoodnatureclubs.arizona.edu

BGCAA.org

ImmersionLearning.org

FirstLEGOLeague.org/mission/support

IXL.com

PiggyBank.disney.go.com/about

Labyrinth.thinkport.org

OTHER GREAT STEM RESOURCES

The National After School Science Directory is a searchable database designed to increase access to high-quality science, technology, engineering, and math (STEM) education beyond the classroom for youth and families across the nation. The directory houses thousands of STEM opportunities, submitted by science centers, museums, schools, and other youth-serving organizations.
http://afterschoolscience.org/directory/index.php

Change the Equation hosts a database of programs that deepen young people's science, technology, engineering, and mathematics learning.
http://changetheequation.org/improving-philanthropy/stemworks

Afterschool Alliance STEM Funding Tool Kit
http://www.afterschoolalliance.org/STEM-FUNDING.CFM

Advocacy Kit "Making the Case for STEM Afterschool"
http://www.afterschoolalliance.org/STEM-toolkit.cfm

National Girls Collaborative Project focuses on supporting girl-serving STEM programs across the country with webinars, newsletters, and even mini-grants.
http://www.ngcproject.org/resources

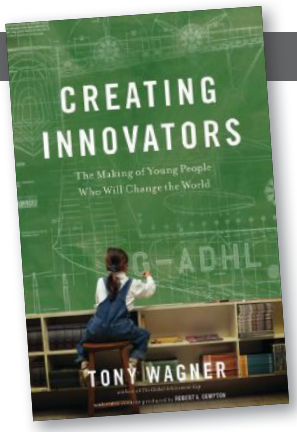
4-H STEMconnector is a one-stop shop for STEM information.
http://www.stemconnector.org/4H

BLOGS TO FOLLOW

AFTERSCHOOL SNACK
http://www.afterschoolalliance.org/afterschoolsnack/ASnack.cfm?idSection=8

COALITION FOR SCIENCE AFTERSCHOOL
blog http://scienceafterschool.blogspot.com/

THE OST PROJECT-BASED LEARNING BLOG
A resource for out-of-school time and afterschool providers interested in the project-based learning instructional method. A lot of STEM posts!
http://ostprojects.wordpress.com/



CREATING INNOVATORS:
THE MAKING OF YOUNG PEOPLE WHO WILL CHANGE THE WORLD

By Tony Wagner

FOR YOU AND YOUR PROGRAM:

Creating Innovators, produced by education expert and author Tony Wagner and documentary filmmaker Robert Compton, is itself innovative: The book employs Microsoft Tags (a Quick Response codes variation) to direct the reader to websites, brief videos involving innovators or innovative schools, and other content-enhancing materials.

Wagner interviewed more than one hundred fifty people while exploring how adults—parents, educators, and others—could nurture young peoples' creativity and imagination, teach them to learn from failure and move forward, and help them to become innovators: "So if we are to remain globally competitive in today's world, we need to produce more than just a few innovators and entrepreneurs. We need to develop the creative and enterprising capacities of our students."

Wagner's research, focused strongly on individuals who perform highly innovative work in STEM fields or are engaged in social innovation and entrepreneurship, showed that creative activities in childhood led to passionate interests and, later, an intensity for career goals and life decisions. Play, passion, and purpose are the forces that drive young innovators. Wagner also took a broader look at education, and considers how educators could apply this knowledge and how parents could help compensate where schooling may lack. The book introduces the reader to compelling young American innovators (such as the product manager for the first Apple iPhone), and to forward-thinking U.S. schools, colleges, and workplaces whose educators and employers collaborate and use interdisciplinary problem-solving and intrinsic motivation to develop innovation cultures.

Creating Innovators creates a change in how people view schools and workplaces, and offers guidance on creating future change makers.

Learn more at tonywagner.com and creatinginnovators.com

NAKED EGGS AND FLYING POTATOES:
UNFORGETTABLE EXPERIMENTS THAT MAKE SCIENCE FUN

By Steve Spangler

FOR YOUTH:

Naked Eggs and Flying Potatoes is not your everyday science experiment book: It's a geek-chic look at the latest crop of tricks and tantalizing do-it-at-home activities from author, professional speaker, science teacher, television personality, and toy designer Steve Spangler, who reveals the secrets of science in fun and unexpected ways. The book's matter of fact manner, humorous writing, and fabulous photographs set it apart from others, and its step-by-step instructions and simple explanations make it easier to discover how and why the featured activities work.

Spangler, creator of A Huge Soda Mess, offers a clever, entertaining approach to science that entices youth and adults alike. His amazing experiments are fun, easy, and inexpensive, and involve common, accessible items—no complicated lab equipment or hard-to-find chemicals required! Could you be the force behind Floating Ping-Pong Balls and Flying Toilet Paper? Ever wonder about the old Straw Through Potato trick? Would you like to learn about Bubbling Lava Bottle, How to Make a Folding Egg, Flying Potatoes, Glacier GAK, Naked Eggs, Nails for Breakfast, Quicksand Goo, Screaming Balloon, Soap Soufflé, or Taco Sauce Penny Cleaner? So do students everywhere!

Naked Eggs and Flying Potatoes is a great interactive resource for your afterschool program. The 160-page softcover book offers guidance on how to experiment safely, and features 248 color photographs to help spark interest in science and guide youth through the delightful experiences within.

Learn more at stevespanglerscience.com

the coalition for
science after school

One Size Does Not Fit All

DEVELOPING SCIENCE PROGRAMMING THAT'S RIGHT FOR YOU

BY ERIKA FIFELSKI

When afterschool coordinators relate science education with memorizing facts, figures, and complicated processes associated with laboratory work, it's no wonder students are wary. The Coalition for Science After School, based in Berkeley, California, is expelling these intimidating notions and proving science could be fun, once and for all—not to mention easy to implement into any afterschool curriculum.

Since 2004, Coalition Executive Director Carol Tang has been working to bridge museums, corporations, schools, and out-of-school time learning in an effort to introduce customized science programming for students across the country. The knowledge is out there. And with the coalition's help, streamlining the jargon and making resources user-friendly for schools makes this oft shied away from programming more accessible and less daunting to schools. In addition to bringing together communities, the coalition aims to disseminate information—ensuring it is distributed to all levels of learning—and set an agenda of best practices for captivating youth in scientific understanding. Instead of reinventing the wheel, the coalition focuses on "what things we already know, so we can move forward in the best way to think about engaging youth in this environment," Tang said.

Tang believes science education in out-of-school time is essential. But according to the latest studies, less than twenty-five percent of parents surveyed said their children are engaged in afterschool science education. "It could be that there is a worry that afterschool might not be able do to it," Tang said, "but the message of the coalition is, if you are good at engaging youth, you can do this for science as well."

The coalition puts tools in educators' hands in ways that specifically relate to each program. Think of what interests your students, Tang said, and incorporate science into it. Do your students enjoy a local park? Bring them there for a park study, during which they examine the different varieties of trees. By registering with the coalition, educators could receive e-newsletters that include tips on how to best equip their afterschool programs with science activities and opportunities for students. The coalition's website is also a wealth of knowledge for getting started with science curriculum.

You don't have to be a science whiz to succeed at this, Tang notes. In fact, "it might be better to have a nonexpert trying to engage kids in science. Science is about what you don't know about the world, and asking questions about it." Afterschool providers who are learning right along with their students explore science side by side, and "that might be an inspiration for them to want to learn more and engage more," Tang said.

There are more than four thousand organization individuals on board with the coalition who believe lessons in science outside of the classroom could advance students through every subject area. Recently, the coalition's work with 826 National is incorporating science into creative writing exercises. By connecting creative writing to science, educators could see that a science curriculum seeps into many areas of learning. "The creative writing program uses hands-on inquiry science to inspire kids to write," Tang said. "Observing is a good science skill, and it helps with being a good writer." Children who are inspired by science become better problem solvers, are more creative, and understand the world around them.

Tang hopes that all out-of-school time educators will adopt some form of science education curriculum, which is precisely why the coalition continues to equip the nation's afterschool programs with the knowledge of how fun, essential, and beneficial science education could be for students. •

For more information about introducing science into your afterschool program, visit AfterSchoolScience.org.
Find out more about science-focused creative writing workshops on YouTube: https://www.youtube.com/watch?v=C1j38Flu184

EXPANDING HIGH-QUALITY INFORMAL STEM EDUCATION: FINDINGS FROM A NATIONAL DEMONSTRATION

BY NINA AGRAWAL AND JULIANNE KANTER

High-quality STEM learning opportunities and a pipeline to STEM careers remain out of reach for many young people, especially in under-resourced schools. Out-of-school time programs in urban communities are particularly well-positioned to help address the STEM education crisis. These programs serve large numbers of low-income and minority students, both of which are traditionally under-represented in the STEM fields. Moreover, with low student-to-staff ratios, an emphasis on hands-on and project-based learning, and opportunities for positive interactions with adult role models, these programs help students develop their math and science abilities and cultivate other twenty-first-century skills, including teamwork, problem-solving, creativity, and persistence.

Unfortunately, high-quality informal STEM education is not yet happening at scale. Science has not been adopted by afterschool programs to the extent that art, music, and physical activity have. In addition, front-line staff members face significant obstacles to effectively implementing informal science education, including lack of buy-in at the managerial level, inadequate comfort in content, insufficient training, and a lack of materials. To address the STEM gap in expanded learning programs, students, educators, and other stakeholders must come to expect high-quality STEM education in afterschool, and front-line staff must be accordingly supported with professional development.

Over the past three years, with the generous support of the Noyce Foundation, the Collaborative for Building After-School Systems (CBASS) and TASC have undertaken a national effort to expand the demand for and delivery of high-quality informal science education. The Frontiers in Urban Science Exploration (FUSE) initiative, informed by the work of TASC, consists of a "grasstops" strategy that engages program and city leaders, funders, and other stakeholders to increase demand and capacity for informal science education; and a "grassroots" strategy aimed at increasing the interest and confidence of the afterschool workforce in delivering STEM learning activities. To date, the initiative has supported demonstration efforts in Baltimore, California's Bay Area, Boston, Chicago, Palm Beach County, and Providence. Each grantee, an afterschool intermediary organization, has adhered to the core elements of the FUSE model while also adapting the strategy to respond to local need.

Evaluations of the FUSE program thus far demonstrate significant effects to instructional confidence and student knowledge, as well as ongoing challenges such as a persistent gender gap and difficulty sustaining programs. The evaluations were conducted by TASC research staff using data collected through interviews, observations of activities, and pre- and post- student and staff surveys (collected before and after program participation).

Key findings from the 2011-2012 FUSE evaluation include:

EXPERIENCE AND TRAINING INCREASE CONFIDENCE IN STAFF WITH NO PRIOR STEM BACKGROUND.

Results from staff surveys showed that, in all cities, front-line staff trained through FUSE who previously lacked experience leading STEM activities or a STEM background were able to "catch up" in their confidence to those who indicated they had a STEM background. This is significant, as only one-fifth of staff members surveyed had majored in STEM in college, and only a quarter of staff members had prior experience in a youth program with a STEM focus.

THERE STILL EXISTS A GENDER GAP IN STEM.

Although some cities' STEM curricula include a gender equity and minority focus, not all cities are using these curricula or training staff in strategies to support gender equity. As a result, male students are still significantly outscoring female students in self-reported STEM motivation and confidence.

SUCCESSFUL GRANTEES SUPPORTED STAFF MEMBERS THROUGH OBSERVATION AND COACHING.

Cities that used quality improvement tools or trained staff in pedagogy displayed consistently high-quality activities. Staff surveys revealed that staff in these cities improved their confidence in facilitating STEM activities.

CONTINUED STUDENT PARTICIPATION IN STEM FROM YEAR TO YEAR INCREASES STUDENT MOTIVATION, CONFIDENCE, AND KNOWLEDGE IN SCIENCE.

Students who participated in STEM activities the year prior reported that the current year's program had a statistically significantly higher impact on their motivation, confidence, and knowledge than students who did not participate in STEM activities the year before. This underscores the importance of long-term participation in STEM programs.

GRANTEES THAT BUILT STRATEGIC PARTNERSHIPS AND LEVERAGED THEIR RESOURCES WERE MOST SUCCESSFUL.

Cities focused on a few key partnerships with organizations that each grantee identified as strong partners for building capacity and scale. By drawing on these partnerships, which included school districts, nonprofit organizations, and colleges, communities were able to build a strong "grasstops" initiative.

These findings have clear implications for the delivery of informal STEM education in the United States. As educators, program providers, policymakers, and other stakeholders work to maximize the availability and quality of out-of-school time STEM experiences and arm youth with twenty-first-century skills, these results could offer them meaningful guidance. •

| Nina Agrawal is the Policy and Communications Coordinator for the Collaborative for Building After-School Systems (CBASS). Julianne Kanter is a Research Associate at TASC.

1 The national expansion of FUSE has been in two phases: in Year 1 (2010-2011), demonstration cities included only the Bay Area and Providence; in Year 2 (2011-2012), the program was expanded to Baltimore, Boston, and Palm Beach County; and in Year 3 (2012-2013), Chicago was added.

2 This is the most recent year for which data is available, and includes the greatest number of cities.

THE STEM COLLABORATORY

Connecting educators in and outside of the classroom. | BY LANETTE SOULIA CYPHER

Inspiring students to pursue literacy and career paths within science, technology, engineering, and math (STEM) curricula serves as the cornerstone for a new professional learning community to formally connect educators with afterschool providers in a dynamic Collaborative Learning Environment®.

The STEM Collaboratory, officially launched April 1, is a two-year pilot program that will provide a shared online learning community for both formal and informal educators with STEM programs, social networking connections, Web links, formal and informal online training opportunities, discussion boards, groups, resource sharing, and access to field experts.

"This really is the first community of its kind to connect educators in the classroom with teachers in after-chool programs," explained Paul Cypher, president and CEO of CypherWorx, the eLearning management company providing the hub for this online network. "Typically in the past, the focus has been on either traditional educators and how to bring STEM into the classroom, or on afterschool providers and bringing STEM into their programs. This initiative brings educators together as equal partners."

Several partners have come together with CypherWorx and San Diego Zoo Global to create this pilot program. NASA, Association of Zoos and Aquariums, Zoo Atlanta, Museum of Science in Boston, Qualcomm Inc., and San Diego State University will contribute to the STEM content for this online portal through a partnership with the San Diego County Office of Education, San Diego Science Alliance, and members of the San Diego County After School community.

This STEM content, developed according to national educational standards, includes many disciplines—from architecture to engineering to technology research—presented through the lens of zoos, museums, and other areas of interest to students and teachers. One course takes students through the construction of a zoo exhibit for a tiger, and engages the students on research for how high the animal could jump, calculating the height and length of an enclosure to contain the animal, deter-

mining the quantity of concrete needed to simulate cliffs and rocks, and how rebar is used to form concrete.

A biology course investigates the idea in the zoo world of "sexing" birds, to determine gender while still in the egg for a species population, genetic makeup, and purpose of international collections of animals.

A technology course developed with engineers at Qualcomm Inc. explores biomimicry and how these engineers studied butterfly's wings, their reflective properties, and perceived colors to create a new touch screen and improve visibility in light and dark spaces for mobile devices and computer screens.

The above courses only provide a snapshot into the extensive catalog of offerings and professional development opportunities for educators. The resources, classes, and expertise of the San Diego Zoo Global Academy and the Museum of Science in Boston serve as integral partners in this emerging, yet robust initiative, which is all shared under one learning community: CollaborNation, an arm of CypherWorx.

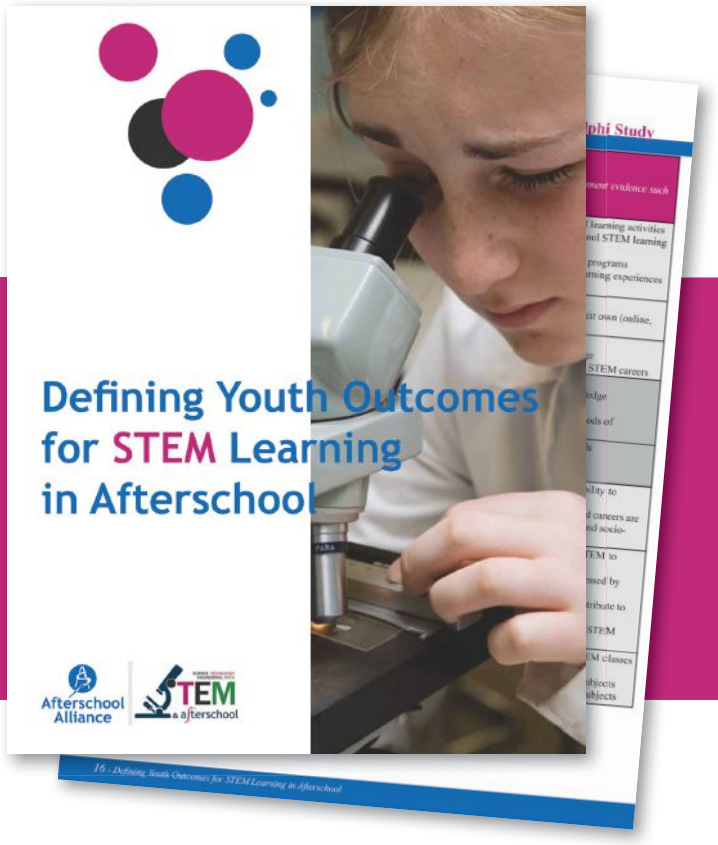
"Specifically, CollaborNation joins the elements of social networking with a formal learning management system," Cypher explained. "The site is intuitive, with a user-friendly interface. Most importantly in this effort, CollaborNation brings STEM experts into a shared environment with educators from both formal and informal education settings. The formal benefit is that classroom teachers can learn how informal afterschool providers make STEM exciting in their programs, and engage kids who have a natural interest in earth, sea, and sky. The informal benefit will be to determine how afterschool programs can become more equipped to help students meet the educational standards and curriculum requirements."

"We want to engage more students, K-12, in developing their interests and understanding around STEM and hopefully inspire more youth to pursue a career in the sciences," Cypher said. "We are excited to be part of a time where school districts and afterschool providers see the benefit of creating professional learning communities that blur the distinction between formal and informal education, and we are happy to play a role in bringing our partners and leaders in the field from San Diego Zoo Global Academy and Museum of Science to the table to create a truly unique and groundbreaking program." •

| The president and CEO of CypherWorx, Paul Cypher, contributed to this article.

AFTERSCHOOL ALLIANCE REPORT:

EDITED BY *AFTERSCHOOL TODAY* MAGAZINE



Afterschool programs increasingly play a valuable role in improving science, technology, engineering, and mathematics education. But expectations for how afterschool supports youth STEM engagement and learning vary. That's why, for the Afterschool Alliance's recently concluded *Defining Youth Outcomes in STEM Learning in Afterschool* study, a panel of expert afterschool providers and supporters were asked to identify STEM education outcomes to which afterschool programs and settings could contribute.

The big picture consensus among those interviewed? Afterschool programs support youth in an effort to enjoy, feel capable in, and want to do more STEM learning.

"This study really came about because we know there's a lot of support for afterschool programs in general and for the role of afterschool in STEM education specifically," said Anita Krishnamurthi, director of STEM policy for the Afterschool Alliance, and lead researcher and report author. "We really wanted to make sure that the afterschool field had a voice in sort of trying to describe what it is that they felt were appropriate and feasible outcomes for afterschool program, because we didn't want something being imposed on the field without taking into account exactly what its strengths were and what it might not be able to deliver."

Ron Ottinger, executive director of Noyce Foundation (a funder of the study), reinforces the importance of having input from the field. "I believe that the next generation's science standards will fail if science centers, afterschool organizations, and youth development organizations are not part of the rollout of the standards, and the standards are narrowly defined as to what kids get in school."

Afterschool program support of youth STEM learning is expected to become increasingly important, with the advent of the Common Core Standards for Mathematics and Language Arts (including literacy in science and technical subjects) and the Next Generation Science Standards. And as federal initiatives such as Race to the Top and Investing in Innovation are implemented, reauthorization of the Elementary and Secondary Education progresses, and new state assessment measures are developed, policies will take effect that directly affect funding and focus for many afterschool programs. Greater clarity about appropriate STEM goals and outcomes will help frame how afterschool is best positioned to support STEM learning.

Achieving consensus on important learning outcomes is critical. Afterschool programs are diverse; their age groups, localized resources, and types of learning goals differ. In an

effort to help distill the experience and insight of expert afterschool practitioners and state and local education leaders, the Afterschool Alliance's study used Delphi methodology, which seeks to achieve consensus among disparate perspectives. Two groups of experts were surveyed confidentially, over three rounds and using online instruments: a panel of fifty-five afterschool "providers" (from a wide youth group and geographic range) and a panel of twenty-five afterschool STEM "supporters."

The consensus set of outcomes and indicators this study produced aren't intended to represent mandatory goals for afterschool STEM programs, but rather to help provide a common framework and language for programs as they define appropriate program goals and describe the program's impact. This should help the Afterschool Alliance better describe afterschool programs' contributions to the larger STEM education issues. •

The three major consensus developmental outcomes and learning indicators for STEM in afterschool:

1. Youth develop interest in STEM and STEM learning activities.
2. Youth develop capacities to productively engage in STEM learning activities.
3. Youth come to value the goals of STEM and STEM learning activities.

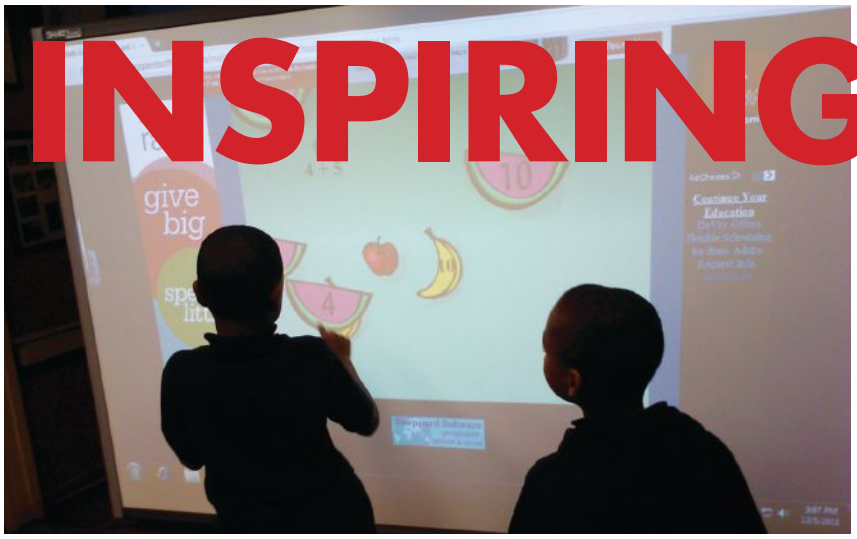
Key recommendations resulting from the *Defining Youth Outcomes in STEM Learning in Afterschool* study:

- Policymakers should utilize the outcomes and indicators described in this study to define the appropriate niche for afterschool programs in STEM education.
- Program leaders should utilize the framework of outcomes and initiatives described in this study to map out how their work contributes to STEM education overall.
- Evaluation and assessment experts should examine the outcomes and indicators described in this study and utilize its results to inform the design of new measures to assess afterschool STEM learning.

Areas for additional research:

- Developing new research and evaluation methodologies and instruments that investigate STEM learning across settings, showing how immediate afterschool STEM learning outcomes relate to longer-term learning in the school setting, and vice versa.
- Afterschool providers conversing with STEM education leaders and researchers to more clearly articulate the relationship between discrete and measurable learning indicators or sub-indicators, and the related overarching developmental STEM learning outcomes.
- Further investigation to detect and resolve any real and meaningful differences in perspective between various afterschool STEM programs stakeholders.

Visit http://www.afterschoolalliance.org/STEM_Outcomes_2013.pdf to view the entire study.



INSPIRING *Minds* STEM PROGRAM

"Inspiring" is the key to this Boys & Girls Clubs of Annapolis & Anne Arundel County afterschool program. | BY AMY L CHARLES

"There has never been a more important time than now to equip our children and young people to prepare for a world that faces a multiplicity of challenges with science, technology, engineering, and math. The afterschool arena must engage our students with fun, innovative learning experiences that make STEM come alive, with transformative results."

— Judith J. Pickens, M.Ed., senior adviser, Youth Advocacy, Boys & Girls Clubs of America and board member, National AfterSchool Association

People involved in the Inspiring Minds STEM Program, Boys & Girls Clubs of Annapolis & Anne Arundel County (Maryland), don't push the idea of producing the next scientist or mathematician or engineer. Instead, they make sure resources are in place to inspire youth—and inspiring them is the most successful piece of the program. By creating relationships with the local school system, Northrop Grumman, University of Maryland, NASA, U.S. Naval Academy, and technology companies, the program puts top-notch professionals in front of students, who benefit from hearing their stories.

"Everyone has a story!" said Reginald Broddie, BCGAA chief professional officer, of the professionals who talk about their experiences, connect them to what they do for a living, and reveal what inspired them toward their professions. "Real-life situations matter to our kids, when looking at vocation," Broddie said, noting that every story inspires youth to pursue one of the STEM areas. "They're connecting with real-life people and real-life stories, which bring the vocations to life."

Inspiring Minds components are created with a fun structure. Skill Tech courses (a Boys & Girls Clubs initiative serving as the program's base) and NetSmartz teach practical technology skills and Internet safety. An "unbelievable" animation program has a waiting list. Thanks to the Technology Advanced Gaming Center program, youth are writing—a lot. "One component of developing a video game is telling a story," Broddie said, "and it has to make sense. It has to have a beginning, middle, and end. We're talking about critical thinking and systems management; making sure everything fits." Participants must consider how to create in a way that translates to the screen: "You have to come out of your head and go someplace."

The gaming initiative has transformed how youth look at video games, for which they learn the "secrets" and inner workings. "It's amazing to hear them talk about how Mario is able to jump up and down," Broddie said. "It's a whole process. We want them to be fascinated. We want them to enjoy the process. We want them to know life has a beginning, middle, and end." Participants think about where they are now, and about what their "middle" could be like and what could get them there.

In math courses, when the word "problem" was eliminated, youth stopped procrastinating and treating math as a problem. "Whenever you're challenged, you treat something differently," Broddie explained. "We're asking our kids to look at math as a challenge: Math is challenging you to get the answers." Youth approach math in a new way, with a changed mindset, saying the challenge is "You can't get the answer!" Getting girls to participate

in robotics was another challenge.

When queried, ninety-seven percent of the girls thought robots were for boys, and were no different from Tonka trucks or other "boy" toys. Pink robots helped to change that mindset and make a difference, as did understanding how girls were different. "They taught us that they could easily manage the robot piece—putting it together and so on—but that wasn't their interest," Broddie said. When they learned they could program robots to carry out various tasks, the girls were intrigued. They loved the power of creating a robot that would do as they wished. "You have this core of girls thinking, If I can program this robot to do what I want it to do, I have to be able to program a boy to do what I want him to do!" said Broddie. "Who would have thought our robotics program would open up a dialogue? Girls want to know more about boys … and boys are inquisitive about girls, but are afraid to ask."

Various elements have been added to the Inspiring Minds STEM Program, now in its fourth year. Each is piloted and surveyed, and at least one is incorporated each year. U.S. Naval Academy will help with an underwater robotics program, being offered later in 2013. ("Three kids from our club are midshipmen now, which I'm extremely proud of," Broddie noted.) The youth-friendly Inspiring Minds is accessible, even when clubs aren't open. "Students could go onto immersionlearning.org and go online and have fun, without being at the club," Broddie said.

"We learn so much from our kids. It's a misconception that the kids come to club and learn so much from the staff. They learn an awful lot, but we learn so much from them, and it helps us put systems and programs together for them," Broddie said. Youth participants value the lifelong relationships they acquire through the adults who come to speak to them; they're connected.

"We're trying to inspire our kids to become mathematicians, scientists, engineers. Our biggest mistake has been telling children what they're going to be, instead of helping them connect and find an interest." • | Boys & Girls Clubs of Annapolis & Anne Arundel County: BGCAA.org.

ADDITIONAL RESOURCES:

ImmersionLearning.org | FirstLEGOLeague.org/mission/support | IXL.com | PiggyBank.disney.go.com/about | Labyrinth.thinkport.org

GLOBAL LEARNING

COULD HELP ENGAGE YOUTH IN STEM EDUCATION

BY ALEXIS MENTEN, ANITA KRISHNAMURTHI, AND CAROL TANG

In his 2013 State of the Union address, President Barack Obama emphasized the need to "redesign America's high schools so they better equip graduates for the demands of a high-tech economy." He praised schools that "create classes that focus on science, technology, engineering, and math—the skills today's employers are looking for to fill jobs right now and in the future."

This is a common refrain among policy, business, and community leaders—the need for our education system to successfully prepare the next generation for jobs that increasingly require STEM knowledge and skills. In the global innovation economy, however, young people won't just be competing with their peers in other countries for jobs; they will also be collaborating with them to create the world of the future.

STEM is a global enterprise, and many global issues could only be addressed with STEM innovations. In our globally connected world, students will find it difficult to become successful scientists, technologists, engineers, or mathematicians without also being globally competent. They need to be able to understand how the world works, how systems interconnect across political and cultural boundaries, how to work with colleagues in other countries as part of the larger international STEM community, and how their own discoveries as well as those in other countries have global applications and implications.

High-performing nations and higher education institutions are highlighting the need for an international dimension to be added to STEM to ensure their students'—and their nations'—global competitiveness (http://chronicle.com/blogs/worldwise/the-neglected-dimension-of-competitiveness/28752). In the same way that STEM and global competence go hand in hand towards professional success, educators should strive to unite the two for students' overall success in school and life.

Sometimes, the most powerful learning opportunities for both STEM and global learning happen outside of school hours and classroom settings. Like global learning, STEM learning during the school day is necessary, but not sufficient to achieve lifelong success in the twenty-first century. Out-of-school time (OST) programs, such as afterschool, before-school, and summer programs, are unique learning environments in which we could not only foster these types of knowledge and skills, but also blend STEM and global learning through experiential, hands-on learning activities for youth.

Both STEM and global learning activities bring many of the same opportunities that educators could leverage for success, such as:

THE WORLD AS A CONTEXT FOR LEARNING: We all live on the same planet. It is easy to find global connections from your own backyard or community, and compare these familiar surroundings with those far away. Often, the best STEM examples may come from outside of the United States, where specific natural phenomena, diverse species, and different types of hypotheses and data could be found. Many famous scientists and discoveries have come from other parts of the world; this provides ample opportunity to incorporate global geography, history, and cultural context within STEM learning.

DISCIPLINARY AND INTERDISCIPLINARY CONNECTIONS: OST provides opportunities to go beyond the textbook and traditional disciplinary boundaries. Similarly, while core disciplines such as science and math provide powerful lenses through which students could investigate the world, global competence also requires that students apply knowledge and skills from multiple disciplines to the complex world around them. Understanding global issues such as environmental sustainability, energy resources, population growth, economic development, and public health are rarely understood through one discipline alone. This type of interdisciplinary investigation of the world is ideally suited for the OST environment.

RELEVANCE THAT LEADS TO ENGAGEMENT: While some students are intrinsically interested in STEM subjects, many more students become engaged when they see them as tools for solving major problems in the world. Educators could use the frame of global learning not only to impart core content knowledge and skills (described earlier), but also do it in a way that is meaningful and relevant for students. Both STEM and global education aim to provide youth with the ability to ask relevant and informed questions, solve problems and create solutions, and envision themselves as part of a larger global community. This requires the capacities and dispositions to acquire and apply core STEM knowledge and skills to complex and novel problems or situations. This is precisely what the interconnected world of the twenty-first century demands.

STUDENT-CENTERED PRACTICES AND ADULT CO-LEARNING:

Both STEM education and global learning benefit from a process of inquiry and reflection that builds on the experiences and knowledge of educators and youth to explore the world together in a co-learning model. By focusing on students' interests, passions, and needs through real-world projects, educators become not only facilitators, but also co-learners. This type of experiential learning builds teamwork, communication, and other twenty-first-century skills, as well. By creating the conditions through which students could learn collaboratively with teachers, peers, and other adults and professionals, OST and expanded learning programs could provide unique—and critical—opportunities for success in STEM and global competence.

Some examples of high-quality projects in afterschool and summer programs that foster both STEM and global competence include:

The staff from Good Shepherd Services at The After-School Corporation (TASC) site in New York City's Public School 79 created a series of activities to help their eight-year-olds understand water conservation. First, the students learned that water is a finite and shared resource by comparing how much water is used by a person in the United States versus someone in a developing country. Then, they joined the World Water Day March and walked a mile to experience firsthand how people in the world must adapt without access to clean running water. Finally, they translated this learning to their own practices about water conservation, and created projects to raise awareness and educate parents, teachers, and peers through posters and performances, including a rap about water.

At Horizon Activities Centers Summer Camp, in Cleveland, Ohio, the standard configuration is to offer lessons linked to a field trip each week. A lesson on transportation and world commerce provided the opportunity to rethink the traditional field trip to the Steamship Mather, a Great Lakes steamship that once shuttled between Cleveland's steel mills and the iron ranges in Minnesota. This year, the field trip was reconceived as an opportunity to talk about water displacement in the context of deep-water ports and what it takes to move trade, both on the Great Lakes as well as across the world's oceans. Students learned about today's global intricate supply system and how these shipping routes enable Ohioans to provide exports, such as corn, to the world, and receive products from the world. • | Alexis Menten, Asia Society. Anita Krishnamurthi, Afterschool Alliance. Carol Tang, The Coalition for Science After School.

For more information:

http://www.goodshepherds.org/ • http://www.tascorp.org • http://www.horizoneductioncenters.org/

STEM EDUCATION *for Girls*

GIRLSTART AFTER SCHOOL

BY TAMARA HUDGINS, PH.D.

By reading this magazine, you already agree with us that afterschool programs represent not only an important part of a child's day, but also a child's overall learning. Because a child will spend less than twenty percent of his or her waking hours in formal learning environments, we share with you a sense of hope about afterschool programs. Like you, we think that learning is highly effective in the afterschool environment, as well as in informal environments, generally. Our Project IT Girl, an afterschool program recently highlighted by the Afterschool Alliance, showed that afterschool programming is effective at driving academic achievement, as well as fostering interest in STEM: Eighty-seven percent of participants enrolled at a four-year university, with eighty percent of participants selecting STEM majors, with the intent to pursue a STEM career.

Girlstart After School is our response to the desire for high-quality education programs delivered at schools in the out-of-school time space. In the past few years, Girlstart has dramatically expanded Girlstart After School to reach more than forty elementary and middle schools in Texas—and more than eight hundred seventy-five girls each week. Our growth is only possible because of investments made in Girlstart by corporate, foundation, and government partners.

Girlstart After School directly reaches girls, but also involves parents, teachers, and whole-school communities. The work we do as part of Girlstart After School includes:

- A club of more than twenty girls who meet weekly for an hour of hands-on, informal STEM afterschool programs—aligned with state and national standards—at each school. We do end-of-semester showcases of the work done in our programs, as well.
- Our internship program, which prepares and trains pre-service teachers to lead our afterschool programs in schools.
- Monthly parent association meetings that teach parents about STEM and why their daughters should continue pursuing STEM electives.
- Free registration—with transportation provided—for all Girlstart After School participants to attend our annual Girls in STEM Conference.
- Science Extravaganzas and math and science nights at partner schools.
- Pedagogic, curricular, and strategic support to STEM efforts at partner schools.

Our consistent positive outcomes show that our programs improve girls' achievement in STEM subjects and foster interest in STEM electives, majors, and careers. Following our programs, ninety-one percent of participants demonstrated that they understand elements of critical thinking necessary for mastery of the scientific method, and eight-seven percent of participants realized after participating that they use science frequently outside of school. In addition, ninety-six percent of participants expressed intent to attend college after high school, with seventy-nine percent reporting interest in taking more STEM classes in middle or high school. Further, seventy-five percent reported that after participating in Girlstart, STEM careers seem more interesting; sixty-eight percent indicated a strong interest; and ninety-three percent indicated at least a moderate interest in entering a STEM career.

Right now, we are beginning a research project to see the correlations between Girlstart After School and academic achievement, and we hope we will be able to share some of our findings when we finish this work. Until then, we will continue to do our best to continue expanding Girlstart After School as districts and schools seek it. And, of course, have fun in the process! • | Tamara Hudgens, Ph.D., is the executive director of Girlstart.

STEMfinity Making Hands-On Learning Accessible to All Students

BY ERIKA FIFELSKI

STEMfinity combines tools afterschool providers want with excitement for learning that students need—in one package. The company's comprehensive learning kits equip PreK-12 students to make science, technology, engineering, and math components fun.

Bill Albert founded STEMfinity two years ago, but has extensive experience with the afterschool community. His understanding of educational markets and zeal for providing learning opportunities prompted the company's creation and propels it to succeed. "I saw the need with STEM education becoming more popular," he said. "There was definitely a demand for these types of project-based materials."

STEMfinity reaches afterschool programs in all fifty states and delivers more than ten thousand kits to nearly fifteen hundred providers. Albert encourages schools to consider getting behind STEMfinity and benefiting from its one-stop shop of online resources. "We have plenty of solutions to fit a variety of needs."

Kits are based largely on common core state standards and aligned with classroom-hours education. STEMfinity is project-based to complement core curriculum lessons, and explore subject matter above and beyond the classroom. "A lot of kids are intimidated by terms like engineering and robotics," Albert said. "But by simply putting a kit in front of them, they can explore and build. Later we plug in the content they learned … and teach the concepts involved with the project." Physics, pre-algebra, renewable energy, and other kits are available online.

Because Albert knows that many school programs STEMfinity works with could benefit from funding, he promotes STEM education grant opportunities. For information on dozens of federal and private grants, visit http://www.stemfinity.com/STEM-Education-Grants.

STEMfinity wants to excite students about STEM subjects and problem-solving in general. As a child, Albert learned what problem-solving meant by working on his family's farm. Now, he gives students the chance to explore and discover the joy of solving intellectual puzzles. •

4-H TAKES EXPLORERS BEYOND BACKYARD WITH NEW NATURE PROJECT

EDITED BY
ERIKA FIFELSKI

Arizona 4-H is inviting children and adults to connect with the outdoors—right outside their own back doors—through a brand-new project, called Backyards & Beyond.

Concerned about an increasing disconnect between youth and the natural world, Arizona 4-H Director Kirk Astroth raised the alarm with 4-H national headquarters about the need to address what author Richard Louv (*Last Child in the Woods*) has called "nature-deficit disorder." In response, USDA awarded Arizona 4-H a three-year grant to develop a curriculum to get children, families, and neighborhoods exploring the outdoors and working together to reclaim neighborhood green spaces. Astroth said reclaiming neighborhoods could mean exploring local parks, backyards, and more. "It means alleys and green spaces between houses, too," he said. "People need to understand that nature is all around them. They don't have to go to Yellowstone or the Grand Canyon; the outdoors is right outside your door."

Astroth recruited Suzanne Dhruv, co-director of the Ironwood Tree Experience, a program of Prescott College in Tucson, to create a curriculum to engage youth and families in exploring the natural environment around them. Project activities like "Sensory Safari" challenge explorers to go outside and experience the shapes, sounds, textures, scents, and even flavors found in nature near their homes. Have you ever tasted bark? Students of the Backyards & Beyond programs are encouraged to. There are many edible plants growing in and around our neighborhoods, Astroth said, and by exposing children to them, they come into a new fascination with the plants under their feet. Yaro is a plant that grows in many different areas. When it flowers, the roots grow edible purple rhizomes that were once used by Native Americans as nature's Novocain for toothaches, Astroth said. (Know your plants before tasting anything in the natural world, he reminds.)

"Yaro is one example of a great learning lesson," Astroth said. "(Students) become interested in what other things are out there that they could learn about." In an activity called "Seasons' Greetings," explorers practice a science called phenology, which focuses on observing seasonal changes. There are also activities that encourage explorers to take part in active play outdoors, to use their creativity in nature, and to observe wildlife and natural resources.

But the project is more than just playing outside, said Dhruv. Building on the sense of place that develops from knowing and loving your environment, Backyards & Beyond also leads kids to make a personal commitment to the environment. "If we're going to be able preserve national parks, open spaces, wild and natural areas, we've got to have advocates. The only way to

have advocates is to have people who have experienced that firsthand," Astroth said. "I'm hoping kids gain greater sense of respect and value for natural spaces, so when the questions come up about paving over everything, they might say no, some of these places have some intrinsic value."

The project's activities in environmental education, sustainability practices, natural resource conservation, citizen science, community development, and environmental action could lead older teens to real-life opportunities such as volunteering, internships, secondary education, and even jobs that involve the outdoors, Dhruv said. One activity where she's really seen youth thrive is the Environmental Action Plan. "I feel very confident that kids are able to make a plan and follow through with positive action that improves their local environment," she said. "They just need opportunities."

With help from volunteer nature club leaders, such opportunities may soon be popping up all over. Anyone could start a Neighborhood Nature Club, even if they aren't already involved in 4-H. A step-by-step guide called the Backyards & Beyond Neighborhood Nature Club Community Organization Guide and Tool Kit tells how. Neighborhood Nature Clubs bring together neighbors to share their love of the outdoors, and invite young people to explore natural spaces and open places.

Astroth said encouraging children to explore their surroundings fosters learning outside of the classroom. Backyards & Beyond is "a perfect fit for out-of-school time programming. Too many programs are trying to get kids off the street and inside, but we should be getting kids outside—and not only in the streets, but in the alleys and natural places. It makes the learning experience so much richer when kids … explore the things around them that they've taken for granted."

Astroth and Dhruv had help from 4-H National Headquarters, U.S. Fish and Wildlife Service, USA-National Phenology Network, Children & Nature Network, and individuals who helped create and review the curriculum.

"It's all about making it easy and fun for people to get into the outdoors," said Astroth. "A lifetime connection to the natural world can start right in your own backyard." •

To learn more about the curriculum, visit: neighborhoodnatureclubs.arizona.edu

Summer
IS A PERFECT TIME FOR STEM LEARNING

BY KATE SHATZKIN

Summer is the perfect time for STEM learning. Even though regular school is out, many summer learning programs are hard at work turning the great outdoors into a limitless science lab, and planting the seeds of project-based learning, collaboration, and interdisciplinary thinking that could spark a student's interest in STEM subjects all year long.

Summer is a critical period in the learning life of any child. Without learning opportunities during the long break from school, young people could lose months of academic skills developed during the previous year. Most students—across income levels—lose more than two months of math skills each summer, and low-income students lose an additional two to three months of reading skills.

But research shows that high-quality summer learning programs could prevent these losses and even produce gains, as well as provide important benefits in student motivation, behavior, and interest in subject matter. Intentionally designed to be different from the school year, a STEM-focused summer learning program could engage a student who might not realize how relevant science, technology, engineering, and math are to the "real world." Summer learning programs could innovate to "re-mix" subjects and disciplines.

One example is a collaboration last summer between 826 National, a nonprofit organization with a network of eight writing and tutoring centers, and the Coalition for Science After School. In a series of "It's (Partially) Rocket Science" workshops for kids ages six to twelve, students blended science and writing, using experiments as springboards to stories or responding to writing prompts that used the scientific concepts they'd learned, such as "How would your favorite Pokemon character fare on Venus?" Students built coolers to save ice cubes from melting, took notes on what worked, then built coolers that could keep frozen an even more important commodity—ice cream.

"We set up our workshops so that students had to think outside their usual science and writing boxes," said Julius Panoriñgan, education director of 826LA, in a talk about the workshops at the 2012 national Summer Changes Everything™ conference in Pittsburgh. "It is neither good writing nor good science to do what's been done before."

Summer could be a fertile ground for trying instructional approaches that could be successfully brought into the school year. To address the issue of summer learning loss, the Providence Public School District formed a partnership with the Providence After School Alliance (PASA) to expand the AfterZone Summer Scholars program—a blended practice of formal and informal educators coming together to use inquiry-based STEM and arts learning as a way to deepen student engagement and achievement in science, math, and literacy—to serve as both a summer and school-year initiative. District teachers work hand-in-glove with community-based STEM educators and AfterZone staff to plan and co-teach a four-week curriculum.

The program also engages a network of STEM-focused community organizations, district math and science teachers, and faculty from Rhode Island College as peer coaches in the planning process, to enhance teacher practice and inject hands-on methods into the classroom that contribute to the district's curricular goals.

The AfterZone Summer Scholars Program revolves around extensive field-based work that could include the study of local ecosystems, learning math and physics on sailing trips, and exposure to green technology and engineering principles through the construction of solar-powered go-carts.

Other promising practices for STEM in the summer include:

Global Kids' Race to the White House Program in New York last summer encouraged young people to brainstorm election issues and plant them via geocaches in New York City. Fellow geocachers demonstrated whether they thought each issue was important by moving it closer to the White House.

Through the Council Bluffs, Iowa, Community School District summer learning program, middle-schoolers could spend four weeks of the summer making scientific observations at the nearby Henry Doorly Zoo.

Last summer, students at Project Exploration, a Chicago nonprofit organization, examined the population and abundance of native bees in Chicago. Working alongside scientists in the field of bee ecology, students conducted authentic field research in local urban habitats, parks, and other green spaces, using handheld mobile devices and a citizen-science online portal to document bee biodiversity. Through the program, students developed an awareness of native pollinators, and their ecological and economic importance to the city of Chicago.

With the help of a partnership with NASA's Wallops Island Flight Facility, students in the Worcester County School District built rockets during the summer. NASA staff helped provide professional development for summer teachers, and supporting books and lessons reinforced the rocket theme in reading and math. The Science and Technology Summer Academy is available at four schools in a technologically isolated rural area of Maryland's Lower Eastern Shore.

With generous support from the Noyce Foundation, the National Summer Learning Association, the Afterschool Alliance, and the National AfterSchool Association are engaged in a multiyear effort to help equip programs to provide high-quality STEM activities and instruction for youth in afterschool and summer. To learn more about how your program can help young people learn about STEM during the summer, visit summerlearning.org/stemresources. • | Kate Shatzkin is the vice president of marketing and communications at the National Summer Learning Assocation.

DECONSTRUCTING STEREOTYPES

The Bronx Task Force makes science attainable.

| BY ERIKA FIFELSKI

Middle school students enrolled in the Afterschool STEM Mentoring Program run by the New York Academy of Sciences become engineers, robotics technicians, and problem-solvers, with the guidance of mentors who teach them the ins and outs of STEM-related education. What's more, the graduate or postdoctoral science or engineering student mentors teach students that becoming a scientist is within their grasp.

At the beginning of each session, students—such as the group comprising the Bronx Task Force, a robotics crew that participates in the Afterschool STEM Mentoring Program—are asked to draw a picture of a scientist. "They draw an Albert Einstein facsimile: an older, white male with crazy hair, big glasses, a bow tie, a pocket protector … people that don't look anything like the students in the classes," said Stephanie Wortel, K-12 education program manager at the New York Academy of Sciences. But when students realize that their mentor is a scientist, they begin to understand that they could be one, too. "It's something that naturally happens when they meet someone that they find interesting as a whole person—not just a 2-D stereotype, but someone who looks like them, is interesting, and is engaging."

The Afterschool STEM Mentoring Program's theory is that you can't be what you can't see. If a young girl has never met a woman engineer, Wortel asks, how could she know that those opportunities to advance to this career path are available to her? By pairing middle school students with mentors, children are given "the juice they need to get through the barriers that stand between where they are now and achieving professional careers in science," Wortel said.

The program also provides a chance for mentors to diversify their own knowledge of science education. Working with middle school students helps set mentors apart from their peers who are also vying for faculty positions. "By participating in the STEM Mentoring Program, they are expanding their training and skills in that area," said Diana Friedman, manager, NYAS Magazine and External Communications, The New York Academy of Sciences.

Each afterschool program is made up of students with different interests and abilities, but the Afterschool STEM Mentoring Program links careers in science to middle school students in such a way that they are able to grow their passion and broaden their understanding, therefore becoming inspired to work in scientific fields. Through their afterschool programs, students hear about the elements of STEM, and are also told through programming that "science can use you—and your way of thinking is useful for the human enterprise of research," Wortel said. •

AfterSchool Works! New York

ABOUT THE AFTERSCHOOL STEM MENTORING PROGRAM:

Founded in 2010 by the New York Academy of Sciences, the Afterschool STEM Mentoring Program pairs graduate students and postdoctoral fellows (or mentors) with students in local community-based afterschool programs. The Academy trains the mentors on age-appropriate, hands-on science curriculum and works closely with existing afterschool programs to provide high-quality, engaging educational programming to students throughout New York City; Newark, New Jersey; and, recently, upstate New York.

It's never too early to start thinking about the 2014 NAA Annual Convention! The event will be held in New York City, home to the Afterschool STEM Mentoring Program and others. Visit naaweb.org to sign up for the NAA eNews and receive alerts about the convention.

Have a "True Story" you want to share? E-mail it to editorial@serendipitymediallc.com.

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