

GENERATION STEM

Empowering Scientists of the Future

THE NEW YORK ACADEMY OF SCIENCES

STEM EDUCATION 10-YEAR IMPACT REPORT, 2024




Executive Summary

The New York Academy of Sciences is dedicated to delivering impactful, top-tier Science, Technology, Engineering, and Mathematics (STEM) programs. Our primary objective is to bridge the opportunity gap that prevents students from entering the STEM workforce. Thanks to generous donor support, the Academy provides programs that propagate youth interest in STEM at no cost to students, schools, or participants.

In the past decade, The New York Academy of Sciences Education Program has embarked on a remarkable journey, one filled with innovation, transformation, and empowerment. Our commitment to nurturing the next generation of STEM leaders has yielded tangible results that extend far beyond the borders of New York City. As we present our 10-Year Impact Report, we hope that it inspires you to follow and support STEM initiatives at the Academy.

Such programs equip students with essential skills that empower them to become well-informed citizens in an ever-evolving world. By cultivating a diverse and inclusive learning environment, we strive to create a future where all individuals have an equal chance to thrive and contribute.

This is accomplished by encouraging students to use STEM to solve meaningful problems through:

-  Engaging scientists as mentors with instructors to allow students to work directly with STEM professionals who share a similar background.
-  Presenting science as a human endeavor with programs that focus on inclusiveness and accessibility.
-  Providing active learning experiences for students that develop key workplace skills such as leadership and the ability to work in teams, solve problems, and think creatively.

From New York City to rural Oman, we focus on research-based strategies to enhance STEM learning, empowering students to turn ideas into action. Leveraging the expertise of the Academy's global network of scientist mentors, the Academy is able to offer unparalleled opportunities for students to engage in authentic scientific experiences.

Serving as a dynamic learning laboratory, NYAS Education offers a wide range of programs that are evolving continually to enhance their effectiveness, respond in real time to the fast-emerging scientific challenges that the world faces and adapt to technological advancements.

Our objective is to cultivate a deep and long-lasting interest in STEM among student scientists, empowering and equipping them to actively develop the essential STEM skills necessary to shape the future of science.

NYAS STEM EDUCATION PIPELINE

Our Impact in numbers:

50%

of scientists involved in NYAS STEM Pipeline Education programs show an increased interest in education as a profession.

10%

pursue a career in education.

- Over ten years, our science-focused programs have impacted over 450,000 individuals including school aged-children, educators, and families. Most students participate in at least one semester of programming.
- Academy member scientists support more than 400,000 hours of mentorship and teaching annually and have donated over 3.5 million hours of their time to mentorship and teaching since 2010.
- Drawing on the Academy's global talent pool of 20,000 scientists, our mentors include 7,000 trainees (post-doctoral fellows, PhDs, and undergraduates).
- More than 16,000 K-12 and higher education students in New York City and abroad annually enroll in our programs.
- Students in more than 100 countries participate in NYAS Education's Virtual Innovation Challenges.
- Scientists placed in NYC public schools have reached more than 160,000 students and increased their participation in innovative STEM activities. Additionally, through their Academy participation, early-career scientists gain essential teaching and mentoring skills.



ACADEMY STEM PROGRAMS

The New York Academy of Sciences' Education Programs foster essential skills such as critical thinking and problem-solving, which are crucial for students to advance in STEM fields. Our goal is to not only empower students but also to provide support to dedicated educators, both formal and informal, ensuring the successful implementation of these projects. All Academy programs share common design elements and similar positive outcomes. Regardless of the specific program deployed, students gain:

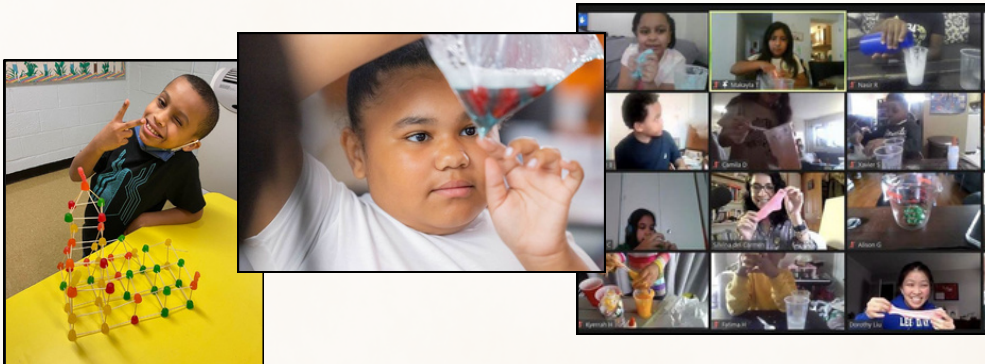
- Increased number of hours participating in active STEM learning.
- Increased self-efficacy and identity, and self-confidence: the ability to engage in scientific pursuits and belong in STEM.
- Increased opportunities to participate in authentic STEM experiences that demonstrate the value of STEM skills to their own lives.
- For scientists/mentors, increased confidence in teaching, mentoring and communication skills vital for the next step in their career.



STEM City: Improving NYC Students' Access to High-Quality STEM Education

Our STEM City initiatives are dedicated to enhancing the availability of STEM education and promoting greater interest in STEM fields. We achieve this by providing direct, hands-on experiences with science throughout all five boroughs of New York City, especially in areas where STEM educational resources are scarce.

Simultaneously, we equip teachers with the tools they need to become better STEM educators. Our STEM City residencies for scientists are intensive, semester- or year-long programs that serve a dual purpose: they provide in-depth learning opportunities for underserved students while also enabling scientists and teachers to develop new skills and capitalize on the teaching experience. While transmitting enthusiasm for their fields of expertise and expanding students' understanding of STEM, mentors are also role models for students, showing them diverse paths to a possible career in science.





Afterschool STEM Mentoring Program

One of the Academy's most heralded education programs, the Afterschool STEM Mentoring Program (ASMP) deploys trained STEM undergraduate and graduate students, postdocs, and STEM professionals in community-based organizations and public libraries, which nurture students' natural curiosity and cultivate their interest in science. With a focus on promoting inquiry and excitement among younger children, volunteers are trained to serve as instructors, mentors, and role models. In partnership with the New York City Department of Youth and Community Development, the ASMP has worked with more than 20,000 children since 2010. External evaluations¹ demonstrate that the program increases content knowledge, STEM identity, and self-efficacy, which are predictors of persistence in STEM careers.



Back to school in the South Bronx: Nayem Haque, PhD, Afterschool STEM mentor

In early 2022, Nayem Haque, PhD student in biomedical science at Albert Einstein College of Medicine, joined the Afterschool STEM Mentoring Program (ASMP). Since then, Nayem has been teaching elementary school students on a regular basis, supporting them through a 10-week curriculum developed by NYAS Education.

"I'm giving back to the community I grew up in," says Nayem, who has returned to the South Bronx elementary school he attended as a kid to provide current students with opportunities he never had. During his early years, his own exposure to STEM subjects was limited and his passion for science was only ignited when he was an undergraduate. "Growing up in the South Bronx, I feel that if students had the opportunities and the exposure, it could have a big impact on their lives," he says. "The ASMP can foster a lot of interest in STEM in places where there aren't many resources. It is really critical because students might not have a head start as a result."

Since 2010, NYAS Education has deployed over 1,500 mentors in 800 classrooms around New York to provide after-school STEM education in public schools with scarce resources, reaching some 15,000 students. Nayem finds mentoring very fulfilling and he says the experience is also improving his presentation skills. "It is especially rewarding to see the switch that happens several weeks into the program, in students who may not have been very engaged at the beginning," he says. "You see you're making a tangible change."

Scientist-in-Residence Program

Launched in 2012 with the New York City Department of Education, the Scientist-in-Residence (SiR) program has matched over 300 scientists and teachers, impacting more than 17,000 students. Scientists and teachers collaborate to develop and implement an exciting, year-long project in the classroom that engages students in hands-on, inquiry-based projects. In addition to promoting students' interest in science, the program builds the school's capacity to support long-term science investigations in the future and allows teachers to become more fluent in STEM. Scientists receive training and hands-on experience in pedagogical methods and strategies and have opportunities to participate in STEM education training from the Academy and partners.

A Powerful Impact and Benefit on Teacher Recruitment and Retention:

- SiR has a positive impact on STEM teacher retention by supporting teachers already in the classroom.
- Youth Educators receive STEM pedagogy and curriculum training – valuable skill sets in the job market.
- While not originally designed as a teacher recruitment tool, evaluations², over the years, demonstrate that approximately 10% of our STEM City participants choose careers in education.
- After participating in our program, scientists are 36% more likely to seek positions that involve teaching. Scientists show a 35% increase in confidence in their ability to teach STEM.



One successful SiR project highlighted here:
Inside a Coney Island school's scientist-in-residence wildlife project - Chalkbeat New York

The New York Academy of Sciences 2023 Student Showcase Science Fair

On May 26, for the first time in three years, The New York Academy of Sciences hosted an in-person STEM Student Science Showcase. We are so proud to serve these school kids from many NYC school districts due to the dedication of both the students, teachers and mentors who collected, analyzed, and presented their data – sharing their research findings with other schools across the city!

This Academy Showcase hosted 20 schools presenting from 15 NYC districts. Academy President and CEO Nicholas B. Dirks awarded prizes to the winning team of student scientists (selected by audience vote).





Chat with a Scientist

The Chat with a Scientist virtual series seeks to inspire young people by offering relatable role models, raising awareness about the range of STEM careers, and fostering a lifelong love for science. Participants not only expand their knowledge, but also gain valuable insights into the world of scientific exploration and discovery. More importantly, guest speakers are available to answer questions directly from viewers, allowing them to engage with these experts in a meaningful way. While the events primarily target middle and high school students, attendees of all ages are welcome at no cost, and students are encouraged to participate alongside their families.





The New York Academy of Sciences

CHAT WITH A SCIENTIST

Middle and high school students are invited to a free web series where they can hear from, and ask questions to, real STEM professionals.

ALANA GUZZETTA, P.E.
Laboratory Manager
U.S. Concrete National Research Laboratory

NEEL S. JOSHI
Associate Professor
Department of Chemistry and Chemical Biology, Northeastern University

**TOPIC:
SUSTAINABLE MATERIAL**
THURSDAY 4/14 5-6PM ET

Open to all ages! Register at events.nyas.org/scientistchat
Any questions about the Chat with a Scientist series can be sent to asmp@nyas.org

A guest Chat with a Scientist speaker is profiled here:
Sashti Balasundaram

ALANA GUZZETTA, P.E.
U.S. Concrete National Research Laboratory Manager



Where did you grow up? San Jose, CA
Where did you go to school? San Jose State University (civil engineering B.S. & M.S.)

Describe your work in 5 words: Testing concrete mix designs.
Why do you love science? I love science because it involves tangible work and I enjoy reviewing data and putting it together in a way that communicates helpful information about the performance of concrete for other people.

Who is someone who inspired you to go into STEM? I look up to my dad who is a civil engineer and had a career in water resources.

What is a surprising fact about yourself? I have many crafting hobbies such as scrapbooking, sewing, and making decorations.

A book recommendation: I loved reading Nancy Drew books (similar to the Nancy Drew series is the Hardy Boys series). I'm just finishing *Death on the Nile* by Agatha Christie and highly recommend it!

NEEL S. JOSHI
Associate Professor, Department of Chemistry & Chemical Biology, Northeastern University



Where did you grow up? Sunnyvale, CA
Where did you go to school? Harvey Mudd College (BS); UC Berkeley (PhD)

Describe your work in 5 words: Engineered Living Materials from microbes
Why do you think science is important? Science is what you get when you do not stop asking the question "why?"

Who inspired you to go into STEM? I looked up to my PhD and postdoc advisors (Matt Francis of UC Berkeley; Mark Grinstaff of Boston Univ.). They played a large role in me wanting to pursue academic research.

What are your favorite activities/hobbies outside of work? I like to track down vinyl records containing songs that were sampled by 90s hip hop music.

A book recommendation: *Flash Forward* by Rose Eveleth - (also) a podcast (now finished) that imagined what the future would look like with different tweaks to science and technology as we know it.



From the lab to the classroom - Chuhyon Corwin

Chuhyon Corwin, PhD, an accomplished neuroscience researcher, has gone from developing therapeutics for neurodegenerative diseases in a laboratory to teaching STEM in a New York City high school. Through a partnership between The New York Academy of Sciences and the EnCorps program, which has already helped 1,300 seasoned scientists across the United States transition to education since it was launched in 2007, Dr. Corwin was able to test her interest in high school teaching in a classroom environment by shadowing an experienced science teacher while learning pedagogical techniques through an online course.

“So many of my assumptions about high school teaching were wrong. In 10 weeks, my perspective on education changed,” Chuhyon Corwin explained enthusiastically.

“I fell in love with the students. The joy I experienced gave me the confidence that I could overcome challenges I may encounter as a public school teacher.”

The experience proved so positive that Corwin opted to leave the laboratory and embark on a new career in education, where she can transmit her passion for science to the next generation. She enrolled in an accelerated program to gain her teaching credentials, with support from the Academy, before accepting a new position in a New York high school. Chuhyon Corwin doesn't see her career change as a major break in her life: “I think a teaching career is very appealing to people who love research,” she says. “I'm simply redirecting my energy to continue my journey as a scientist to make a greater impact by raising more capable future scientists.”

Surveys show that NYAS Education programs build up students' STEM identity. Overall, students report the following improvements:

62% increase in their interest in science

77% increase in acquiring new knowledge

78% increase in their understanding of what it means to be a scientist



Junior Academy Innovation Challenges (online/virtual program)

In 2021, the Junior Academy and 1000 Girls 1000 Futures merged to form a year-long high school research program for students who want to study STEM. Innovation challenge participants work in collaborative research teams to find innovative solutions to real-world problems. Talented students around the world who are passionate about science may lack access to research programs, mentors from the STEM fields, enrichment programs, and a community of like-minded peers. The Junior Academy (JA) has reached over 17,000 students with over 50 Innovation Challenges since 2016.

Our high school research programs are conducted online, using the Academy's virtual-collaboration platform Launchpad to support teams of participants around the world working on project-based activities. Spanning time zones, cultures, and disciplines, Launchpad allows teams of solvers from over 100 countries to work together, share ideas, fine-tune designs, and ultimately harness the most effective concepts, and test them.

The platform serves as a hub for students to collaborate across borders on solutions for industry and donor-sponsored innovation challenges. Teams self-assemble and work through a design thinking process to produce a solution, with guidance from a mentor, a process that develops critical thinking, creativity, and problem-solving skills.

Since the Junior Academy's launch, an estimated 2,500 students from over 100 countries, have worked on over 50 interdisciplinary challenges all related to the UN Sustainable Development Goals, with social justice, science for the public good, and ethics as common threads.

Global Innovation Challenges

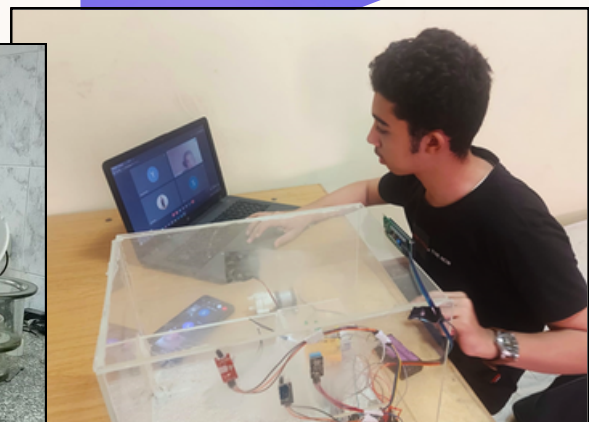
Promoting diversity, equity, and inclusion

55% of teams led by young women

74% of US teams led by students of color

2,500 students a year from over 100 countries

75% of participants from the Global South.



Junior Academy Innovation Challenges

Expanding STEM knowledge, learning new skills, building self-confidence

Participants in NYAS Education Innovation Challenges acquire STEM knowledge and apply it to solve real-world issues. An external evaluation showed that:

- 88% of students say they learned to collaborate and communicate in diverse teams.
- 86% of students use the goal-setting skills they acquire during the Challenge to explore their own interests and passions.
- 75% affirm they exceeded their own performance expectations and challenged themselves to take risks.
- 85% of thousands of students who participated in the Innovation Challenges completed those challenges – a ratio significantly higher than comparable enrichment programs.
- 95% of students wanted to do another challenge and reported their favorite aspects of the experience included working in groups, building a network of global peers, engaging with new and meaningful STEM subjects, and working with a mentor.

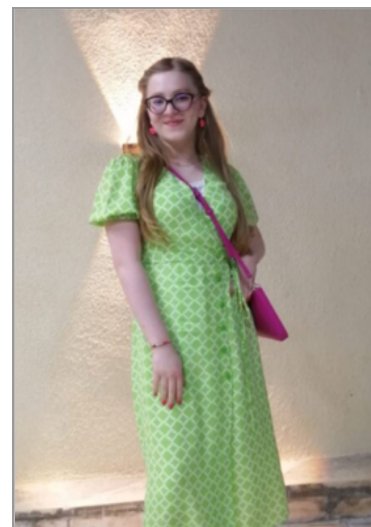
Global Mentored Research-Based STEM Learning via the Junior Academy

Sebsa, Junior Academy participant from Amman, Jordan

Sebsa was 14 and living in the Jordanian capital, Amman, when she joined three US-based students to take up a Junior Academy Innovation Challenge, designed to address The Impact of COVID-19 on Non-Communicable Diseases. The team opted to focus on diabetes, a condition that affects millions around the world, and created an application that enabled doctors to monitor their diabetic patients remotely in spite of COVID-19 restrictions.

Sebsa and her teammates came third with their well-researched, innovative solution. Collaborating successfully with international peers increased Sebsa's self-confidence. "I am very proud of what we have achieved," Sebsa says, delighted that her team's project did so well with their contribution. "But the proudest people were my mom, because she works in healthcare, and my science teacher."

The experience also fueled her desire to push her personal boundaries further and explore other areas of science. In the months that followed this first foray, the Jordanian teen signed up for courses in robotics and technology and joined national competitions for young scientists. When the time comes, Sebsa, buoyed by these exciting opportunities, intends to embark on a career that merges scientific expertise and entrepreneurship. "I want a career that links the two and doesn't just benefit me, but enables me to help others," says Sebsa.



The Junior Academy dramatically increases access to mentored research experiences for students, especially girls and students of color, around the world and aids in closing the opportunity gap for students traditionally underrepresented in the STEM fields in their home countries by building work-ready skills rarely taught at their own schools. These include:

- ✧ Collaboration and leadership
- ✧ Communication and convention with other students from around the world
- ✧ Participation in active learning that duplicates workplace experiences

The Junior Academy supports mentored research experiences for high school students, which typically take place in a university or industry lab. These initiatives are key extracurricular activities that build a student's network, publishing record, and ability to participate in STEM fairs.





See students talk about their experience with Junior Academy here:
[The Junior Academy Informational Video on Vimeo](#)




Classroom challenges in schools around the world

Since 2014, NYAS Education has hosted top-rated programs that leverage our unparalleled resources and educational approach. Combining scientific innovation, youth development expertise, and an enthusiastic corps of scientists, the Academy has operated hack-a-thons and classroom challenges for schools around the world.

 In Kigali, Rwanda, over 500 students in 12 government-run schools participated in our Urban Gardens Challenge. Students worked in the computer lab after school and on the weekends to design and prototype small footprint gardens.

 In Colombia, the Academy conducted its first Spanish-language challenge with adolescent women who were participants in a research study led by our Nutrition Institute.

 In Jersey City, 25 out of 39 public schools (with 26,000+ students in total) participated in a district-wide Sustainability Challenge. The Academy helped to shape the challenge, provided virtual scientist mentors, and offered a supply budget for each classroom.

Using Urban Gardens to Improve Nutrition and Address Food Scarcity

In 2022, 547 students from schools across Kigali, Rwanda's capital, joined a NYAS Education challenge aimed at using micro-gardening techniques to expand access to fresh and nutritious food. Ten public schools and three charter schools in Rwanda supported the competition and gave students access to computer labs. Several Rwandan science teachers acted as mentors for participating teams.

Aged between 13-17 and grouped in 118 teams, the participants researched urban gardening methods and explored suitable crops to enable underprivileged households to supplement their diet with home-grown vegetables. The students came up with innovative solutions using collected discarded materials that they turned into planters to create kitchen gardens.

Teachers and participating schools expressed satisfaction with the challenge, as did the students who were proud to

contribute to solving issues like food scarcity and poor nutrition that affect their community. "This project taught me that there are multiple ways to grow plants and that growing plants is actually really interesting if you give it time and attention," says Ivanka, one of the participants. "This project helped me in different ways," said Fabrice, who led one of the teams. "It got me thinking and work hard and helped my parents to have our own food garden."



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to pledge your support!*





Science Alliance:

Preparing Young Scientists for the Workplace with Skills Building Opportunities

The New York Academy of Sciences Education partners with Science Alliance, a consortium of more than 30 leading universities, teaching hospitals and research institutions committed to better preparing future scientists and engineers from diverse backgrounds to meet the needs of a global workforce.

As well as networking and career exploration opportunities, Science Alliance members gain access to an extensive curriculum of professional development training and communications and leadership workshops that will equip them to enter a competitive marketplace.

Leadership Training:

The Science Alliance Leadership Training (SALT) is a professional development program that supports over 150 Graduate students (60% women and 40% from underrepresented communities). Students develop critical soft skills – such as communication and leadership that complement their technical expertise and enable them to thrive in the workforce and embark on the career of their choice.

Workshops and Seminars on Emerging Critical Topics: Science Alliance offers virtual and hybrid workshops such as Engaging with the Public – Why Scientists Need to Communicate their Work; Scientists Teaching Science; Transition to Research Independence: Funding and Grantsmanship; as well as career development, and data science.

Service Learning:

Science Alliance members include most mentors in our K-12 programs. External evaluations³ confirm that this model builds key communication, teaching, and mentoring skills while supporting the next generation of scientists.



Sources:

^{1,3} National Science Foundation funded research grants and evaluations

² Evaluations administered by The New York Academy of Sciences

Conclusion

Over the last ten years, The New York Academy of Science's STEM programs have made an indelible mark, impacting over 450,000 individuals, including students, educators, and families. Through the dedication of our scientist mentors, who have selflessly donated over 3.5 million hours of their time, the Academy has bridged gaps in STEM education. Our programs have expanded to reach more than 100 countries, bringing the wonders of STEM to countless eager minds:

- ✓ The STEM City initiative, designed to enhance access to STEM education, has ignited the spark of curiosity in students across the five boroughs of New York City and empowered teachers with the tools and knowledge to inspire the next generation.
- ✓ Our Afterschool STEM Mentoring Program has been a beacon of light in underserved communities, offering students opportunities they may never have imagined. Academy scientists-turned-mentors are making a profound impact, nurturing future scientists, and enhancing STEM identity and self-efficacy.
- ✓ The Scientist-in-Residence program has enriched the lives of more than 17,000 students by matching hundreds of scientists and teachers. Not only does it foster student interest in science, but it also supports STEM teacher retention, a critical factor in the future of STEM education.
- ✓ Our Junior Academy Innovation Challenges have enabled students worldwide to tackle real-world problems. With the support of mentors and the Academy's proprietary virtual collaboration platform, students are gaining skills that transcend traditional classroom boundaries.
- ✓ The impact of our work extends far beyond numbers. It transforms lives. Through the stories of scientists, mentors, and mentees like Nayem, Chuhyon, and Sebsa, we see how our programs change not only the trajectory of individuals but also the communities they touch.
- ✓ Chat with a Scientist breaks down barriers, offering students direct access to experts and fostering a lifelong love for science. In classrooms around the world, our programs have sparked innovation and collaboration. From urban gardening projects in Rwanda to sustainability challenges in Jersey City, we shape young minds to think critically and address real-world issues.
- ✓ Our partnership with Science Alliance is equipping future scientists with essential skills, ensuring they are technically proficient and capable leaders in the global workforce.

As we reflect on the past decade, we are driven by the belief that our work is a catalyst for change. It is a force that empowers individuals, transforms communities, and shapes the future of STEM.



For more about Academy STEM Youth Programming contact:
Dr. Meghan Groome, SVP STEM Youth Education
mgroome@nyas.org
115 Broadway, Floor 8, NY, NY 10006
www.nyas.org