Global STEM Alliance
The New York Academy of Sciences

REGIONAL COORDINATOR HANDBOOK

Afterschool STEM Mentoring Program

INTRODUCTION

The goal of this document is to help organizations and individuals understand how to run the Afterschool STEM Mentoring Program in their region. The idea—recruit STEM professionals, train them to teach enrichment science, technology, engineer and math (STEM) curricula in afterschool learning environments—is a simple one. Details such as "Where do I find scientists?" and "What are best practices in partner management?" are much more complex issues covered in this guide.

This guide is the result of a three year, collaborative research project between the *New York Academy of Sciences,* the *State University of New York (SUNY), Empire State College* and *six SUNY campuses* across New York State. Thanks to the National Science Foundation (DRL1223303) for their support and we hope you'll steal these ideas and make them your own!

EXECUTIVE SUMMARY

The Afterschool STEM Mentoring Program was founded in 2010 by the New York Academy of Sciences to recruit, train and support scientists-in-training to teach and mentor middle school students in afterschool programs in New York City.

This model, based upon the idea of mutually beneficial partnerships, would provide students with high quality, inquiry based STEM enrichment opportunities while the scientists would improve their teaching, mentoring and communication skills through community service. The volunteer, typically a graduate student or other trainee, receives training on youth development and pedagogy as well as instruction on how to teach an inquiry based curriculum. They are then placed with an afterschool program to teach and mentor for one afternoon a week over a school year or a summer camp program to teach a range of topics including coding, game design, math, nutrition, life science, space science and many more.

After a 2-year pilot phase demonstrated that viability of the model, the Academy and the State University of New York received a $2.9 million scale up grant to better understand how the program could be scaled up to a variety of urban and rural settings and to better understand the impact on the middle school students and the scientists. As of 2016 and with generous support from private, philanthropic and public support, ASMP has a scalable model that provides significant content and attitudinal gains to the student participants and significant improvement in teaching, mentoring and communication skills of the scientist. Together, with a robust network of higher education, governmental, community based organizations and non-profits, the program has served over 13,000 4th through 9th grade high poverty urban and rural students in 150 sites after school sites and 1,000 volunteer scientists. The ASMP team and its partners have produced peer reviewed research in the areas of program design and scale, service learning and scientist training, afterschool partnership management, the use of the program to create new avenues of teacher recruitment and teaching attitudes of young scientists.

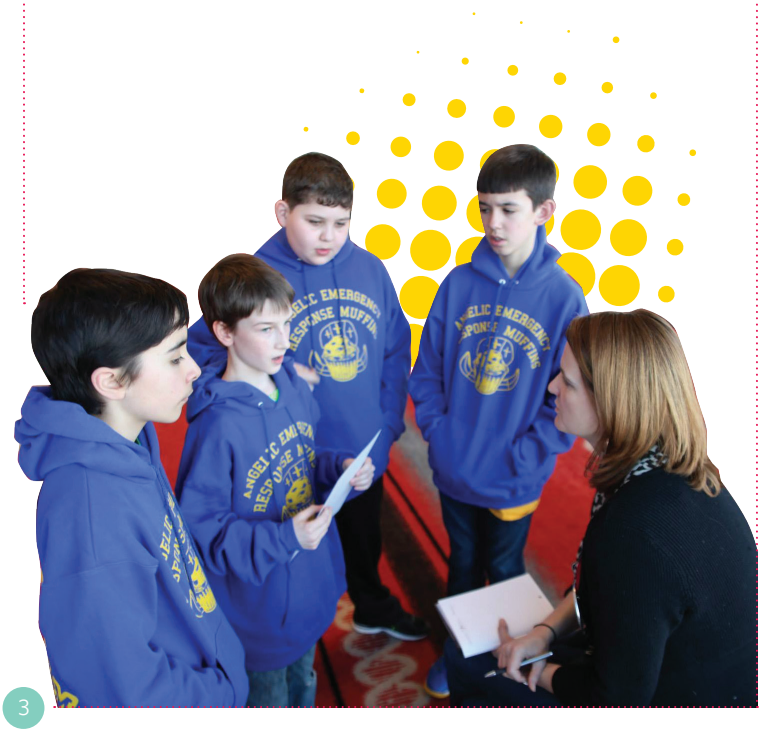
AS WE FINALIZE OUR NYAS/SUNY SCALE UP GRANT, WE HAVE IDENTIFIED A SET OF KEY PROGRAM DESIGN FINDINGS THAT HAVE BEEN OR WILL BE INCORPORATED INTO THE PROGRAM DESIGN.

- Local adaptation with a centralized support structure is key to implementing a successful program across a wide range of learning environments and higher education intuitions. The Regional Coordinators, located at each SUNY campus, identified local solutions and quickly share them with the other coordinators and program team through weekly video conferences. The combination of local empowerment with a trusting cohort of individuals in parallel positions is now a core program design.

- "Club" curriculum – where students learn a set of skills and then work on real world projects of increasing complexity and individuality – were a more successful model than traditional, linear curriculum. Afterschool and youth development settings have a low attendance rate and heterogeneous set of learners which makes skills and project based curriculum a better fit.

- Approximately 40% of the scientists become "repeat" mentors which means that complete multiple cycles of the program. These "repeaters" help orient new mentors more quickly and contribute to the library of available curriculum. In addition, they found new roles including trainer, curriculum writer and coach to provide support across the program.

Approximately 10% of mentors have become or are becoming teachers. Research indicates that the program increases interest in teaching careers in the K12 system. In conjunction with the NYCDOE, the Academy has created the Scientist-in-Residence program to take advantage of this interest and place scientists in classrooms to serve as consultants to teachers implementing STEM research projects.



OVERVIEW OF THE GRANT

PRIMARY PROJECT GOALS

1) Increase middle school students access to high quality engaging STEM programs in afterschool learning environments to improve content knowledge, improve student self-efficacy and confidence in STEM, present them with STEM role models

2) Improve the teaching and outreach skills of the participating scientists-in training

3) Create a scalable model by creating an RFP to determine suitable locations, centralized training and orientation structures and ongoing technical assistance

PROGRAM LOCATIONS

1. Albany
2. Brooklyn
3. Empire State College
4. The New York Academy of Sciences
5. Oswego
6. Stony Brook
7. SUNY Central
8. Syracyse
9. Utica

RESULTS

The external program evaluation was conducted by Gaylen Moore Evaluation Services and consisted of a mixed methods, quazi-experimental design. In addition to surveys and interviews, the evaluator used Harvard University's *Dimensions of Success* protocol.

The majority of evaluation respondents represented the program's intended target population of underserved underrepresented students. The population served was 52% female and 83% free or reduced lunch. Overall, across all sites and semesters, more than one third of the student population self-identified as African-American/ Black, followed by Latino or Hispanic; and Asian students (8 percent); other non-Caucasian students comprised 23 percent. White, Caucasian (non-Hispanic) comprised 15 percent of the students served.

The data was collected over five semesters and served 1,297 students in 6th – 8th grade. Mentors (142) came from 6 SUNY campuses, taught 12 different curriculum and were stationed in 96 classrooms.

ABOUT THE STUDY

Professor Robert Tai and his colleague Claire Mitchell from the Curry School of Education at the University of Virginia recently conducted an analysis of evaluation data gathered from this grant. Dr. Tai ran a logistic regression on 106 control samples and 464 treatment samples. An analysis of the pre-program participation responses of the control and treatment samples indicated that the control group was very similar to the treatment group.

The evaluation shows that the majority of respondents represented the program's intended target population of underserved underrepresented students. The population served was 52% female and 83% free or reduced lunch. Overall, across all sites and semesters, more than one third of the student population self-identified as African-American/ Black, followed by Latino or Hispanic; and Asian students (8 percent); other non-Caucasian students comprised 23 percent. White, Caucasian (non-Hispanic) comprised 15 percent of the students served.

The data was collected over five semesters and served 1,297 students in 6th – 8th grade. Mentors (142) came from 6 SUNY campuses, taught 12 different curriculum and were stationed in 96 classrooms.

RESEARCH QUESTIONS

1 *What is the association of STEM engagement (active and receptive) with aspirations for future STEM careers among ASMP participants and non-participants?*

DEFINITIONS

Receptive engagement in STEM: reading, listening and watching STEM content

Active Engagement: taking things apart, STEM projects, out of school time STEM activities

Aspirations for future STEM careers: young students with aspirations of future STEM careers have a higher likelihood of graduating from college with a STEM degree

FINDINGS

Non-treatment/Control Group participants who report higher levels of Receptive Engagement in STEM (e.g. watching STEM-related programs) have a 2.3 times greater odds of reporting aspiring to a STEM career. Among Treatment Group participants, the results show 2.7 times greater odds of interest in STEM careers. The results suggest that participation in ASMP does not appear to greatly influence youth's connection between receptive engagement and STEM career aspirations.

However, for **active engagement** the results are very different. While, the non-treatment/control group analysis found NO SIGNIFICANT association between increased active engagement in STEM learning and stronger aspirations for STEM careers, findings from ASMP participants showed that higher levels of active engagement in STEM learning resulted in 4 times greater odds of having STEM career aspirations.

	NON-TREATMENT/ CONTROL GROUP	TREATMENT GROUP
RECEPTIVE ENGAGEMENT	2.3 times greater odd of aspiring to a STEM career	2.7 times greater odds of aspiring to a STEM career
ACTIVE ENGAGEMENT	**Not Significant**	**4 times greater odds of aspiring to STEM career**

KEY CONCLUSIONS

- Among the youth who participated in ASMP, the findings suggest that these participants are many times more likely to see a strong connection between "doing science" and having a STEM job in the future. Students in the control group did not develop these associations on their own. Aspirations for a future career in STEM in a strong predictor of degree completion in STEM.
- The intervention helps students understand that "doing science" leads to STEM careers and this understanding is a strong predictor of degree completion in STEM.

2 *Does participation in ASMP encourage STEM engagement among girls?*

Students were asked questions about their attitudes towards STEM before and after the treatment. The control group students were asked the same questions, at the same time.

KEY:

No= no interest in STEM ✲ *Yes*= Interested in STEM

	"NO" BEFORE & "NO" AFTER No change in attitude towards STEM	"YES" BEFORE & "NO" AFTER Lost interest in STEM	"NO" BEFORE & "YES" AFTER Gained interest in STEM	"YES" BEFORE & "YES" AFTER No change in attitude towards STEM	
CONTROL BOYS	**14** *(30%)*	**7** *(15%)*	**8** *(17%)*	**16** *(35%)*	**45** *total students*
TREATMENT BOYS	**44** *(19%)*	**34** *(15%)*	**30** *(13%)*	**123** *(53%)*	**231** *total students*
CONTROL GIRLS	**21** *(30%)*	**13** ***(19%)*** ▼	**8** ***(12%)*** ▼	**26** *(38%)*	**68** *total students*
TREATMENT GIRLS	**79** *(30%)*	**24** ***(10%)*** ▲	**52** ***(20%)*** ▲	**106** *(40%)*	**261** *total students*

KEY CONCLUSIONS

- There are about the same number of control group boys who gain interest in STEM (8) as lose interest in STEM (7). In the girls control group, 8 girls gain interest in STEM while nearly double (13) lose interest in STEM. One can see adolescent girls "falling out of the STEM pipeline" in the control group confirming what many other researchers have found.
- In the ASMP Participation group, the pattern for the boys is similar to the control group. However, among the girls, the pattern is markedly different from the boys and "opposite" from the control group girls. Among control groups girls, about twice as many lose interest in STEM as gain interest. Among ASMP participants, about twice as many girls gain interest in STEM as lose interest.

WHAT MAKES A GOOD SITE?

For the grant, the team created a Request for Proposal (RFP) to help select participating sites. We've modified some RFP questions to help determine whether an organization is well suited to run this model.

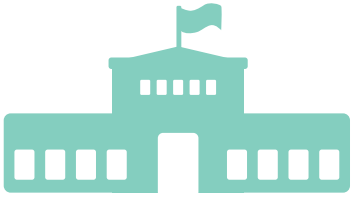
- **Do you have access to subject matter experts who are interested in outreach opportunities and want to improve their teaching and learning skills?**
  - Do you have incentives in place to encourage subject matter experts to volunteer their time such as outreach/teaching requirements, service learning internship requirements or community service clubs.

- **Do you manage and maintain relationships with K12 partners such as individual teachers, schools, administrators or other organization that serves your target population?**
  - Have you run programs with them in the past? If yes, that's great!

    If not, check out the partnership section on page 10

- **Do you have the necessary budget to run this program including: at least a part time staff person, supply budget, travel stipends for the mentors and sites, etc. We estimate that it costs between $75,000 to $120,000 to start up a formal program within a university setting. Check out the low-budget options on page 14.**
  - See Appendix A for a sample job description of a regional coordinator

- **Is your senior team or administration supportive of this effort?**



PROGRAM TIMELINE

BEFORE YOU START

☐ **Students on my campus want to mentor students**

☐ **Research time:**
- ☐ Talk to afterschool clubs and programs in close geographic proximity to see if they're interested in hosting an afterschool STEM club
- ☐ Talk to scientists to see how much interest there is running an afterschool club
- ☐ Check out local laws that govern adult volunteers in your afterschool clubs

☐ **You'll need:**
- ☐ Recruitment plan to find and vet your mentors
- ☐ Partnership agreements with your afterschool STEM club sites
- ☐ To choose a curriculum
- ☐ University or administrative approval

LATE SUMMER

- Recruit, vet and train your mentors*
- Recruit, vet and secure partnership agreements with your afterschool sites*

FALL

- Match your mentors to sites and ensure they're in communication
- Start mentoring!
- Observe teaching session and keep in regular contact with mentors and sites to make sure everything is going smoothly
- Plan for school holidays and breaks!

SPRING

- Conduct refresher training on curriculum
- Have mentors and sites confirm schedule for spring semester
- Start teaching!
- Observe teaching sessions and regular contact

END OF SEMESTER

- Celebrate
- Review partnership agreements and expectations with afterschool sites to fix any problems before the summer *(See Appendix X for a sample MOU)*
- Deep reflection upon viability of the project

END OF SUMMER

- Start it all over again

HOW TO RECRUIT MENTORS

OUTREACH

- Raise awareness of opportunity with key faculty members, administrators and others within the institution
- Work closely with any campus entities that coordinate or advertise student activities
- Advertise directly to the students via posts, email and personal conversations. Ask other campus groups to talk to their members

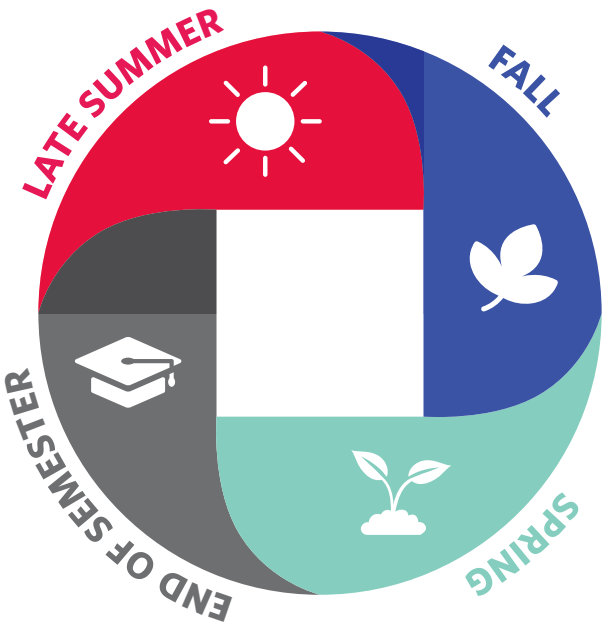
SELL THE BENEFITS OF MENTORING

- Improve your teaching, mentoring and communication skills*
- Give back to the community
- This experience is meant to be fun

WHO MAKES A GOOD MENTOR?

- People who are passionate about their subject matter
- People who want to be involved with the community
- People who have been mentored or have worked with youth
- People who want to do this type of program

** Our evaluation results demonstrate that participation in the program led to **increased skills and confidence** in teaching, mentoring and communication*



**Make sure they understand their roles and responsibilities which can be found on Page 8 of this document!*

ROLES AND RESPONSIBILITIES

RESPONSIBILITIES OF THE REGIONAL COORDINATOR

- Liaise with SUNY and the Academy
- Recruit, interview, and approve mentors
- Coordinate trainings for mentors
- Identify and cultivate relationships with afterschool providers
- Effectively match mentors with providers
- Support mentors through ongoing technical assistance regarding teaching and relationship building
- Meet monthly with mentors
- Monitor with the online course
- Conduct site visits (2 per semester per mentor per) and evaluation observations
- Equip mentors with necessary supplies
- Facilitate and ensure collection of evaluation data from mentors, student participants, and student control groups. Data will include:
    - consent letters from parents of students in treatment and control groups to permit participation in the project evaluation
    - pre/post student surveys (start/end of curriculum)
    - pre/post student knowledge assessments (start/end of curriculum)
    - pre/post mentor surveys (start/end of year)
- Promote the program internally (within SUNY) and externally (blogs, press, etc.)

ROLES AND RESPONSIBILITIES FOR HOST (CBO/SCHOOL)

- Serve as a partner who hosts AfterSchool Mentoring Program
- Ensure activities are aligned with CBO's mission and programming
- Provide critical feedback, request support when needed and identify problems
- Liaise with schools and community to understand needs and concerns and explain program benefits
- Promote the program
- Ensure compliance with state, local, and organization regulations
- Provide space for activities to take place
- Recruit youth to participate and ensure they attend regularly
- If possible, identify a control group for comparison
- Maintain a regular schedule
- Provide rosters with attendance data
- Store supplies in a safe place

ROLES AND RESPONSIBILITIES OF CBO/SCHOOL STAFF

- Sites must pair the mentors with a staff member who:
    - is familiar with the youth.
    - will always be present when mentors are there.
    - should attend one of the curriculum trainings.
    - wants to be an active participant in the sessions by setting an example for youth or supporting the mentors.
    - can facilitate the distribution/collection of parent consent forms
- In return they will receive:
    - training using the curriculum that can also be used to meet state requirements
    - experience enacting a high quality STEM curriculum
    - work closely with an expert volunteer
    - access to a network of experts and peers

ROLES AND RESPONSIBILITIES FOR THE MENTORS

- Complete an application and all required paperwork including a background check
- Participate in training on the curriculum, youth development and additional training required by the host site
- Dedicate approximately an afternoon a week to the site. This includes travel, preparation, planning and reflection time
- Be open to coaching and feedback on your teaching and mentoring
- The most effective mentors share information about their own journey in STEM, spend more time listening than talking to the students and work to build a fun, hands on classroom environment.

#IAMNYAS

DEVIKA VARMA

Meet Devika Varma, a PhD candidate who gives back to the next generation of STEM by participating in the Academy's mentoring programs.

WHAT IS THE MOST IMPORTANT BENEFIT YOU FEEL THE GLOBAL STEM ALLIANCE PROVIDES?

DV: The programming at the Global STEM Alliance has been very impressive in terms of how impactful they are for young professionals in STEM and how genuine their outreach efforts have been. Their mentoring programs such as the Afterschool STEM Mentoring Program and its "Food Connection" project have really helped me tap into the inner mentor in me.

They are making genuine efforts to connect professionals like me in STEM to the youth to garner their interest in these daunting fields through fun programs. Further initiatives like Scientist-in-Residence expose graduate students and post docs to hands-on teaching at high school and middle school level which helped me assess my science communication skills while helping develop curricula for science projects outside of my research realm - that was challenging but refreshing! Most importantly, it connects you to a great network of inspiring and smart scientists, educators and innovators."

KENNY SHATZKES

A hockey fan with a love of sharing science and combating dangerous pathogens, Academy Member Kenny Shatzkes is helping to bring cutting-edge science to the classroom.

TELL US ABOUT YOUR EXPERIENCES MENTORING IN STEM (E.G., HOW LONG HAVE YOU BEEN A MENTOR?, WHY DO YOU DO IT?, ETC...)

KS: I was far from an A student when I took freshman biology in high school. But despite my struggles, my teacher still encouraged me to explore scientific research as a potential career. The faith my teacher had in me still has a profound effect on me, as it continues to motivate me to give back to our communities through education. I believe the best way I can pay her back is to pay her kind deed forward. That is why when I entered graduate school, I sought out opportunities to mentor young students and inspire them to take a deeper interest in STEM careers. Furthermore, as I have an interest in a career in science policymaking, I find it important to understand the state of science education in today's classrooms. The New York Academy of Sciences Outreach programs have allowed me to do just that. I was a mentor with the Academy's Afterschool Mentoring Program during the 2014-2015 school year, when I taught a Life Sciences curriculum at JHS 227 in Bay Ridge, Brooklyn."

BEST PRACTICES IN PARTNERSHIP MANAGEMENT

WHAT IS A "NORMAL" PARTNERSHIP?

Although there is great value to linking the school community to the scientific research community, the practical reality of educators working with scientists can be challenging. We offer ourselves as examples of how well meaning, highly expert professionals from different fields can journey to, and then come back from, the brink of curricular disaster. We provide this example to help other partners avoid our luckily non-fatal mistakes.

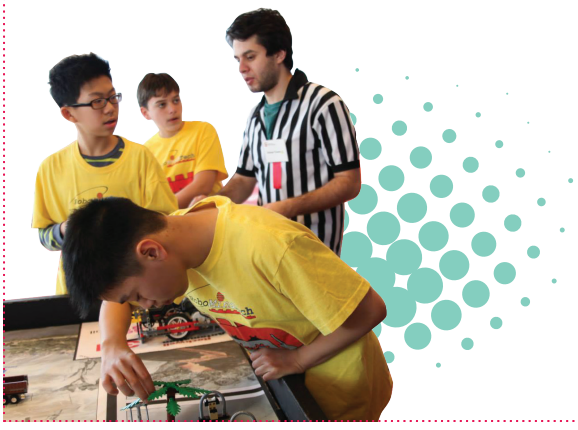
While cross-sector partnerships are very common in education there are few frameworks or best practices in managing those partnerships. There is little available to educators to help them determine what is "normal" or a predictable pattern for working with professionals from different fields. Evidence abounds that even well meaning, mutually beneficial partnerships often end when tensions start to mount.

We'd like to present Tuckman's model on group development as a guide to help others frame four stages of cross sector partnership – forming, storming, norming, and performing. Forming, the first stage, consists of individuals orientating themselves within the group by testing boundaries and establishing dependency relationships with leaders. The next stage, storming, contains intragroup conflict. In the third stage, norming, cohesiveness flourishes as new standards and roles are established. Finally, in the performing stage, roles become more flexible and group members harness the interpersonal structure of the group to accomplish tasks.

HOW TO TEST OUT NEW PARTNERSHIPS?

Our research demonstrates that trusting partnerships with clear roles and responsibilities, formal and informal open lines of communication and a common vision of success are key factors in the success of this program. Our findings also demonstrate that those types of partnerships can take a long time to build so we'd like to recommend a "quick start" partnership guide.

We've created a few programs to try out new partnerships. The goal is to start a partnership small, try a few low stakes events, work out any communication issues, build trust and then, if all goes well, build a long term partnership.



HOST A FAMILY SCIENCE NIGHT

Whether during pick up or at a Valentine's Day Dance, set up a table and recruit some mentors to run short, hands on activities with the students and parents. Make sure everyone has a nametag and the students can collect stickers for each activity that they complete.

BRING A GROUP OF STUDENTS TO CAMPUS AND VISIT A LAB

Whether by school bus or public transportation, arrange to visit your mentor's labs and universities. Students love to see where STEM gets done and the mentor can show off their day to day research activities. Call the admissions office and see if the students can get a tour of the campus. It's important for students to see a college campus no matter how young they are!

SEND A VISITING SCIENTIST

Sometimes getting students to a college campus can be expensive or difficult to arrange. Encourage your mentor to bring a few of their friends. Once on site, they can each talk to the kids about their work and their science autobiography. Bonus points if they bring some artifacts from the lab.

WORKING WITH A YOUTH SERVING ORGANIZATION

1 Identify high quality partners—Do they serve the underserved? Are they close to campus?

2 Identify high quality partners—Do they serve the unMeet with CBOs/schools to cover the expectations, and the roles and responsibilities of those involved. Do they have a SACC license?

3 Gauge their interest—Are they excited? Can they "make it happen?"

4 Does the program have a set schedule? Can they ensure mentors will be accommodated so they can keep to a schedule? Can that schedule be matched with the availability of two mentors?

5 Before mentors start at the site there needs to be some kind of documentation between the RCs and the site that shows a commitment by the site to host mentors and fulfill the expectations (middle school youth, 12 sessions over the course of at least 12 weeks with staff member from the site involved).

BUDGET

Each site needs to create a local budget to administer the program but here are the basic budget categories to help you understand the costs associated with the program.

STAFF TIME	At least a half-time coordinator dedicated to the program administration
BACKGROUND CHECKS	Typically between $60 and $100 per mentor
SUPPLIES	$100 - $500 per classroom depending upon the curriculum
STIPENDS FOR THE EDUCATOR	$30-$50 per hour to cover training. Should be based upon local "per session" for teachers
STIPENDS FOR MENTORS	Depends upon the university set up. Incentives included subsidized graduate credits, small honorarium, travel subsidization
OTHER COSTS	Marketing materials, field trip funds, program overhead and administration
EVALUATION	Typically 10% of a program budget for external evaluation

FAQS

WHAT NEEDS TO HAPPEN BEFORE INSTRUCTION BEGINS?

Mentors and site coordinators will be matched by the regional coordinators. An introductory email to both will be sent out and then they need to coordinate a time to meet via phone or in person to plan for the first day of instruction.

IF A SCHEDULE CHANGE NEEDS TO HAPPEN, HOW SHOULD IT HAPPEN?

Direct communication is best, if you're a mentor call the site coordinator in advance to let them know. Oftentimes, a session can me made up for later in the semester. Scheduling changes may also need to happen if the school/site has a conflicting event. To minimize the chances of this happening it is a best practice for the site coordinator and mentors to meet prior to the first day of instruction to coordinate calendars.

WHERE CAN MENTORS GO FOR HELP WITH TEACHING A LESSON?

The first level of support for mentors is the local regional coordinator.

WHAT HAPPENS IF A SESSION IS CANCELED UNEXPECTEDLY WITHOUT NOTICE?

It is important to be respectful of people's time and the commitment this partnership requires. That said, there may come a time when a session has to be cancelled unexpectedly. If this happens it is the expectation that the session will be made up for at a later date and that it does not happen again. It should never happen two consecutive weeks. If it does it may result in the termination of the partnership.

WHAT IF THERE'S A CULTURAL MISMATCH BETWEEN THE MENTOR AND CBO?

We all can learn from diversity, and this model emphasizes that by matching highly skilled adults with youth who may have never interacted with a scientist. On another level, the sites themselves have their own identities. Some will be highly structured and others will be more flexible. Most of the time the best "teachable moments" come when different perspectives come together to understand a lesson they did not previously understand.

WHAT DO MENTORS DO IF YOUTH ARE ASKING AWKWARD QUESTIONS?

Count on middle school youth asking awkward questions! If the questions are related to the day's lesson you may simply say "we'll get to that." Or if it is not an appropriate question you may let the child know that it wasn't appropriate, and that you can tell them why it isn't appropriate.

IF A MENTOR NEEDS MORE SUPPLIES, OR WANTS TO TAKE THE GROUP ON A TRIP THAT REQUIRES TICKETS IS THAT POSSIBLE?

Mentors are given a small amount of money to buy the items they'll need for their curriculum. Anything beyond that amount is handled on a case-by-case basis.

WHAT IF A MENTOR IS UNSURE ABOUT SOMETHING HAPPENING AT A SITE?

Mentors should always be paired with a staff member who is in the room with the mentor at all times. Part of the reasoning for this is that the site staff are the ones trained for recognizing youth who may have been mistreated and are the ones knowledgeable regarding the site's policies. So, if mentors are being left alone with youth during sessions an intervention needs to take place to eliminate that challenge. If a mentor sees something out of the ordinary then he/she should talk with the site coordinator and appropriate supervisors. Then the appropriate measures will be taken.

WHAT IF A MENTOR OR SITE HAS TO END THE PARTNERSHIP BEFORE THE TWELVE-WEEK CYCLE CONCLUDES?

Unfortunately, sometimes circumstances (ie illness, career change, etc) take place that are unforeseen. If this happens we encourage either party to be upfront about it and let the other party know as opposed to cancelling multiple sessions.

WHAT MAKES A GOOD CURRICULUM?

The New York Academy of Sciences Education Standards can help program designers in formal and informal education settings compare their materials to the expectations of schools, universities and employers. We've distilled these expectations down to a simple STEM Readiness checklist for quick reference and use. This checklist can be used as an evaluation rubric when choosing materials or as a conversation starter with stakeholders. The Standards themselves provide significant detail and background research on the items in the checklist.

COMPETENCIES	PERFORMANCE INDICATOR(S) Academy program participants will:
SOCIAL COMPETENCY Social Competency is broadly defined as the ability to interact successful with others.	• **Students should work collaboratively and learn how to play different roles within a team** • **Students should be able to lead a team** • **Students should be able to work independently** • **Students should be able to work with and disagree with people who are different than they are and be able to provide and take constructive feedback** • **Students should be able to resolve conflict**
CRITICAL COMPETENCY Critical Competency has at its core critical thinking and other habits of mind.	• **Students should be able to use multiple methods of solving problems with emphasis on novel techniques including the scientific method, computational thinking and design thinking** • **Students should understand what makes good science and compare and debate scientific claims** • **Students should be able to evaluate information from different sources** • **Students should be able to reflect upon their work and path** • **Students should recognize that there are barriers to success in STEM and be prepared with strategies to overcome them**
GLOBAL COMPETENCY Global Competency outlines a vision for global citizenship and interactions.	• **Students should approach the world with an ethical framework** • **Students should see STEM as a force for good in the world, be driven by a sense of mission and find joy in their work** • **Students should be able to operate in multiple settings: (Work, academic, peer) and learn in different settings (in school and out)** • **Students should have an actionable intergenerational network**
CREATIVE COMPETENCY Creative Competency describes the way an individual explores and manages ideas.	• **Students should be able to plan, manage, and execute a project (define goals, benchmarks, organize ideas and solutions)** • **Students should be able to define a scientific question and design and conduct a research project** • **Students should have executive function capabilities (risk assessment, time management)** • **Students should be able to demonstrate scientific imagination**
CONTENT/EXPERT COMPETENCY Content/Expert Competency includes acquisition of proficiency in a domain.	• **Students should have a passion for STEM and identify an area of interest that they would like to learn more about** • **Students should be able to connect problems and solutions to a personal, local, and global context** • **Students should be able to perform a set of technical skills safely** • **Students should have a specific set of content knowledge in the STEM fields as defined by local, state and national standards** • **Students should be able to advise others on a STEM path and recognize their role as a STEM Ambassador**
COMMUNICATION COMPETENCY Communication Competency describes an individual's ability to transmit ideas.	• **Students should have be able to use technology to enhance their work** • **Students should speak and write the language of STEM** • **Students should be able to communicate to different audiences** • **Students should communicate in multiple modalities about their own research and the nature of science**

PROGRAM MODIFICATIONS

The essential elements of the model are subject matter experts teaching and mentoring students who want more STEM enrichment in their life.

SHORT CASE STUDIES

In Malaysia, the National University of Malaysia has modified the program so that scientists teach groups of students during school breaks. Curriculum can be modified and concentrated to create intense, but short term, "camps" for students. Modifications include the Academy's Hack Your Health program, hack-a-thons, and STEM festivals.

Many organizations run 8am to 5pm summer camps. The Academy, in conjunction with NYC's Department of Youth and Community Development have run the Afterschool program with multiple, 2-4 hour visits over 4 weeks. This provides the perfect opportunity to integrate field trips into a curriculum.

Scientists don't just have to go to afterschool programs, they can work during the school day too! The Academy places "Scientists-in-Residence". The scientist serves as a consultant to the teacher to enact a student research program such as a Citizen Science project, science fair or student research program.

LOW BUDGET OPTIONS

The Afterschool STEM mentoring program was tested out at a set of universities and worked with hundreds of scientists and thousands of students in a research based intervention. While we didn't study other permutations of the program we're exploring three low-cost options.

1 Form a STEM Community Service Club: If you're a high school through graduate school student, your campus probably provides funding to student clubs. Start the process and see who is interested in joining.

2 Reach out to your local school or community organization to build an individual partnership. Many organizations accept individual volunteers and can provide you with an application. Many communities have robotics or STEM clubs who can often use a volunteer.

3 Become a visiting scientist: Many organizations run career days. Create a 1 hour, student friendly activity that introduces students to who you are and what you do. The "Draw a Scientist" activity is a great way to start and whatever you do, don't lecture!

APPENDIX A: REGIONAL COORDINATOR JOB DESCRIPTION SAMPLE

RESPONSIBILITIES

- In conjunction with your organization, the Regional Coordinator will recruit, interview, and place scientists and other STEM professionals to serve as mentors and facilitators to afterschool and in school clubs and classrooms
  - Build relationships with university faculty, administrators, students and student leaders to build knowledge of the opportunities and help identify suitable candidates
  - Build relationships with teachers and afterschool programs, inform them of the program and help identify suitable classroom placements
  - Work with Academy staff to coordinate training and logistics for educators workshops
- Conduct evaluation activities, classroom observations and coaching for scientists and teachers
  - Provide guidance in effective teaching strategies, lesson modification, and classroom management
  - Facilitate communication between Mentor and site staff
  - Schedule and execute site visits to each afterschool placement
  - Order and prepare supplies for Mentor
- Identify capacity building opportunities in schools and afterschool programs. Work with project team to evaluate and implement capacity building projects that satisfy performance metrics

CHARACTERISTICS

- In urban areas, comfort navigating diverse neighborhoods and public transportation
- In suburban and rural areas, access to a car
- Strong interpersonal skills -- ability to easily and quickly develop rapport with a wide variety of stakeholders
- Strong oral and written communication skills
- Flexibility and ability to problem solve
- Passion for furthering the development of service and the opportunities for at-risk youth

EDUCATION/EXPERIENCE

- Bachelor's degree with a strong record of service
- Ability to work in school and youth settings

APPENDIX B: SAMPLE LINKAGE AGREEMENT

GENERAL LINKAGE AGREEMENT

Partnership Proposer: *CBO Name Here* _____

INSTRUCTIONS: This agreement is a demonstration of a commitment to integrate service delivery through working relationships with other organizations. It is not a consultant agreement.

CBO Name Here will establish a programmatic linkage with ***Your Organization*** in the form and manner described below:

1. ***CBO Name Here*** will - Provide After School programming to all ***CBO Name Here*** participants
2. ***CBO Name Here*** will – Provide classroom supplies to the Graduate Students
3. ***CBO Name Here*** will – Identify a staff member to be trained in the STEM curriculum
4. ***CBO Name Here*** will – Assist the Graduate Students in co-teaching the STEM courses
5. ***Your Organization*** will – Provide a math and/or science mentor to ***CBO Name Here*** (which is located ***CBO Address Here***) participants once a week from Dates, if there is a mentor available.
6. ***Your Organization*** will- Provide one ***CBO Name Here*** Staff member 6 hours of training on the STEM curriculum.

Signed by:

_____
Your Organization

_____
Executive Director of Partnership Proposer

Date: _____

THE GLOBAL STEM ALLIANCE

The Global STEM Alliance is an international initiative of the New York Academy of Sciences with over 230 partners in more than 50 countries and regions, including government agencies, corporations, educational institutions, and nongovernmental organizations. The mission of the GSA is to increase the number and diversity of students in the STEM pipeline, with a goal of reaching a total of 1 million students in 100 countries by 2020.

The Afterschool STEM Mentoring Program is supported in part by the National Science Foundation (DRL-1223303) and (DRL 1440869).

Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

ABOUT THE NEW YORK ACADEMY OF SCIENCES

The New York Academy of Sciences is an independent, not-for-profit organization that since 1817 has been driving innovative solutions to society's challenges by advancing scientific research, education, and policy. With more than 20,000 Members in 100 countries, the Academy is creating a global community of science for the benefit of humanity.

Please visit us online at **www.nyas.org** and follow us on Twitter at **@NYASciences**.

THE NEW YORK ACADEMY OF SCIENCES

7 World Trade Center
250 Greenwich Street, 40th floor
New York, NY 10007-2157