THE NEW YORK ACADEMY OF SCIENCES'

SCIENTIST-IN-RESIDENCE PROGRAM EVALUATION REPORT

Teacher and student outcomes

CONDUCTED BY ED INVESTIGATIONS

Prepared by Noah Goodman
Submitted August 14, 2025

ABOUT ED INVESTIGATIONS

Ed Investigations (www.edinvestigations.com) is a research and evaluation firm that helps partners develop, improve, and evaluate educational media, apps, programs, and curricula to help youth and families have successful learning experiences and grow in community.

This study was led by Noah Goodman, principal and founder at Ed Investigations. Noah brings expertise in design-based research and utilization-focused evaluation and has more than a decade of experience conducting federally-funded research and evaluation programs in the fields of STEM, family learning, digital media, and primary-source learning. His work has been funded by the National Science Foundation, the Department of Education's Institute of Educational Sciences, and the Gates Foundation.

As a researcher at Education Development Center's Center for Children & Technology (EDC), Noah developed and evaluated a range of educational tools and programs. For the Playing with Data project, Noah contributed to the formative development of a dashboard to help science teachers make data-informed instructional decisions based on student performance in Glasslab's Mars Generation One digital game. As part of the National Science Foundation-funded Cyberchase Mobile Adventures in STEM, Noah designed and ran a national research study and evaluation to explore families' use of educational media and activities to create informal science interactions. Noah has also led EDC's research collaboration with the Library of Congress's Teaching Primary Sources program, designing tools, briefs, and evaluations to help organizations create learning experiences around the Library's historical collections.

Executive Summary

The New York Academy of Science's (NYAS) Scientist-in-Residence (SiR) program places working scientists in K-12 classrooms during an academic year to support more authentic scientific inquiry and STEM experiences. Since its launch in 2012 through a collaboration with the NYC Department of Education, the SiR program has paired over 500 scientists and teachers. The program is designed to (a) support students to gain opportunities to engage in authentic scientific inquiry and gain exposure to STEM career pathways; (b) invigorate teachers' practice with new scientific methods and content; and (c) to expose scientists to teaching careers and develop their science communication skills.

> "The Scientist-in-Residence program matches scientists with NYC public school teachers to bring scientific inquiry to life in the classroom. By combining their content and pedagogical expertise, each scientist-teacher pair will develop and implement a year-long project that prepares students to engage in authentic research and spark their interest in STEM learning." - SiR Acceptance Packet

This report presents the results of a mixed-methods evaluation conducted by Ed Investigations during the 2024–2025 school year to explore program outcomes for students and teachers. The evaluation drew on data from five group-interviews with 15 teachers, post-survey responses from teachers in the most recent 2024-2025 cohort (n=37) measuring teachers' perceptions of student outcomes, and pre- and post-survey data collected over five years of the program (n=131) measuring change in teachers' confidence in their knowledge of STEM content and use of inquiry methods (see *Appendix A* for a description of the evaluation methods).

Overview of Findings

The evaluation produced four primary findings about student and teacher experiences of the Scientist-in-Residence program:

1. Students got new opportunities to engage in authentic scientific inquiry and use real-world methods.

When asked what they most valued about their participation, most teachers discussed the opportunities their students got to engage in authentic scientific inquiry as their students worked with the scientists and developed their projects for the end-of-year showcase. Most teachers agreed or strongly agreed that during their time in SiR they made more time in their classes for scientific investigation (87%) and that their students were more likely to develop an investigation over multiple class periods when compared to their normal classes (89%). Teachers described how their participation in the SiR program resulted in students:

- engaging in more sustained investigations,
- using more rigorous methods for data collection and analysis, and
- becoming more engaged in their projects and investigations.

> Wow. My elementary students were learning what I learned in middle-school. **I kept telling my kids they were a few steps ahead of their peers**. - Upper-Elementary Teacher

> It's not everywhere that classes can get the astrophysicist from down the block to come into your high school classroom right and teach you about this incredibly cool thing they're doing. It was really important to show them how cool it is that we have these opportunities in our backyard. - High School Earth Sciences Teacher

2. Students got new opportunities to learn about the work and career pathways of scientists.

Teachers discussed how working with their scientists introduced them and their students to what it was like to be a scientist, to the day-to-day work scientists did in their labs or centers, and to the steps and training that led scientists to their positions. Above all, teachers felt that the collaboration "put a face on science" for their kids and helped them see that "scientists are regular people," making the idea that they too could become scientists more tangible.

- 87% of teachers agreed or strongly agreed that their students found their scientist fun and interesting.
- 84% reported their students learned more than they would have normally about the work involved in different scientific or engineering careers and how to pursue them.

> **I think a lot of it simply comes down to the fact it's the first time they've met a scientist.** My fifth graders are starting to realize that there are so many different jobs out there—so many possibilities. So, when they met our scientist, they got excited and started asking good questions about the scientist's work and how it helps others. - 5th-Grade Science Cluster Teacher

3. Having the scientist in the classroom gave teachers the confidence to do new types of activities or cover new content

In addition to these impacts on students, teachers talked about the confidence working with their scientists gave them to try new things, such as running longer-term investigations, building more open-ended projects, and using new materials or approaches.

> Having the scientist there helped me gain confidence in my ability to create long-term investigations and organize them so the kids remain engaged and willing to do the next steps even though we may have begun the project in the previous month. - High School Living Environments Teacher

4. Teachers were exposed to new science content and research processes that could excite their students about science.

Finally, teachers reported learning new scientific concepts, tools, and strategies—ranging from data analysis in Excel, to the safe use of petri dishes, to how to integrate quantum physics concepts. From the pre-survey to the post-survey, teachers reported statistically significant gains in their:

- knowledge of current scientific practices and advancements, increasing from a pre-survey mean of 3.73 to a post-survey mean of 4.37 ($t(130) = 8.44$, $p < .001$) with a large effect size (Cohen's d=0.74), and
- confidence in their ability to incorporate inquiry-based projects in their existing curriculum, increasing from a pre-survey mean of 4.08 to a post-survey mean of 4.62 ($t(129) = 7.14$, $p < .001$) also with a large effect size (Cohen's d=0.63)[1].

> I learned how to use graphs in Excel to summarize the data and use the graphs. - 10th-Grade Earth Sciences Teacher

> I hadn't taught torque or springs before working with this scientist, but now they're a staple in my curriculum. - High School Physics Teacher

[1] Mean scores were calculated based on a confidence scale where a score of 1 means the respondent selected *not very confident* and a score of 5 means the respondent selected *very confident.* Pre-survey to post-survey change was calculated for all teachers who completed both a pre- and a post-survey in the past 5 years of the program (from the 2020-2021 school year to the 2024-2025 school year).

Overview of the Scientist-in-Residence Program Structure

In order to achieve the program goals, NYAS provides a number of structural supports to teachers and scientists including:

- **Program expectations and deadlines.** Scientists are expected to visit the teacher's classroom at least 10 times during the year. NYAS provides partners with a timeline that includes key due dates for project plans, peer reviews, and periodic check-ins with program staff (see *Appendix B* for an example of the timeline and program expectations).
- **Workshops to support project development and professional growth.** The program includes an orientation and regularly scheduled check-ins, where scientists and teachers are introduced to one another, workshop pedagogical strategies, and collaborate with their cohort to develop project plans
- **Structured initial meetings and for project planning tools.** The program offers guidance for initial classroom engagement, including recommendations for a *session zero*, where scientists observe the classroom, an introductory session (where scientists describe the work they do and their professional and personal background). In addition, teachers and scientists are expected to complete *partner sites*—Google Sites where they introduce their project, list major concepts and skills for the project, and aims and plans for each individual session.
- **A culminating student showcase.** The inquiries culminate with the student showcase, during which student teams from across the program meet to present their projects and receive feedback.
- **Funding for participation.** Program participation is provided at no expense to the school, and all teacher and scientist teams receive personal stipends as well as a materials budget to purchase supplies for their project.

In-Depth Findings from the Evaluation

Finding 1: Students got new opportunities to engage in authentic scientific inquiry and use real-world methods.

When asked what they felt was the most important outcome of the program, most teachers spoke about the opportunities students got to engage in authentic scientific inquiry. Teachers reported that their students conducted scientific inquiries in "more rigorous and authentic ways" (2401[2]), that it pushed their students to do more "advanced work" (1303), and that students had greater buy-in and excitement when working on their projects.

> Wow. My elementary students were learning what I learned in middle-school. **I kept telling my kids they were a few steps ahead of their peers**. - Upper-Elementary Teacher (3101)

Teachers' discussions of these opportunities revolved around three key themes:

- Students engaged in more sustained investigations.
- Students used more rigorous and authentic methods for data collection, analysis, and communicating findings.
- Scientists brought authenticity and real-world, first-hand experience, to the classes' work.

Finding 1a: Students engaged in more sustained investigations

Science curriculums are often packed with content that teachers are expected to cover, which can leave many teachers feeling they don't have time for inquiry[3]. Teachers in our focus groups noted how participating in the SiR program led them to prioritize time for more sustained and authentic scientific inquiry. In the end-of-program survey, 89% of teachers reported that their SiR classes were more or much more likely to spend

87% Teachers who agreed or strongly agreed that they made more time for scientific investigation. (n=37)

89% Teachers who reported that SiR students were much more likely to spend multiple class periods on one scientific investigation. (n=37)

[2] Throughout the report, we cite quotations and the data that supports our findings using teacher study IDs. These are four-digit ids assigned to teachers in lieu of their names used to internally track and externally present the representativeness and closeness-to-the-data of the themes (see *Appendix A* for further discussion).

[3] National Research Council. 2000. Inquiry and the National Science Education Standards: A Guide for Teaching and Learning. Washington, DC: The National Academies Press. https://doi.org/10.17226/9596.

multiple class periods on a single scientific investigation, while 87% agreed or strongly agreed that they made more time in their curriculum for scientific investigations. One high school AP Biology teacher (1301) said that they “wouldn’t have normally prioritized the time for deep dives, especially in a class like AP Bio where the curriculum is so intense.” An 11th grade science teacher (1102) talked about how, normally her students work “unit by unit” in her classes. But, when she participated in SiR, they “left a project open for the whole year” for her students to “continuously work on.” A 9th grade Living Environment teacher reported that her students had the opportunity to replicate scientific tests they conducted—something she wouldn’t have normally taken the time to do.

> We always tell the kids you’re supposed to do an investigation at least three times. But when do we really have time to run through these protocols multiple times? **My students got to replicate their tests with our scientist.** - 9th Grade Living Environment Teacher (1302)

> We were able to do a deep dive and leave that project open for the whole year because they were preparing for the SiR showcase. When I was doing research in undergrad, we worked on one project for the whole semester, but in the classes I teach, students tend to work unit-by-unit without long-term projects. **So, it was nice to bring that more in-depth research back into my classroom.** - 11th and 12th-Grade Science Teacher (1102)

Finding 1b: Students used more rigorous and authentic methods for data collection and analysis

Teachers discussed how the scientists they worked with helped their class harness new and more professional methods and approaches for collecting and analyzing data, reporting findings, and conducting authentic scientific inquiry (see *Figure 1* for examples). 89% of teachers reported that their students who participated in SiR were more or much more likely to use tools and methods that are common in professional scientific research, and 87% reported their students were more or much more likely to compile and present data in a clear and structured format.

89% Teachers who reported their SiR students were more, or much more, likely to use tools and methods common in professional scientific research. (n=37)

87% Teachers who reported that students were more, or much more, likely to compile and present data in a clear and structured format. (n=37)

For example, teachers described how their students used micropipettes to measure liquids when performing serial dilutions in order to study the growth of beneficial bacteria in fermented foods (S602). They used GIS to “research and propose a wildlife corridor for specific species” (S787), Raspberry Pi and Python to code a rover (S892), they created charts to illustrate their results from water safety tests (S217), and they learned how scientists analyzed peer-reviewed articles (S327).

An elementary science teacher talked about how, through their scientist, their students "got to see the excitement of preparing a slide" to view under a microscope during a study they conducted of plant cells (3101). This scientist showed students "how to seal the slides and covers using nail polish," helped students know "what to look for under the microscope," and described "how to take a good science notebook." A high school environmental science teacher talked about how her students presented their findings about exoplanets to a group of 20 to 25 NASA scientists (1303). Their mentor scientist helped them plan the presentation—noting what elements needed to be included and how to come up with a title—and they got feedback from the scientists they presented to, one of whom even suggested that they publish their findings.

> **The scientist we worked with gave our kids so much technique**. Students were excited to learn how to prepare a slide for the microscope and what to look for or how to keep a good science notebook. - Upper-Elementary Teacher (3101)

> **My students presented their project to real scientists in a NASA building.** There were more than 20 scientists. I didn't expect so many to be there. The scientists asked the kids questions and shared their ideas on what they might research next. **That's when the kids realized they wrote a scientific-level paper. They were very proud**. - 10th-Grade Earth Sciences Teacher (1303)

Figure 1: Methods Strengthened by the Collaboration with the Scientists

Scientific Method	Examples
Data collection	"The kids were studying plant cells, so our scientist explained techniques for how to slice a leaf so it's thin enough to put under glass, or how you can use nail polish to seal the slides closed. They helped the kids understand what they were looking at in the microscope and how to choose which lenses and magnifications to use." - Upper-Elementary Teacher (3101)
Data analysis	"Our scientist was a lab analyst testing water quality, so when our students went to test whether the water in our school was safe to drink, she helped them identify which chemical reactions to look for in the test results we got back from the lab." - 10th Grade Chemistry Teacher (1202)
Reporting findings	"Our scientist-in-residence showed students how to write a real paper. He showed his own papers, explained the research they did, and told them how they came up with the title. I also learned how to use the graphs in Excel. We

	don't normally graph data." - 10th-Grade Earth Sciences Teacher (1303)
Authentic science	"My scientist and I have developed a protocol that mirrors what happens in real research labs. The kids start by coming up with their own research questions and narrowing it down to something researchable. Then, we have them actually complete a grant writing process where they fill out a grant request form and they have to pitch why their project deserves funding. I've learned how to better fit that full scientific method into my classes." - High School AP Biology Teacher (1301)

Finding 1c: Scientists brought authenticity and real-world, first-hand experience

Beyond the specific methods and approaches that scientists contributed to students' projects, teachers reported that the scientists' real-world experience contributed to an overall sense that what students were doing was authentic science. Teachers described ways scientists connected the class to their work, such as by bringing "samples from their actual studies" (1303) and highlighted the cool things the scientists had done in their work or training, such as spending their summers in a field camp studying glaciers (1101).

> **My scientist brought real-world and firsthand experience.** She spent summers in field camps on glaciers. I have a friend who did that, but ha! I never stayed in a field camp. **It was really valuable to show my students what a scientist looks like.** - 9th-12th-Grade Earth Science Teacher (1101)

While many of the teachers did study science in college, or had some background in the sciences, they noted how the professional knowledge and experiences of their scientist differed from their own. One middle school science teacher noted that, while their scientist worked with data every day, the last time they had collected data for anything outside of a classroom assignment was when they were in college. This meant that their scientist was "bringing contemporary methods and materials" (2401) to the students' projects.

> **Our scientist helped the kids collect data in a much more rigorous and authentic way.** I was in college last time I collected any data in the field that wasn't for the science class I was teaching. So, my scientist brought contemporary methods and materials I didn't know about. - Middle-School Teacher (2401)

Several teachers talked about how interesting it was for them and their students to see people who were specialists in their field. An elementary science cluster teacher talked about how their scientist focused on water sanitation systems in third world countries. She felt the type of knowledge their scientist had—which was "hyper-focused"—presented her students with an interesting contrast from her generalist knowledge of science topics. A 9th-grade physics teacher felt meeting an expert "with a depth of knowledge in their field" who "can just field questions" helped excite her students about their work and "built kids' imaginations as far as being interested in science" (1401).

> I'm a generalist. I'm a common branch science teacher. I have, you know, multiple lessons I teach throughout the day and they're all on different topics. So, **it's good for the kids to see somebody who is this super specialist—hyper-focused on one topic—and who loves it.** - 5th-Grade Science Cluster Teacher (3201)

Finally, a middle-school science teacher felt that exposing their students to someone who, in their daily life, uses the technical language students only hear in their science class "affirms" for students "what science is about" (2401), connecting what they learn in class to the real world.

> There's a lot of highly specialized vocabulary in science and it sometimes feels like I'm teaching a whole other language. So, when students can hear other people using that language, it affirms for them that—for lack of a better word—this scientific language is *real*. **My students get to see that there is a whole community of professionals who are *real people really* speaking to each other using the scientific vocabulary we learn in our sixth-grade class.** - Middle-School Teacher (2401)

Finding 1d: More authentic and extended science inquiry created student engagement and investment

Most importantly, teachers felt that this feeling of being engaged in authentic scientific investigation motivated students, both by exciting them generally around STEM fields, but also by investing them deeper in the work of their projects. 95% of teachers agreed or strongly agreed that after participating in SiR, their students were more excited about science.

Teachers talked about how students were "made to feel like real scientists," which led them to "take more ownership over their projects" (S217); how they were able to explore topics that felt more "meaningful," such as how planting native flowers in little gardens on their window sills could attract pollinators and strengthen the local ecosystem (S207); or how they explored topics that felt relevant to students' lives, such as conducting experiments around odor and soaps, which students got excited about because of "the stink in their classroom" (1302).

> Collaborating with my scientist allowed me to **create a more authentic and modern lab experience for my students that was more relevant and engaging**. - High School Living Environments Teacher (1302)

Teachers reported that conducting more authentic and relevant studies increased students' engagement. For example, a 5th-grade science teacher talked about how she was excited to see what the students would produce for their scientist, sensing that they would "step up for him" (3201). Another elementary science teacher talked about how exciting it was for him to see his students embodying the language and behaviors of scientists as they interacted amongst each other (3101), while a high-school biology teacher felt that working with her scientist to create space in their class for "that full scientific method including the administrative stuff," helped them focus on studies "that have larger implications" and brought her students "joy, competency, and autonomy" (1301).

95% Teachers who agreed or strongly agreed their SiR students were more excited about science after participating. (n=37)

> **It was exciting just to see the questioning my students were doing amongst themselves—how they were talking and acting like scientists with each other rather than just with the grown-ups.** 'Oh, did you see this?' 'Did you see that?' 'Oh, I'm not understanding what I'm doing here.' The scientist and I just sat back sometimes and watched the kids do their thing. - Upper-Elementary Teacher (3101)

> **My students really enjoyed having someone new and special coming into our room, and they felt special that they got this experience that other classes at school didn't.** They felt attached to our scientist. She was out for two months because of a family emergency, and my students were really worried about her. When she came back to the classroom, they all ran over and were hugging her. They were really excited that she was back. - Pre-K to 2nd-Grade Teacher (4101)

> Being able to continuously work on a project for a longer period of time allowed my students to go back and edit and revise their work. We don't always have time to improve what we've done, and **it gave them opportunities to apply the skills they had learned and to see their growth.** - 11th- and 12th-Grade Science Teacher (1102)

Finding 2: Students got new opportunities to learn about the work and career pathways of scientists.

While scientists brought specific methods and authenticity to the classroom, they also shared their personal stories, which (a) “put a face on someone who does science” (1102) and (b) exposed students to new STEM-related careers and career paths.

Finding 2a. Scientists put a face on the profession

While teachers reported that some scientists they worked with connected more easily with students than others, many of the teachers could describe informal conversations where their students asked questions about their scientists professional work and background, which built a relationship between the students and scientists and helped students understand that “scientists are regular people” (2401) and helped them connect to the scientists. 87% of teachers agreed or strongly agreed that their students found their scientists fun and interesting. Numerous teachers emphasized the importance of pairing students with scientists whose backgrounds felt relatable—whether they had grown up in the same neighborhood (3102), were closer in age or had attended community college (1201), shared racial or ethnic backgrounds (1302), or spoke English as a second language (3201). Teachers felt it was important to provide their students with different types of mentors and that these details helped students connect to their scientists as real people and allowed them to see themselves as capable of entering into a STEM field.

87% Teachers who agreed or strongly agreed their students found their resident scientist fun and interesting. (n=37)

> My students got exposure to another mentor figure. Someone that they can look up to who's a bit closer to their age and who's going through things they might go through in a few years when they think about applying to colleges. The scientists that we had went to a community college, for example, which is something that a lot of our students do. **I think it's good for them to see that you can commute from home to a community college and become a really successful scientist.** - Biology and AP Biology Teacher (1201)

> I don't know if this was on purpose, but **all of my scientists have been black women. And all of my kids are black or brown.** I feel that's very important. They're able to see someone who looks like them and is successful and can speak to their research and what they're doing. - High School Living Environments Teacher (1302)

One teacher talked about how her class looked their scientist up on Google Scholar when they weren't in the room and how "excited" her students were "to see all of his papers" listed (1102) and see another side of the professional life of their scientist.

> My students loved our scientist. **He had spent time working in academia and in industry,** and they asked him questions about what that was like and how those settings were different. **We looked our scientist up on Google Scholar when he wasn't in the room, and the kids were all very excited to see all of his papers**. The papers were too technical for them to read, but they got a big kick out of seeing them. - 11th and 12th-Grade Science Teacher (1102)

Finding 2b. Students learned about different STEM-related careers and pathways

In addition to this humanizing of the profession, teachers talked about the exposure their students gained to scientific careers and career pathways. The mentor scientists worked in diverse fields—such as biochemistry, neuroscience, astrophysics, computer science, and sanitation—and 84% of teachers reported that students learned more or much more about the work involved in different scientific or engineering careers or about career pathways in science or research than they would have in their normal classes. One elementary science teacher said their students were "starting to realize that there are so many different jobs out there" (3201) and "being exposed to someone whose job is in the sciences is something new to them."

84% Teachers who reported their SiR students learned more, or much more, about the work involved in different scientific or engineering careers. (n=37)

84% Teachers who reported their SiR students learned more, or much more, about career paths in science or research. (n=37)

> **I think a lot of it simply comes down to the fact it's the first time they've met a scientist.** My fifth graders are starting to realize that there are so many different jobs out there—so many possibilities. So, when they met our scientist, they got excited and started asking good questions about the scientist's work and how it helps others. - 5th-Grade Science Cluster Teacher (3201)

Hearing scientists talk about their backgrounds gave students and teachers a "much clearer understanding of a scientist's career path" (2401) and the different contexts within which scientists work (academia, independent labs, freelance researchers, industry, etc.). Students learned how scientists had "started in one place and ended up in another," such as "the head of a medical department who flunked biology in their first year of college" (1102) or a NASA scientist who had been touring with their band on the west coast before they decided to return to school where they studied climates on Mars (1303). In general, students got opportunities "to just ask a bunch of questions about college and what the scientist studied" (1201).

> **I have a much clearer understanding of a scientist's career path**—of what it is to be an academic, or to work in an industry, or to be a freelance researcher and have an independent lab and apply for grants to work at universities in different places. And **having that understanding gives me a sense, when I talk to students about careers, of what they might do as scientists and what research is about.** - Middle-School Teacher (2401)

Finding 3: Having the scientist in the classroom gave teachers the confidence to do new types of activities.

In addition to ways that collaborating with their scientists directly impacted students, teachers talked about impacts on their own teaching. Many teachers discussed ways that "having an expert in the room" gave them "confidence" to do things like dissections that they "wouldn't have done on [their] own" (1201) and teachers mentioned that working with their scientists helped them to feel more "brave about doing projects that [the] didn't know the answer to" (1301). 87% of teachers reported their students were more or much more likely to conduct investigations where the outcome was not predetermined.

> **87%** Teachers who reported their SiR students were more, or much more, likely to carry out investigations where the outcome was not predetermined. (n=37)

> Even though I was a biology major, I never worked in an actual lab, or worked with rats, or did any dissections in college. And so, I learned a lot from my scientist. **Having an expert in the room who was familiar with the process—who had dissected pigs before, and looked at brains, and was able to help the students identify body parts—it gave me confidence to do dissections with the students that I wouldn't have done on my own.** I think they got a lot out of it. They had a really fun time like feeling like scientists and getting to go through that process.
> - High School Biology Teacher (1201)

One teacher talked about how their scientist could answer content-specific questions, which allowed her to not feel "unprepared" to explore new topics with students and gave her the confidence to move back and forth between covering their normal curriculum and engaging in "longer-term investigations" (1302).

> Usually, the investigations we do are something that can be done within a week. **Having the scientist there helped me gain confidence in my ability to create long-term investigations and organize them so the kids remain engaged and willing to do the next steps even though we may have begun the project in the previous month.** Knowing she was going to be there for support helped me feel prepared. - High School Living Environments Teacher (1302)

A Pre-K to 2nd grade science teacher, who had been at their school for 17 years, talked about how they had been "teaching the same curriculum for a long time" and that their collaboration with the scientist provided them with an opportunity to "change up" the way they were teaching and to "rethink" how they approach their curriculum and what they "fit into it" (4101). This teacher was used to working alone, so even just having someone else in their classroom who they had to "hand over" some of her classroom time to was new.

> When I found out my scientist was with a cellular biologist, I thought, "Oh, my! How am I going to work with a cellular biologist and second graders?" **I like that working with my scientist forced me to rethink my biology curriculum and to find opportunities to insert new ideas into it.** - Pre-K to 2nd-Grade Teacher (4101)

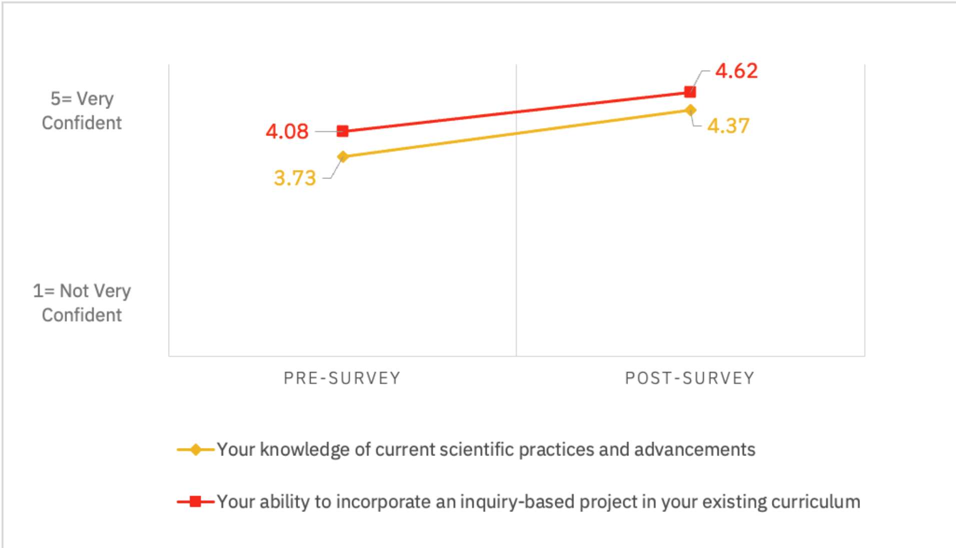
> **I've learned new content to teach and new ways to introduce concepts that spark student interest and excitement about science.** - High School Physics Teacher (1401)

Finding 4: Teachers were exposed to new science content and research processes that could excite them and their students about science.

In addition to the immediate impact on teachers' willingness to take risks, teachers also described gaining exposure to new content, research processes, materials, and methods—as discussed in Findings 1 and 3—often learning these "along with [their] kids" (1102). In the post-program surveys, teachers participating in SiR were more likely to report confidence in their knowledge of current scientific practices and advancements (see *Figure 2*), increasing from a pre-survey mean of 3.73 to a post-survey mean of 4.37 ($t(130) = 8.44$, $p < .001$) with a large effect size (Cohen's d=0.74). Teachers were also more likely to report greater confidence in their ability to incorporate inquiry-based projects in their existing curriculum, increasing from a pre-survey mean of 4.08 to a post-survey mean of 4.62 ($t(129) = 7.14$, $p < .001$) also with a large effect size (Cohen's d=0.63)[4].

[4] Mean scores were calculated based on a confidence scale where a score of 1 means the respondent selected *not very confident* and a score of 5 means the respondent selected *very confident.* Pre-survey to post-survey change was calculated for all teachers who completed both a pre- and a post-survey in the past 5 years of the program (from the 2020-2021 school year to the 2024-2025 school year).

Figure 2. Growth in Teacher Confidence from Pre- to Post-program Survey



Teachers said that working with their scientist helped them "remember the foundations of the scientific method" (1102)—such as "how to develop a research questions, what makes it a good question, how to collect data"—and they discussed gaining exposure to new content areas, such as in topics such as chemistry (1302), mental health and artificial intelligence (S435), biochemical testing (S548), quantum physics (S626), or climate science (S995). A 9th grade physics teacher talked about collaborating with a bioanthropologist who studied the bone structure of fossils to learn about the evolutionary history of animals (1401). With this scientist, they developed labs "to demonstrate springs and torque through the human experience" and the human body. This teacher explained that prior to this collaboration, they hadn't taught spring or torque in their intro to physics class, but since then it's become a "staple in their curriculum."

> **We worked with a bioanthropologist who studied fossil bone structure to group animals and explore evolutionary history.** To connect her work to my physics course, we developed labs where students explored torque and springs through the human body. It was cool to see students realize things like the reason chimpanzees have proportionally longer arms than humans is because it allows them to generate more torque when climbing—and how that relates to physics concepts like Hooke's Law and the torque equation. **I hadn't taught torque or springs before working with this scientist, but now they're a staple in my curriculum.** - High School Physics Teacher (1401)

Other teachers discussed materials or technology they learned to use through their collaboration with the scientist. For example, a high school environmental sciences teacher had agar plates in their science lab storage but had never used them before (1302). Their scientist, who was a lab analyst, showed how they could use these petri dishes, which contain a gel-like substance that serves a growth medium for microorganisms, in order to study antibiotics in different types of food. Furthermore, the scientist also showed her how to purchase already prepared slides, which was "the best way to go" in order "to quickly start an investigation."

Several teachers discussed what they learned about more authentic ways to present scientific findings. One teacher said their scientist showed her how to use Excel "to summarize the data and use graphs" (1303). Previously, neither she nor her class had made graphs with their data. Another teacher said their scientist helped them understand "the parts you need" to include in a poster you would present your findings on for a symposium (2401).

One teacher talked about how they worried about safety when working with bacteria. She wondered "where [she] could put the culture," whether it needed to go in "incubators or put on ice," and "basic things about how to handle the materials" (1201). She didn't "think it would be that easy" to purchase and use materials related to bacteria. Similar to the boost in confidence discussed in Finding 3, having a scientist at hand meant that she learned how to work with bacteria, in part, because she knew she could rely on a professional's expertise to ensure they could maintain safety.

> I learned a lot about how scientists organize information in a poster when they're presenting their work. Our scientist looked at how I was planning on presenting the projects, and said, "No, no, no, these are the parts we need, **this is what you want to include when you go to a symposium and present your work."** - Middle-School Teacher (2401)

> **I learned how to use graphs in excel to summarize the data and use the graphs.** All of the scientists I worked with in this program used excel, but we hadn't previously used it in class. - 10th-Grade Earth Sciences Teacher (1303)

Conclusion

Taken together, these findings highlight the SiR program's unique strength: its ability to bring authentic scientific inquiry into classrooms in a way that benefits both students and teachers. While authentic inquiry is at the heart of the NGSS standards, national data show how rare it can be—on the 2019 NAEP science assessment, 42% of eighth graders had teachers who reported engaging in inquiry-related activities only once or twice a year, and those students were more likely to underperform on the assessment. Teachers in this study echoed that reality, describing how, before SiR, investigations were often short, highly scripted, and aimed at a predetermined outcome.

Through SiR, teachers carved out space for deeper, more open-ended investigations, often inspired by their scientist partner's professional expertise. Students gained access to more rigorous, sustained, and meaningful science experiences—ones that deepened their understanding of STEM concepts and their sense of belonging within the field. As one teacher put it, "With the pre-scripted labs we're forced to do by the state, students know it's not real science... When they work with our scientist and develop their projects though, my students know I'm not BSing them when I say they're the scientist, because they were the ones that developed the project through every stage."

Meanwhile, teachers grew more confident in their ability to integrate inquiry-based projects into their curriculum and gained exposure to current scientific practices and ideas. These outcomes weren't isolated—they reinforced each other: As teachers explored new approaches, students got new opportunities and responded with greater ownership and excitement.

In future evaluations, it would be useful to explore more closely this challenge of time and coverage in the curriculum and how to integrate inquiry, despite its pressures, through holistic planning that accounts for holidays and state testing as it is the most frequently cited challenge that teachers faced. Similarly, NYAS might look to find new ways to support teams to identify and develop authentic investigations on topics that students will find interesting or relevant and do so in ways that are feasible given different amounts of time and attention available to a class. This might involve utilizing the expertise of alumni teachers or highlighting approaches that incorporate the "spirit of inquiry" (2401) without requiring the complete inquiry arc. Additionally, NYAS could likely explore new ways to pair and support teachers and scientists to ensure smooth communication, scheduling, and planning, as this is another challenge often cited by teachers.

Appendices

Appendix A: Research Approach

The evaluation was a mixed-methods study conducted by Ed Investigations during the 2024–2025 school year to explore program outcomes for students and teachers. The evaluation drew on data from five group-interviews with 15 teachers, post-survey responses from teachers in the most recent 2024-2025 cohort (n=37) measuring teachers' perceptions of student outcomes, and pre- and post-survey data collected over five years of the program (n=131) measuring change in teachers' confidence in their knowledge of STEM content and use of inquiry methods.

Researcher notes and transcripts from the interviews were analyzed thematically (Braun and Clarke, 2006) in Atlas.ti. Survey data was analyzed in SPSS with descriptive statistics calculated for post-only measures and paired sample t-tests conducted for pre- and post-survey change items.

Teacher Interview Participants

The 15 teachers who participated in interviews had a range of experience and background (see Figure 2). Most teachers were high school teachers (n=9), although there were also middle school (n=2) and elementary (n=4) teachers. Teachers taught a range of subjects from elementary generalists, elementary science cluster teachers, to AP biology, physics, environmental sciences, earth sciences, chemistry, and forensics. 7 of the 15 teachers were participating in their first year of the program when we interviewed them, while the rest of the teachers were returning for their second, third, or fourth year (see *Figure 3*).

Figure 3. Participants in Teacher Interviews (n=15)

Grade level	
High school	9
Middle school	2
Elementary	4

Years in the program	
One	7
Two	3
Three	3
Four	2

Discussion of Study IDs

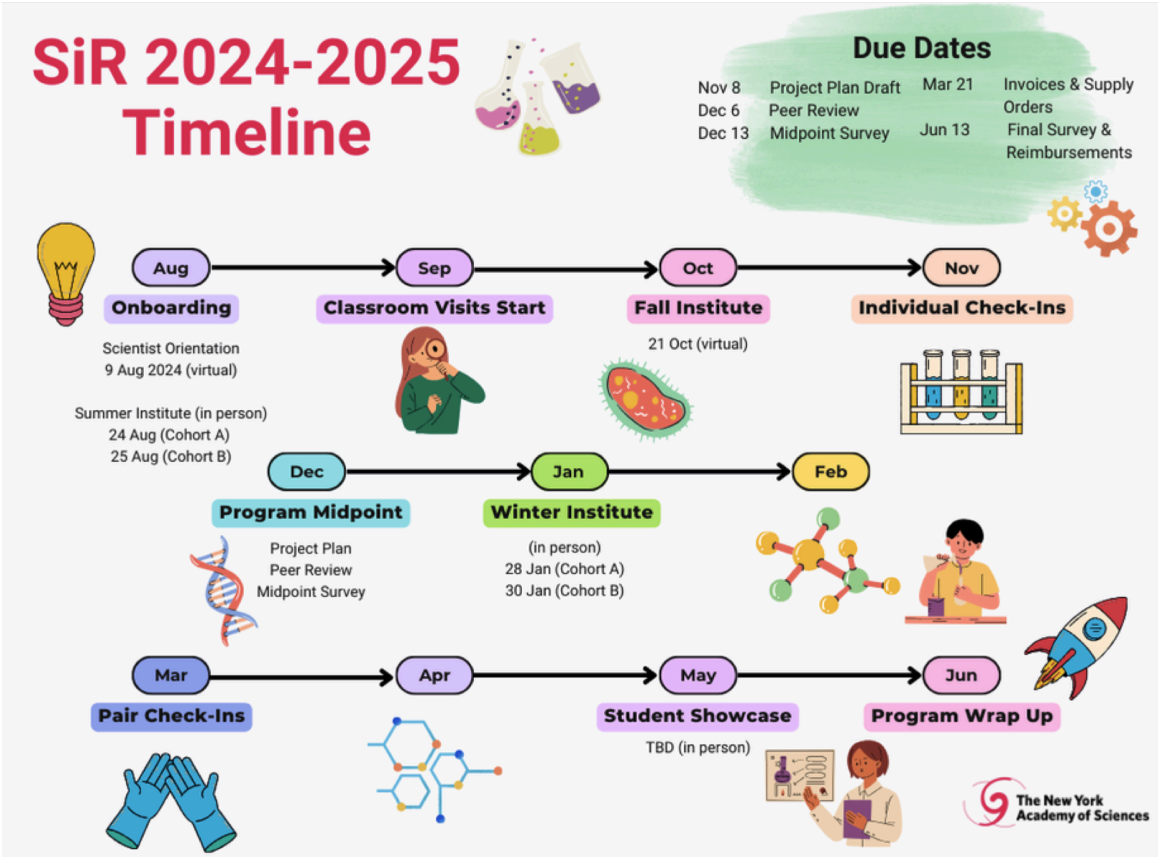
Throughout the report, we use study IDs to identify teachers when we quote them. These study IDs are four-digit ids assigned to teachers in lieu of their names used to internally track and externally present the representativeness and closeness-to-the-data of the themes. See *Figure 4* below for reporting of the number of citations for each participant in the group interviews.

The first digit of the study ID refers to a teacher's grade-level: 1 for high school, 2 for middle school, 3 for upper elementary (grades 4-5), and 4 for lower-elementary (grades K-3). The second digit indicates the number of years the teacher had participated in the program. The final two digits are randomly assigned and do not have a meaning. So, a study ID of 1102 would be a high-school teacher who had participated in the program for one year. Additionally, the report references a number of teachers who responded to the surveys but did not participate in the interviews. These respondents are identified by the letter S plus 3 random digits, since we did not have the same data on survey participants.

Figure 4. Data Representation: Counts of Citations per Interview Teacher per Finding

Study ID	Finding Number										Total
	1	1a	1b	1c	1d	2	2a	2b	3	4	
1301		1	1		1				1		4
1401				1					1	1	3
1201							1	1	1	1	4
3101	1		1		1						3
1302					1		1		2	1	5
2401	1			2			1	1		1	6
1101				1							1
3201				1	1		1	1			4
1102		1					1		1		3
4101					1				1		2
1303	1		1	1				1		1	5
1202			1								1
2101							1				1
3102							2				2
1102						1		1	1	2	5
Total	3	2	4	6	5	1	8	5	8	7	

Appendix B: SiR Timeline and Expectations



SiR 2024-2025 Program Year

Program Expectations

Additional check-ins and deliverables:

- **November - December: Individual check-ins**
  - Check-ins conducted by a NYAS staff member with individual participants to ensure that the first half of the program has progressed smoothly and that classroom sessions have started (or that there is a plan of when to start)
- **Nov 8: Partner Site Drafts Due**
  - Partner Site drafts should be completed by this point in preparation for the peer review process
- **Dec 6: Peer Review Due**
  - Pairs should review and make notes on their assigned partner sites to provide feedback and suggestions
- **Dec 13: Midpoint Survey**
- **March - April: Pair check-ins**
  - Each Scientist-Teacher pair will meet with an Academy staff member to discuss the progress of their project and plans for the student showcase
- **March 21: Invoice and Final Deadline for Supply Orders**
  - Stipend Invoices and supply order requests should be submitted by this date. Check our Google Drive for these templates
- **June 13: Final Survey and Final Reimbursements Due**
  - Any additional reimbursement forms (materials purchased out-of-pocket or transportation reimbursements for Scientists) are due. Relevant receipts are required. The End-of-Program Survey is also due, and Completion Certificates are distributed upon receipt of completed surveys.

The New York Academy of Sciences

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