

SUMMARY OF RESEARCH FINDINGS

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CONTENTS

- 03. EXECUTIVE SUMMARY
- 04. PROGRAM BACKGROUND
- 05. METHODS
- 06. RESIDENCY MODEL
- 07. LEARNING TO TEACH IN A MUSEUM
- 08. WHY TEACHER PREPARATION AT A MUSEUM?
- 09. CULTURALLY RESPONSIVE-SUSTAINING TEACHING
- 10. TEACHER RECRUITMENT & DIVERSITY
- 13. TEACHER ATTRITION & SHORTAGES
- 15. RETENTION, EMPLOYMENT PATTERNS
- 17. IMPACT STUDIES
- 25. AREAS OF RESEARCH
- 26. ACKNOWLEDGEMENTS & REFERENCES



*To date,
the AMNH RGGGS
MAT Earth Science
Residency Program
has prepared 167
certified Earth
Science teachers for
high-need middle
and high schools in
New York State*

EXECUTIVE SUMMARY

In this summary, we highlight the main research findings for the AMNH RGGGS MAT ESRP to date:

- Hiring principals report that program graduates are **well prepared in areas of science content knowledge, instructional planning, school and community relations, and professionalism** compared to graduates of other programs.
- Findings from our first 12 cohorts from 2012-2023 indicate that the program is successfully recruiting candidates with diverse life experiences into teaching in NYS public schools.
- A review of NYSED data suggests that close to **50% of new certified Earth science teachers in NYC between 2014 and 2022 were prepared at AMNH.**
- Findings from our first eight cohorts indicate that **94% of graduates have stayed in teaching for 3 or more years and 83% have stayed in teaching for 5 or more years**, indicating that our retention rate is on par with, and even exceeds the average retention rate reported by residency programs—and is far above the national average.
- **Students of AMNH RGGGS MAT ESRP teachers are performing higher, on average, on the Earth Science Regents Exam than students of other teachers.**
- Schools that have hired our graduates have seen an **increase in the number of students taking the Earth Science Regents Exam.**
- Evidence indicates that AMNH RGGGS MAT ESRP is having a **positive impact on the partner schools** where residents carry out their clinical placements, as **mentor teachers report benefits to their students and practice.**

EARTH SCIENCE RESIDENCY PROGRAM BACKGROUND

As an urban residency program, we **partner with six high-need middle and high schools** in New York City and Yonkers: Bronx Early College Academy for Teaching and Learning (Bronx), Hunter's Point Community Middle School (Queens), Midwood High School (Brooklyn), Roosevelt High School (Yonkers), South Bronx Preparatory (Bronx), and Urban Academy Institute of Math and Science for Young Women (Brooklyn).

Residents experience **10-months in clinical placements**, completing two five-month residencies at partner schools working with a science content mentor and a discipline specialist mentor (English as a New Language (ENL) and Special Education (SpEd)). Residents are in schools Monday through Thursday and attend

classes on Friday and some Saturdays.

During 2022-2023, approximately 33 school-based clinical faculty (mentor teachers) participated in the program, comprising science teachers and discipline specialists (ENL/SpEd). Nine of the mentor teachers, across all partner schools, were also program graduates. Mentors participate in Mentor Academy professional learning at the Museum.

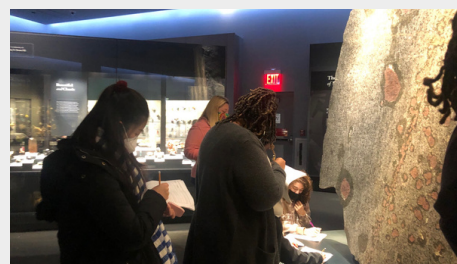
Across partner schools, approximately **3,600 students are taught in classes with MAT ESRP residents over the course of the year.**

Residents commit to teaching in high-need public schools for three years.

THE ONGOING COVID-19 PANDEMIC

During the pandemic, courses and residencies operated in a combination of in person, blended/hybrid, and remote settings. All residency program components shifted online during the Museum closure (Mar. 13-Sept. 9, 2020). Residents continued clinical placements with their mentor teachers throughout Spring 2020 remotely. In August 2020, courses transitioned from fully remote to blended, which continued throughout the 2020-21 year. School residencies took place in a combination of in person, blended, and remote settings; this was rather unique as studies show that clinical practice experiences for teacher candidates in programs nationally were greatly reduced and varied immensely by district (AACTE, 2021a; Choate et al., 2021). For instance, results from a recent survey conducted by AACTE indicate that 44% of participating teacher preparation programs suspended clinical placements in spring 2020 (AACTE, 2021a).

In 2021-2022 and 2022-2023, courses and residencies operated almost entirely in person. Induction has remained remote and Mentor Academy continued to be blended with sessions at the Museum and online. In August 2022, the Museum resumed opening to visitors 7 days a week, after reopening at 5 days a week in September 2020.



RESEARCH & EVALUATION



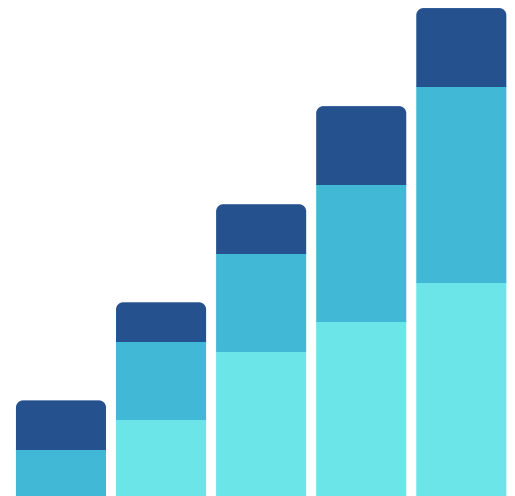
As a relatively recent teacher residency program in our twelfth year, we have a deep commitment to understanding and learning from our program. Starting with the pilot year of the program, we have adopted a rigorous and systematic approach to document, examine, reflect on our work, and strive for continual improvement.

We use a multi-pronged, mixed methods approach to examine evaluation data, program outcomes, retention and attrition. As a program, we acknowledge the importance of documenting and sharing our findings.

METHODS

To examine and better understand our program, we conduct multiple research and evaluation studies using a wide variety of methods and approaches, including:

- Longitudinal quantitative impact study of graduates' students' academic performance
- Mixed methods, multi-pronged evaluations
- Case studies, multiple case studies, cross-case analyses
- Cross-institutional studies
- Self studies
- Teacher research
- Scientific research
- Teacher and principal perception surveys





THE RESIDENCY MODEL

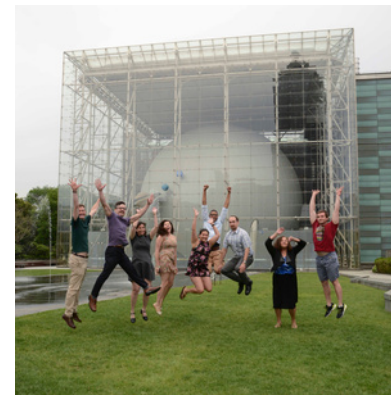
The AMNH RGGS MAT ESRP reflects features that research on residencies have found particularly effective and important in preparing teachers, features that specifically help teachers learn and support them in staying in the field. These features include recruiting strong candidates, extensive clinical partnerships, providing financial incentives such as free tuition and a living stipend, ongoing mentoring at the residency schools, and two years of comprehensive induction supports for new teachers.

Uniquely, academic courses take place in the Museum and aspects of informal learning are integrated within the program.

The design of the teacher residency model provides strong clinical preparation (Guha et al, 2016; Sutchter et al, 2016; AACTE, 2018) and offers potential and promise for addressing many of the challenges that teacher preparation programs in this country face, including recruitment, shortages, and attrition across the nation (Darling-Hammond et al., 2018; Pathways Alliance et al., 2022). With key characteristics, research finds that the residency model is effective in promoting, preparing, and retaining high-quality teachers (AACTE, 2018; The SFP, 2016).

Studies indicate especially **high retention rates of new teachers who graduated from residency programs** (Berry et al, 2008; Guha et al, 2016; The SFP, 2016), despite the increase in teacher attrition rates and shortages nationally (Carver-Thomas et al., 2017). Research suggests that residencies are particularly important in terms of **high-retention for teachers of color** due to the support they provide for learning to teach. With the increase in high-quality, well prepared teachers, residency programs offer a viable solution to the incredible cost and financial strain of teacher turnover that districts and schools continue to face (The SFP, 2016; Carver-Thomas et al., 2017).

LEARNING TO TEACH IN A MUSEUM



UNIQUE TEACHER PREPARATION IN A MUSEUM

- Museum-based summer residency learning to teach using the museum and museum resources
 - Learning and practicing strategies to support museum visitors' thinking
 - Summer rotations in museum-based youth programs
- Courses co-taught by museum scientists/curators and teacher educators
- Summer science practicum working closely with museum scientists to conduct research in the field and labs on astronomy, geology, and oceanography
- Coursework focusing on how children learn in out-of-school settings

WHY A TEACHER RESIDENCY PROGRAM AT A MUSEUM?



History in teacher education. With a mission "To discover, interpret, and disseminate - through scientific research and education - knowledge about human cultures, the natural world, and the universe," the AMNH serves nearly four million people annually. Dating back over 150 years, the Museum has a **longstanding history in teacher education and partnerships** with public schools and institutions of higher education. AMNH's history providing credit-bearing courses for teachers dates back to 1929 (AMNH Annual Report, 1929), with already established relationships with professors and nearby universities.

Innovation to transform teacher preparation. In 2010, there was a shift in the policy landscape that made it possible for museums to develop graduate-level teacher preparation programs. Building off of existing partnerships and **leveraging the Museum, collections, scientists, educators, and teaching resources, scientific research, and leadership in teacher education**, AMNH developed the first teacher preparation program housed in a Museum -- a signal of the Museum's **deep commitment to the importance and value of teaching**. Launched in 2011, the MAT Earth Science Residency Program was designed with a specific equity focus to address the **critical shortage of Earth science teachers in NYS**, providing a pathway to teaching through an **informal science education (ISE)-based model** of science teacher preparation to **bridge two disparate fields of education, urban teacher residencies in formal education and science learning in ISEs** (Macdonald & Kinzler, 2011). In 2015, the program officially became part of AMNH's Richard Gilder Graduate School.

LEARNING TO TEACH IN CULTURALLY RESPONSIVE-SUSTAINING WAYS

As an urban teacher residency designed to address critical shortage of qualified and certified Earth science teachers in NYS, the AMNH RGGG MAT ESRP has an explicit focus on issues of equity. In efforts to center equitable and inclusive teaching practices, culturally responsive-sustaining education (CR-SE) is an ongoing approach that threads throughout work with preservice teachers, professional learning with graduates, and research (Hammerness et al., 2022; Howes & Wallace, 2022; 2020; Wallace et al., 2021; 2022b; 2023).

Grounded in foundational works by Gloria Ladson-Billings, Geneva Gay, Django Paris, and many others, the AMNH RGGG MAT ESRP integrates the **NYS Culturally Responsive-Sustaining Education Framework** that centers four pillars of CR-SE: 1) Creating a welcoming and affirming environment, 2) Fostering high expectations and rigorous instruction, 3) Identifying inclusive curriculum and assessment, and 4) Engaging in ongoing professional learning and support (NYSED, 2019).



Preservice Teachers

Starting in the first summer, residents become familiar with the NYS CR-SE Framework. Residents use program tools aligned with the framework including the Observation Rubric and the Dispositions for Teaching and Learning Continuum Tool. For instance, the Disposition Tool features eight dispositions such as respect for difference, highlighting the importance of facilitating conversations about racism and implementing change as well as supporting students in developing a critical consciousness. Residents engage in racial literacy and diversity, equity, access, and inclusion workshops that explore identity, privilege, and power in the classroom. Various course and residency experiences employ different aspects of CR-SE in the context of learning in and about NYC schools.

Graduates & Professional Learning

Within *new teacher induction*, graduates receive two-years of ongoing supports through professional learning that delve into various aspects of CR-SE. For instance, graduates engaged in a recent summer induction institute on Collaborative Planning to Create Culturally Inclusive Science Classrooms that was co-led by graduates.

Beyond induction, the *Culturally Responsive Education Professional Learning Group* supports graduates in the development of and inquiry into strategies and protocols that demonstrate CR-SE in science. The group also develops and leads teacher professional learning workshops, and engages in teacher research into CR-SE in their science classrooms.

Ongoing Research

Research on what culturally responsive and sustaining education looks like in science classrooms can be elusive and more concrete examples are needed. In collaboration with teacher preparation programs at Virginia Commonwealth University and SUNY Cortland, AMNH RGGG MAT ESRP faculty researchers are currently engaged in an National Science Foundation-funded qualitative multi-year research study designed to explore culturally responsive science education and core science teaching practices. Program graduates who are practicing science teachers with experience beyond their teaching commitment act as co-researchers on the project, informing each stage of the research. The study will result in a set of case studies and cross-case analyses on the teacher education programs and program graduates' teaching.

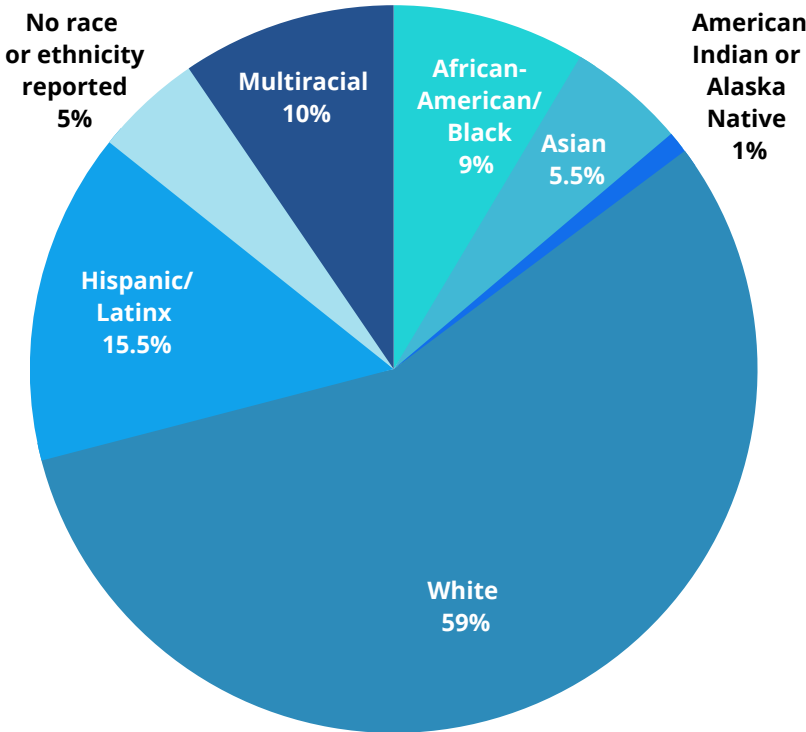
PROGRAM DEMOGRAPHICS

Nationwide: Research finds that 45% of teachers in residency programs in 2015-2016 were people of color, which is more than twice the national average of teachers of color entering the field at 19% (Guha et al., 2016). In 2022-2023, 69% of teachers in a national network of residency programs identified as people of color (NCTR, 2023). This was an increase from the previous year with 57% of teachers in that network identifying as people of color (NCTR, 2022). Declining enrollment related to the pandemic is a significant challenge that teacher preparation programs are facing, including teacher residencies (AACTE, 2021a; DiNapoli, 2021; Lachlan et al, 2020).

New York State: Studies in NYS show that 39% of candidates enrolled in teacher preparation programs in 2016-2017 were people of color (NYS DOE, 2019), although not specific to residency programs. Research shows 539 conferred master’s degrees in STEM education in 2018-19 in NYS compared with 1,231 in 2009-2010 (AACTE, 2021b).

Science teaching: Studies find a 32% decline in total number of mathematics and science education degree recipients of color in 2018-19 compared with 2011-12, and 36% less degree recipients who are male (AACTE, 2021b).

The AMNH RGGS MAT ESRP continues to strive to recruit residents with diverse life experiences. Findings from our first twelve cohorts, indicate that the The AMNH RGGS MAT ESRP has recruited and enrolled approximately 37% (74 of 200) residents identifying as people of color since its inception. Across cohorts, residents who have joined the program identify as African- American/Black (9%), Asian (5.5%), Hispanic/Latinx (15.5%), multiracial (10%), and American Indian or Alaska Native (1%).



*Data as of June 2023

CONSIDERING DIVERSITY IN OUR CONTEXT OF NY PUBLIC SCHOOLS

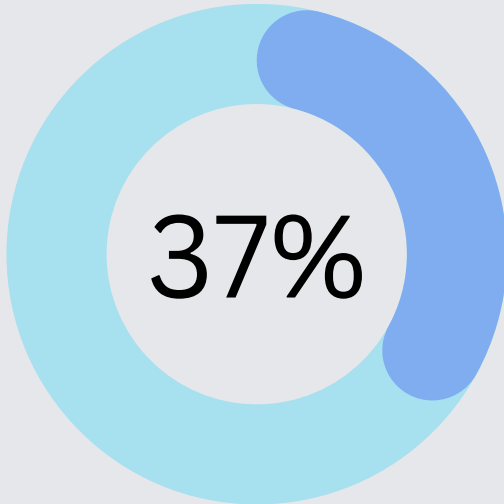


The number of teachers of color in the system remains lower relative to the proportion of students of color; shortages of teachers of color are of special concern given the importance of diversifying the profession. The student body in New York is increasingly diverse in terms of race, ethnicity, and gender while the educators teaching the students are 80% white with teachers of color under-represented (NYS DOE, 2019).

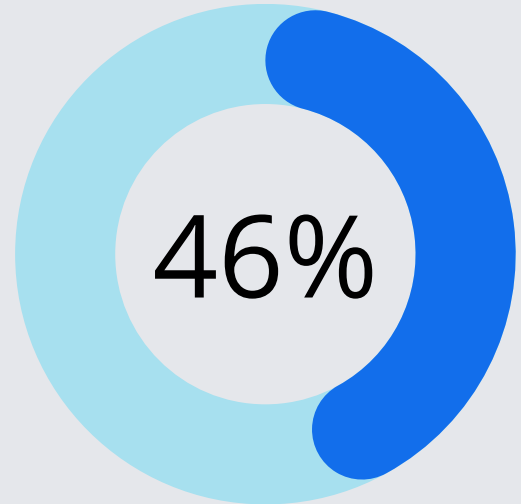
RESEARCH FINDS THAT STUDENTS IN SCHOOLS WITH LARGER PERCENTAGES OF STUDENTS OF COLOR DO NOT HAVE AS MUCH ACCESS TO CERTIFIED TEACHERS COMPARED WITH SCHOOLS WITH LOWER ENROLLMENT OF STUDENTS OF COLOR (CARDICHON ET AL., 2020).

TEACHER RECRUITMENT & DIVERSITY

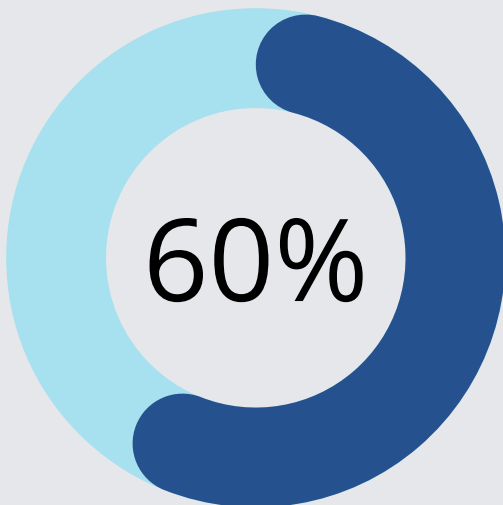
2012-Present, Across 12 Cohorts (N=200)



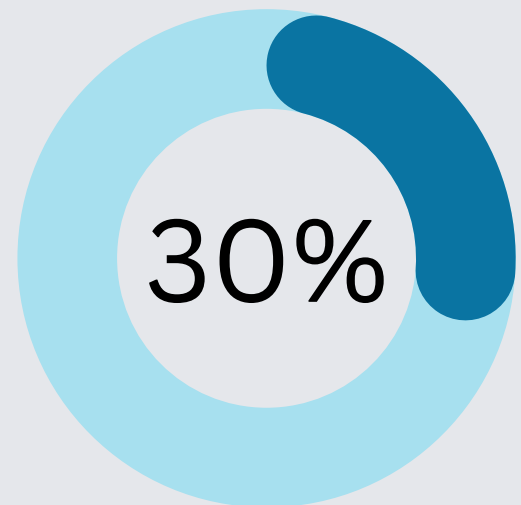
Recruited and enrolled residents of color



Almost one half are from out-of-state



More than half identify as women



Nearly one third are career changers, including veterans

*Data as of June 2023

TEACHER ATTRITION & SHORTAGES

The AMNH RGGG MAT ESRP prepares teachers specifically to teach Earth science in high-need schools and was designed to address the shortage of certified Earth science teachers in New York. Thus, we review recent research on teacher shortages nationally, in NYS, and in science, as well as before and during the COVID-19 pandemic, to provide context for our findings.

Impacts of COVID-19 pandemic nationally: Exacerbated by the pandemic, studies show increases in resignations and retirements, and estimated rise in teacher shortages nationally – long-term effects are still being determined. A systematic review of reports on teacher shortages estimates at least 36,000 vacant teaching positions and 163,000 positions currently held by underqualified teachers (Nguyen et al, 2022). According to Bureau of Labor Statistics data, there was a nearly 3% decline in the public school workforce of teachers and staff from 2020-2022 (Dill, 2022); while NCES (2022) reports teaching vacancies at 44% of public schools, with over 50% of those vacancies due to resignations.

Studies suggest that teacher retention and mobility differed by subgroup at different stages of the pandemic, notably amongst teaching experience, with turnover increasing as the pandemic proceeded. Recent research on teacher mobility in Washington and Massachusetts suggest large increases in early career teachers leaving teaching during the third year of the pandemic in 2022-2023, and with a concentration in high-poverty schools (Bacher-Hicks et al., 2023; Goldhaber & Theobald, 2023). Conversely, a study on teachers in Arkansas found more experienced teachers and Black teachers more likely to leave the workforce during the pandemic (Camp et al., 2023). Additionally, findings from a survey of more than one thousand science teachers nationwide found a rise in those considering leaving the profession during the 2021-22 school year, and half reported considering leaving teaching within the next two years (Trygstad et al., 2023).

Prior to COVID-19: Research finds that about 8% of public school teachers leave the profession with an additional 8% who change schools annually. Approximately 90% of teacher demand is due to teacher attrition (Darling-Hammond & Podolsky, 2019). Studies show that teacher attrition affects low-income districts disproportionately, with more acute teacher shortages in high-poverty and high-minority schools. In fact, the attrition rate is 50% or more in high poverty schools and in high-need subject areas including science (Carver-Thomas & Darling-Hammond, 2017; Guha et al., 2016).



NYC, NYS, and science teacher shortages: In fall 2021-fall 2022, NYC experienced more than 8% of teachers leaving public schools, the highest rate of attrition in over 10 years (Elsen-Rooney, 2023). In 2019-2020, science for grades 7-12 was designated as one of 17 teacher shortage areas in NY (NYSUT, 2019). Shortages in science teachers is consistent nationwide. In 2021-22, 41 states reported shortages in science teachers (US DOE, 2022).

KEY PROGRAM STATS

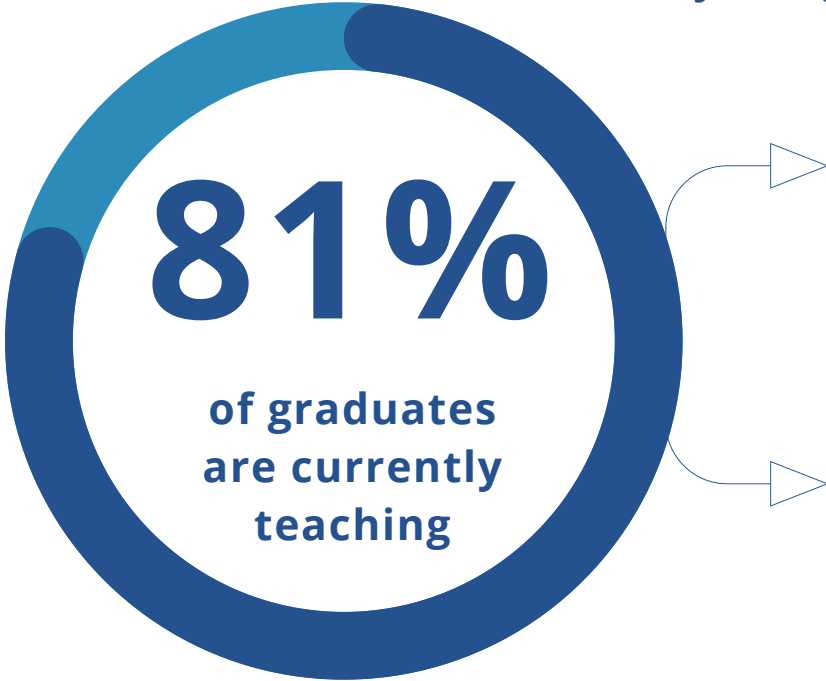
167

Certified Earth science teachers prepared to teach in high-need middle and high schools in New York State

94%

Graduates stayed in teaching for 3 or more years

Of our graduates currently teaching...



90%

are teaching in high-need schools

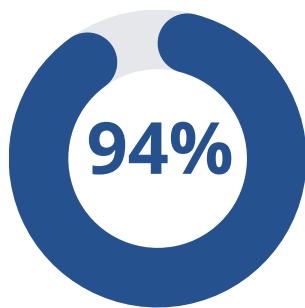
79%

are teaching in New York State

*Data as of June 2023

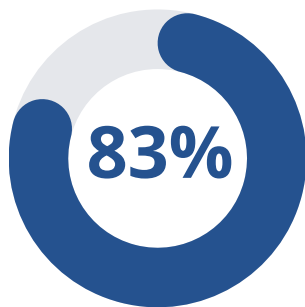
TEACHER RETENTION & PATTERNS OF EMPLOYMENT

Findings from our first eight cohorts of graduates indicate that our retention rate is on par with, and even exceeds the average retention rate reported by residency programs—and is certainly far above the national average for teachers prepared across all programs working in high-need schools and teaching in subject areas for which there are teacher shortages.



94% stayed in teaching for 3 or more years

Findings indicate that 116 out of 120 graduates from the first eight cohorts, or 94%, have stayed in teaching for 3 or more years.



83% stayed in teaching for 5 or more years

Findings from our first six cohorts of graduates show that 78 of 94, or 83%, completed 5 years of teaching.

Situating within teacher retention research

Studies consistently find that 20-30% of new teachers leave within five years, and attrition is even higher for teachers in higher poverty schools (similar to the ones in which our residents often teach) (Ingersoll, 2003; Sutchter et al., 2016).

For residency program graduates, studies of retention show higher rates of those who stay in the same district after three years with 80-90%, and 70-80% after five years (Guha et al., 2016, Silva et al., 2015). In fact, some studies indicate graduates of residency programs, including those in high-need schools, stay in teaching at rates above 90% after four years, compared with national turnover rates of 40-50% in the first five years (The SFP, 2016, Ingersoll et al., 2018). The National Center for Teacher Residencies reports that 86% of graduates from over 30 residency programs return to teach for a third year and 79% stay in teaching for a third year in a partner district or CMO (NCTR, 2023).

In NYC, a recent study shows that 41% of teachers hired during 2012-2013 left teaching within five years (Bird, 2019).

*Data as of June 2023

GRADUATE RETENTION STUDY

A recent study examining influences on retention of AMNH RGGS MAT ESRP graduates from the first four cohorts after completing their teaching commitment finds that graduates' decisions to stay or leave the profession were complex and shaped by multiple factors and levels of influence (Fallona et al., 2019). **Graduates reported that a primary motivating factors to remain in teaching was their relationships with their students.** School level support and education policies such as standardized assessments also played a role in their decision to stay in teaching. This is consistent with literature on factors that influence teachers' career decisions (Johnson et al., 2005), and there is a need to better understand reasons that science teachers stay in teaching, particularly in high-need schools (Grillo & Kier, 2021).

Findings indicate that **graduates' who decided to leave teaching after four years were more strongly influenced by external factors, including original intent to pursue another career path and financial and geographical considerations** (Fallona et al., 2019). In addition, AMNH RGGS MAT ESRP **graduates who decided to leave teaching after their commitment felt a general sense of satisfaction with their teaching.** This is an important finding, as several teacher retention studies identify a critical factor in teachers' decisions to leave the profession is often related to dissatisfaction or feelings of lack of success or efficacy (Boyd et al., 2011; Johnson & Birkeland, 2003).

This study highlights that graduates who decided to stay in teaching had an ongoing and evolving relationship with the Museum. Findings surfaced the **significant and salient role that the program and Museum resources played in graduates' first years of teaching as a source of support.** In fact, **both the program and the Museum contributed to graduates' identity as a teacher, suggesting the development of a Museum teacher identity** (Fallona et al., 2019). Although the only Museum-based teacher residency program, this finding resonates with other studies that developing a strong sense of identity in the profession can contribute to teachers' decisions to stay in the profession (Lindqvist & Nordanger, 2016; Grillo & Kier, 2021).



STUDYING RESIDENCY PROGRAM IMPACT ON STUDENTS



Few studies of residency graduates' pupil outcomes exist, because most residency programs are still in their early years (Chu & Wang, 2022; Guha et al., 2016).

However, those studies that exist suggest that our findings are similar to those of other programs. A study of the Boston Teacher Residency, for instance, found that achievement gains of their program graduates were similar to those of other novice teachers' in ELA and Math, but that graduates' student outcomes surpassed new and veteran teachers by their fourth year (Papay et al., 2012).

At the same time, scholars point to the limitations of drawing strong inferences from measuring teacher effectiveness using value-added analysis to examine student gains, noting the instability of measures from year to year, and particularly inaccurate for students at the top and bottom of the distributions, and small sample sizes add to the challenges of drawing strong inferences (American Statistical Association, 2014). **We recognize the limitations of these analyses, and, as such, seek additional measures of student learning.**

GRADUATES' REACH

To date, the program has prepared **167 certified Earth science teachers** to work in high-need schools. Residents commit to teach in a high-need school for three years in the USA.

Considering the current reach of our graduates, we estimate that AMNH RGGS MAT ESRP graduates were teaching over **11,000 students in high-need schools in New York across the 2022-2023 school year**. Over the ten years in which our graduates have been teaching, **graduates have worked with approximately 80,000 students in high-need schools** across the country.



*Data as of June 2023

UNDERSTANDING OUR REACH



50%

A review of data from the NYS Education Department suggests that close to 50% of new certified Earth science teachers in NYC between 2014 and 2022 were prepared at the American Museum of Natural History.

671

AMNH RGGGS MAT ESRP graduates have contributed 671 years of teaching in high-need schools over the past 10 years of the program, benefitting approximately 80,000 students.

*Data as of September 2023

IMPACT STUDY

We use data from the New York City Department of Education to examine student outcomes presented below related to the AMNH RGGs MAT Earth Science Residency Program. We use these data to help us understand who our residents are serving and whether they are working in

the high-need schools for which we prepared them; as well as how students in the classrooms of our graduates are performing on the Earth Science Regents Exam.

Below we summarize findings from our most recent analyses (Weinstein, 2023; 2022; 2021).

AMNH RGGs MAT ESRP GRADUATES CONTINUE TO TEACH STUDENTS WHO ARE DISADVANTAGED

Findings from a recent analysis show that in 2021-2022, in schools where graduates teach, nearly 80% of students in grades 6-12 were eligible for free and reduced price lunch, 21% were students with disabilities, 57% were Latino, and 17% were Black (Weinstein, 2023). Due to the COVID-19 pandemic, we have limited data on students' previous science performance as students did not take the 8th grade Intermediate Level Science exam. In 2019-2020, graduates' students were performing lower in science than the citywide mean on the 8th grade Intermediate Level Science exam with 47% meeting the standards (Weinstein, 2021).



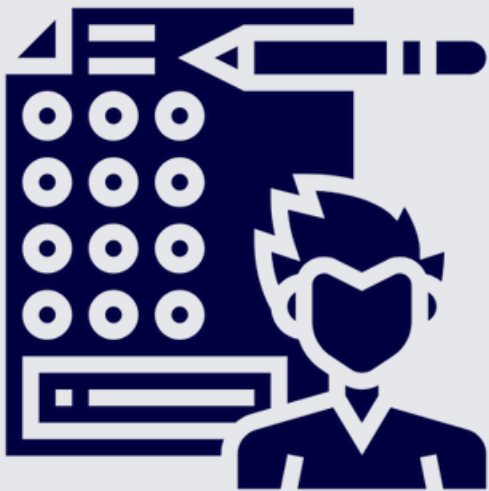
IMPACT ON STUDENTS

STUDENTS OF AMNH RGGGS MAT ESRP GRADUATES ARE OUTPERFORMING STUDENTS OF OTHER TEACHERS ON THE EARTH SCIENCE STANDARDIZED EXAM

Findings from a longitudinal study reveal that students of AMNH RGGGS MAT ESRP teachers score higher on the Earth Science Regents Exam, on average, compared to other students. In 2015-2019, AMNH RGGGS MAT ESRP graduates' students performed statistically significantly higher than students in the matched comparison group* (Weinstein, 2023).



*Although positive in nature, the most recent results in 2022 were not statistically significant.

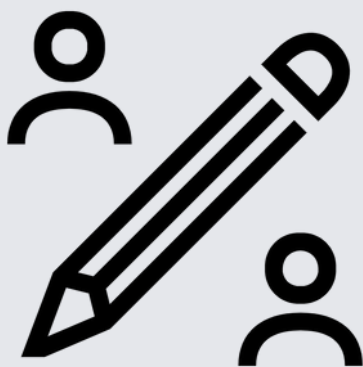


Students of AMNH RGGGS MAT ESRP graduates are **more likely to pass the Earth Science Regents Exam at 65 and 85** or higher compared to other students. In 2022, students of ESRP graduates were 2.4 percentage points more likely to pass at 65 or higher, and 5.0 percentage points more likely to pass at 85 or higher -- the equivalent of **55 additional students more likely to pass the exam at 65** or higher, and **116 additional students (of 2300) more likely to pass at 85** or higher than students in the matched comparison group (Weinstein, 2023).

IMPACT ON STUDENTS

STUDENTS OF OUR GRADUATES WHO IDENTIFY AS BLACK, LATINO, ENGLISH LANGUAGE LEARNERS, AND ECONOMICALLY DISADVANTAGED OUTPERFORM OTHER STUDENTS ON THE EARTH SCIENCE STANDARDIZED EXAM

Findings from analyses of disaggregated data by subgroup reveal that students of AMNH RGGG MAT ESRP teachers who identify as Black, Latino, English Language Learners, and economically disadvantaged score significantly higher on the Earth Science Regents Exam, on average, compared to similar students of other teachers (Weinstein, 2022).



Since 2017, students of AMNH RGGG MAT ESRP graduates who identify as Black and Latino, economically disadvantaged, English Language Learners, and students with disabilities are more likely to pass the Earth Science Regents Exam at 65 or higher compared to other students (Weinstein, 2022).

IMPACT ON STUDENTS

SCHOOLS THAT HAVE HIRED OUR GRADUATES HAVE SEEN AN INCREASE IN THE NUMBER OF STUDENTS TAKING THE EARTH SCIENCE REGENTS EXAM

In relationship to one of the main goals of the program, which is to provide students in New York State with greater access to Earth Science education, data from New York City show an increase in the number of students taking the Earth Science Regents exam in the schools that have hired our graduates. Between 2013-2014 and 2018-2019, there has been a 28% increase in the number of students at schools where AMNH RGGGS MAT ESRP graduates teach taking the Earth Science Regents Exam (Weinstein, 2020).



A higher percentage of students taught by AMNH RGGGS MAT ESRP teachers take the Earth Science regents. In 2018-2019, 58.2% of students taught by our graduates took the exam, compared to 26.9% of all other enrolled students in an Earth Science course (Weinstein, 2021b).

IMPACT ON PARTNER & HIRING SCHOOLS

Through extensive evaluation since its inception, evidence indicates that the AMNH RGGS MAT ESRP is having a positive impact on the partner schools where residents carry out their residency placements as well as on the schools where graduates teach.



Mentors report benefits to their students and practice

Recent evaluation findings indicate that **88% of mentors reported learning more about culturally responsive and sustaining education practices** through program workshops. Approximately **75% of mentor teachers agreed that their students benefitted academically by having a resident in their classroom.** Additionally, **75% reported making changes to their teaching practice** as a result of their involvement in the program (Sachs et al., 2023; Horizon Research Inc., 2023).



Hiring principals report graduates are well prepared

Results from an annual survey show that **hiring principals** considered graduates **well prepared in areas of science content knowledge, instructional planning, school and community relations, and professionalism** compared to graduates of other teacher preparation programs (Horizon Research Inc., 2023).

"[The program has] done a really great job of pushing us beyond just how the residents are evaluated to how can we be better teachers and incorporating culturally responsive education and making sure our classrooms also are good examples of that good teaching that we are trying to foster."

Mentor Teacher

"I've seen a lot of my veteran or expert teachers trying these new things that I haven't seen before that I really appreciate... I do see influence from residents onto their mentors and then mentors onto their residents. And from there, I do see their influence from the mentors to their colleagues, so it's nice that they're sharing these strategies."

Partner School Administrator

IMPACT ON TEACHERS' PRACTICE



Few studies have focused more on a qualitative approach to looking at effects of teacher preparation on teacher practice.

Recent research on how teacher preparation affects teacher practice has found reflections of programs' ideologies, values, and pedagogies in their graduates' teaching practices (Tamir & Hammerness, 2014) and connections between graduates' practices and their preparation program's specific approach to teaching, learning, and teacher development (Lit et al., 2015).

Recently, we conducted qualitative case studies of four graduates from the first three cohorts (Doykos et al, 2017) and a cross-case analysis (Fallona et al., 2017; Wallace et al., 2022a) to examine the impact of the program on graduates' practices as teachers. **The case studies explore graduates' use of the Museum and Museum resources in their teaching, as well as pedagogical practices that they learned in the program.**

Findings highlight the impact of the program on graduates' teaching practices and indicate that **graduates are bringing what they learned in the program into their teaching.** More specifically, teaching practices that surfaced amongst graduates across the cases reflecting what they learned in the program include **teaching the practice(s) of science, modeling scientific thinking and natural processes, making science local and relevant, and using assessment to inform instruction.** The case studies also suggest that graduates have positive effects on their students' learning content and engagement in science practices.



AREAS OF RESEARCH

Program faculty and staff engage in multiple areas of research on and related to the program, including:

- mentoring and mentor practices
- high-leverage science teaching practices with pre-service and in-service teachers
- culturally responsive and sustaining education
- teaching and learning in informal science settings
- scientific research and fieldwork by faculty and pre-service teachers
- collaborative research and inquiry by faculty and graduates
- designing teaching and learning experiences aligned with NGSS
- development of programmatic tools
- leadership and teacher learning continuum

In addition to studies conducted internally, the program is a [case study of new graduate schools of education](#). Researchers continue to disseminate and share their work on teacher learning broadly across the field.

AMNH RGGS MAT ESRP Faculty Research and Dissemination: <https://www.amnh.org/learn-teach/evaluation-research-and-policy/research/amnh-rggs-mat-faculty-research-and-dissemination>

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