



# FREQUENTLY ASKED QUESTIONS

## AMNH RGGs MAT EARTH SCIENCE RESIDENCY PROGRAM SUPPORTED BY RESEARCH AND EVALUATION

Karen Hammerness, Jamie Wallace, Rosamond Kinzler, Linda Curtis-Bey, Daniel Wolff, Meryle Weinstein, & P. Sean Smith,  
AMNH RGGs MAT ESRP Research and Evaluation Team

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# FAQs

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- 3 *Is AMNH RGGGS MAT ESRP really a teacher residency program housed in a Museum?*
- 4 *How does the program contribute to the critical need for Earth science teachers in New York?*
- 5 *How does the program recruit and retain teachers with diverse life experiences?*
- 6 *How does the program's retention rate compare with other teacher preparation programs?*
- 7 *How does the program continue to support teachers and their students after graduation?*
- 8 *What are the impacts of graduates on students' achievement?*
- 9 *What do we know about the influence of the program on teachers?*
- 10 *What features of the program are supported by research on residency programs?*
- 11 *How has the program been affected by the pandemic?*

# FAQ: Is the MAT ESRP really a teacher residency program housed in a museum? Not a museum education program? How does that work?

Answer: Yes, the American Museum of Natural History's (AMNH) Master of Arts in Teaching (MAT) is a **teacher residency program with a specialization in Earth science for grades 7-12** that is housed in the Richard Gilder Graduate School (RGGS) at the Museum. It is a 15-month program followed by two years of new teacher induction. Program residents attend academic courses in science and pedagogy co-taught by educators and scientists at the Museum.

As an urban residency program, MAT ESRP has **clinical partnerships with six high-need middle and high schools in New York City and Yonkers**, which is where residents complete two school-based residencies over 10 months. Residents are in schools working with mentor teachers four days a week during the residencies. In addition to **coursework and school residencies, residents participate in a Museum-based residency** working with visitors and youth in summer enrichment programs during the first summer. During the second summer, they engage in **scientific research and fieldwork** with Museum scientists and curators.



# FAQ: How does the program contribute to the critical need for qualified and certified Earth science teachers in New York?

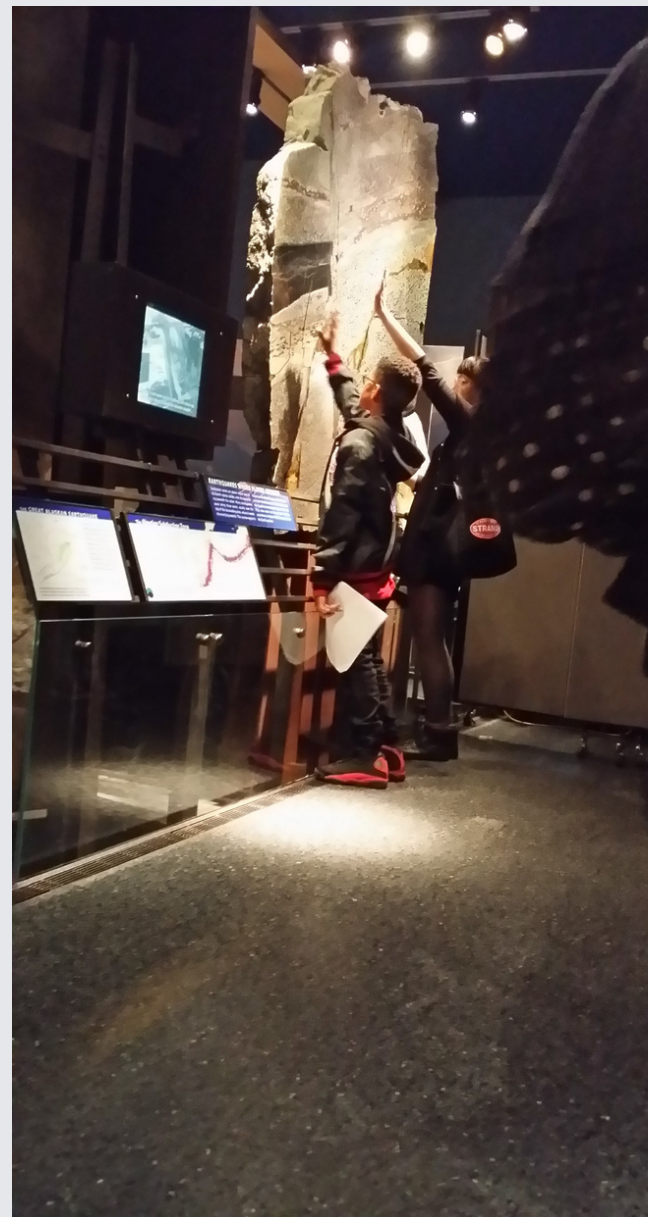


Answer: Designed to address the **critical shortage of effective and certified Earth science teachers in New York State**, the MAT ESRP seeks to address concerns about children’s access to science in complex, urban schools. Nationwide, research finds that approximately 3% of secondary STEM teachers have a degree in geoscience; and, compared with other sciences, Earth sciences has the least number of trained secondary teachers (Wilson, 2016). In 2019-2020, science for grades 7-12 was designated as one of the 17 teacher shortage areas in New York by the US Department of Education (NYSUT, 2019).

The program **partners with six high-need schools** throughout NYC and Yonkers, each of whom have hired our graduates as Earth science teachers. During 2022-23, residents worked with a total of 33 school-based mentor teachers (comprising science teachers and specialists in English as a New Language and Special Education). Across partner schools, an **estimated 3,600 students are taught in classes with MAT ESRP residents** throughout the year.

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. We estimate that our **graduates were teaching over 11,000 students in high-need schools in New York** across the 2022-23 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.

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.**



# FAQ: How does the program recruit and retain teachers with diverse life experiences?

→ Answer: The program uses a number of inclusive admissions strategies, such as outreach to HBCUs and LatinX serving institutions. Although the field of geoscience degrees tends to be predominantly white with only 7% of undergraduate and graduate degrees awarded to underrepresented minorities in the U.S (Stokes et. al., 2015), the **MAT ESRP has recruited and enrolled 37% (74 of 200) residents of color since its inception. In addition, 60% identify as women and 30% are career changers including veterans.**

Additional **research-based strategies** that the program adopts to recruit and retain teachers with diverse life experiences include underwriting the costs of teacher preparation by providing a **full fellowship and living stipend**, providing **mentoring support** in school residencies for a full year, and offering two years of **comprehensive induction** supports with stipends for participating in induction meetings (Carver-Thomas, 2018; Hansen et al., 2018).



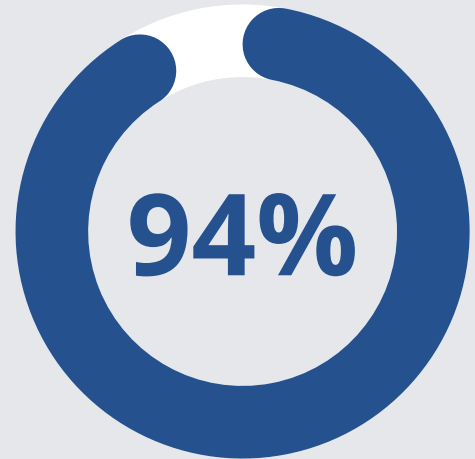
## And how does it relate to the education context in New York?

Answer: The number of teachers of color in the school 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, gender, and age while the educators teaching the students are 80% white and teachers of color are underrepresented (NYSED, 2019a). 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).

# FAQ: How does the program's retention rate compare with other teacher preparation programs?

Answer: **The retention rate of MAT ESRP graduates is on par and even exceeds other residency programs**, and is far above the national average for teacher preparation programs where teachers are working in high-need schools.

Findings from our first eight cohorts reveal that **94% of our graduates have stayed in teaching for 3 or more years**. Research shows that retention rates for teacher residency programs are especially high, with 80%-90% of teachers stay in teaching after 3 years (Guha et al., 2016; Silva et al., 2015), and a network of 30 teacher residency programs reports that 86% of graduates return to teach for a third year (NCTR, 2023). National turnover rates are 40-50% in the first five years (Ingersoll et al., 2018).



\*Data as of June 2023






## FAQ: How does the program continue to support teachers and their students after graduation?

→ Answer: After teachers graduate from the MAT ESRP, they receive **two years of comprehensive induction** supports such as monthly meetups, classroom visits, planning forums, peer mentoring, office hours, and professional learning activities.

For instance, Advances in Geosciences offers a **full-day program for recent graduates with their students together with an AMNH scientist to collect rocks** at an underground zinc mine, tour a scientist's lab, and visit Museum exhibitions (Trowbridge, 2019). Additional programs for graduates include the EArth-sciences Reciprocal Learning Year (EARLY) initiative working with a scientist and educator engaging in **fieldwork in paleontology** (Trowbridge et al., 2023) and the Culturally Responsive Education Professional Learning Group (CRE PLG) exploring **culturally responsive and sustaining education in science classrooms** in high-need schools (Wallace, Howes, & the CRE PLG, 2022a).

# FAQ: What do we know about how students who are taught by program graduates do?

## What are the impacts of the MAT ESRP teachers on students' achievement?

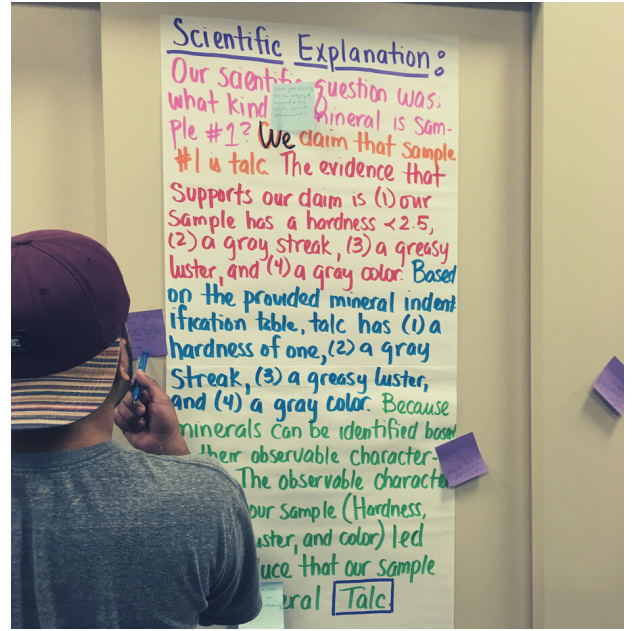


→ Answer: Few studies explore student learning outcomes of residency graduates, potentially due to the recent history of residency programs (Chu & Wang, 2022; Guha et al., 2016). Since the first year of the program, NYU researchers have worked on assessing MAT ESRP graduates' student outcomes on statewide exams using statewide and citywide teacher and student data.

From these analyses, we have learned that **MAT ESRP graduates continue to teach economically disadvantaged students**. In 2021-22, nearly 80% of students in schools where graduates teach were eligible for free and reduced price lunch. Findings show that students of our graduates are **outperforming students of other teachers on the Earth science standardized exam**. Additionally, **students of our graduates are more likely to pass the Earth Science Regents Exam at 65 and 85 or higher** compared to other students (Weinstein, 2023).

Schools that have hired our graduates have seen an **increase in the number of students taking the Earth Science Regents Exam**. Overall in 2018-2019, 58.2% of students taught by our graduates took the state exam, compared to 26.9% of all other enrolled students in an Earth science course (Weinstein, 2021).





## FAQ: What do we know about the influence of the MAT Earth Science Residency Program on teachers?

Answer: There are multiple research studies conducted on the program by researchers internally and externally. We have learned through qualitative studies that **graduates bring what they learned in the program into their teaching.**

We have found that MAT ESRP graduates draw on the **passion of being a scientist**; they have a **strong sense of identity** as an AMNH teacher; that they pull from what they've learned in **museum experiences** and bring that into the classroom such as using rock samples they collected during fieldwork in the program as well as **field trips and museum resources**; and we have evidence that they are especially attuned to their **students' thinking and to assessment** to support their students' science learning, and some early evidence that they are planning to use the **ambitious science practices** that they are learning in their own classrooms (Fallona et al., 2017; Howes & Wallace, in preparation; MacPherson et al., 2020; Trowbridge et al., 2019; Wallace et al., 2022b).

# FAQ: What features of the MAT ESRP are supported by research on residency programs?

→ Answer: The MAT Earth Science Residency Program highlights key research-based characteristics of a residency model in its very design, features that are designed to help teachers learn and support them in staying in the field. These features include **recruiting strong candidates, extensive clinical partnerships with six high-need schools, providing financial incentives such as free tuition and a living stipend to candidates, and offering ongoing mentoring** at the residency schools over 10 months, and two years of **comprehensive induction** supports for new teachers.

Studies show that teacher residency programs provide strong clinical preparation and offer promise for addressing many of the challenges that teacher preparation in this country face

including recruitment, shortages, and attrition across the nation (Darling-Hammond & Podolsky, 2019). Research finds that the residency model is **effective in promoting, preparing, and retaining high-quality teachers** (AACTE, 2018; The Sustainable Funding Project, 2016).

The program continues to make research-based investments through the practices and strategies for teaching and learning that it fosters. For instance, teachers in the program learn to teach through the use of **research-based instructional practices such as culturally responsive and sustaining teaching** (NYSED, 2019b) and **ambitious science teaching** (Windschitl et al., 2018; Hammerness et al., 2020). The program emphasizes the use of a **co-teaching model** throughout the program, including in residencies and courses (Villa et al., 2013).



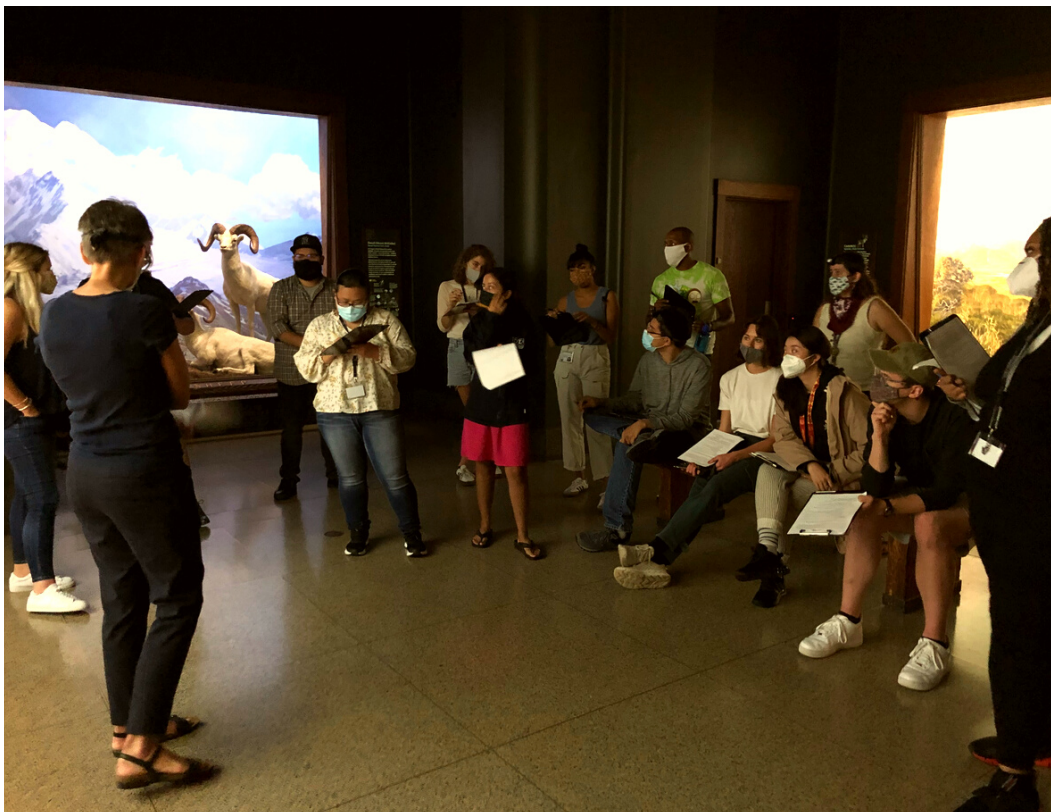
# FAQ: How has the program been affected by the ongoing COVID-19 pandemic?

Answer: During the pandemic, courses and residencies have operated in a combination of in person, blended/ hybrid, and remote settings. All residency program components shifted online during the Museum closure from March 13-September 9, 2020. Residents continued their clinical placements with their mentor teachers throughout Spring 2020 remotely.

In August 2020, courses transitioned from fully remote to blended, which continued throughout the 2020-2021

year. School residencies took place in a combination of in person, blended, and remote settings; this is rather unique as recent studies show that clinical practice experiences for teacher candidates in programs nationally were greatly reduced and varied immensely by district (AACTE, 2021; 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, 2021).

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.



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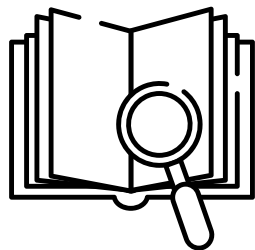
**AMNH RGGS MAT Earth Science Residency Program:**  
[www.amnh.org/mat](http://www.amnh.org/mat)



Email: [mat@amnh.org](mailto:mat@amnh.org)

## CHECK OUT MAT ESRP FACULTY RESEARCH AND DISSEMINATION:

<https://www.amnh.org/learn-teach/evaluation-research-and-policy/research/amnh-rggs-mat-faculty-research-and-dissemination>



# REFERENCES

- American Association of Colleges for Teacher Education (AACTE). (2018). [A pivot toward clinical practice, its lexicon, and the renewal of educator preparation: a report of the AACTE Clinical Practice Commission.](#)
- American Association of Colleges for Teacher Education (AACTE). (2021). [Fall 2020 member survey.](#)
- Cardichon, J., Darling-Hammond, L., Yang, M., Scott, C., Shields, P. M., & Burns, D. (2020). *Inequitable opportunity to learn: Student access to certified and experienced teachers.* Learning Policy Institute.
- Carver-Thomas, D. (2018). *Diversifying the teaching profession: How to recruit and retain teachers of color.* Learning Policy Institute.
- Choate, K., Godhaber, D., & Theobald, R. (2021). The effects of COVID-19 on teacher preparation. *Phi Delta Kappan* 102(7), 52-57.
- Chu, Y. & Wang, W. (2022). The urban teacher residency model to prepare teachers: A review of the literature. *Urban Education*. <https://doi.org/10.1177/00420859221102976>
- Darling-Hammond, L., & Podolsky, A. (2019). Breaking the cycle of teacher shortages: What kind of policies can make a difference? *Education Policy Analysis Archives* 27(34).
- Fallona, C., Doykos, B., Howes, E., Trowbridge, C., & Wallace, J. (2017). *Exploring the impact of a museum-based MAT program on program graduates' science teaching practices and their students' learning.* AMNH internal report.
- Guha, R., Hyler, M.E., & Darling-Hammond, L. (2016). [The teacher residency: An innovative model for preparing teachers.](#) Learning Policy Institute.
- Hammerness, K., McDonald, S., Matsko, K.K., & Stroupe, D. (2020). How do teachers learn to teach science in ambitious and equitable ways? In Stroupe, D., Hammerness, K. & McDonald, S. (Eds.), *Preparing science teachers through practice based teacher education.* Harvard Education Press.
- Hansen, M., Quintero, D., & Feng, L. (2018). *Can money attract more minorities into the teaching profession?* Brookings Institution.
- Ingersoll, R. M., Merrill, E., Stuckey, D., & Collins, G. (2018). Seven trends: The transformation of the teaching force – Updated October 2018. CPRE Research Reports.
- MacPherson, A., Howes, E., Abowd, N., Gupta, P., Hammerness, K., & Kinzler, R. (2020). Preparing teachers to teach science in a non-university setting. In Stroupe, D., Hammerness, K. & McDonald, S. (Eds.), *Preparing science teachers through practice based teacher education.* Harvard University Press.
- National Center for Teacher Residencies (NCTR). (2023). NCTR Annual Report 2022-2023. <https://nctrresidencies.org/resource/nctr-annual-report-2022-2023/>
- New York State Education Department (NYSED). (2019a). *Educator diversity report.* Report submitted to the Governor and Legislature of the State of New York.
- New York State Education Department (NYSED). (2019b). [Culturally Responsive-Sustaining Education Framework.](#) <http://www.nysed.gov/common/nysed/files/programs/crs/culturally-responsive-sustaining-education-framework.pdf>

# REFERENCES CONTINUED

New York State Teachers Union (NYSUT). (2019). Teacher shortage in New York State. Fact Sheet No: 19-17.

Silva, T., McKie, A., & Gleason, P. (2015). New findings on the retention of novice teachers from teacher residency programs. NCEE 2015-4015 Evaluation brief.

Stokes, P. J., Levine, R. & Flessa, K. W. (2015). Choosing the geoscience major: Important factors, race/ethnicity, and gender. *Journal of Geoscience Education* 63(2), 250-263. <https://doi.org/10.5408/14-038.1>

The Sustainable Funding Project (SFP). (2016). For the public good: Quality preparation for every teacher. Bank Street College of Education.

Trowbridge, C.A. (2019). Mining science capital: Collaboration with a scientist enhances out-of-school education for new teachers and their students. *Connected Science Learning*10.

Trowbridge, C., Donofrio, R-E, DiPadova, E., Wolk-Stanley, J., Kinzler, R., Curtis-Bey, L., & Hopkins, M.J. (2023, June). Museum as muse: Inspiring science teachers' learning. Poster presented at the Annual Noyce Summit, Washington, DC.

Villa, R.A., Thousands, J.S., & Nevin, A.I. (2013). *A guide to co-teaching: New lessons and strategies to facilitate student learning*. Corwin.

Wallace, J., Howes, E., Funk, A., Krepski, S., Pincus, M., Sylvester, S., Tsoi, K., Tully, C., Sharif, R., & Swift, S. (2022a). Stories that teachers tell: Exploring culturally responsive science teaching. *Education Sciences* 12(6), 401. <https://doi.org/10.3390/educsci12060401>

Wallace, J., Hammerness, K., Howes, E., Kinzler, R., Trowbridge, C., & Weinstein, M. (2022b, April). Exploring outcomes of a museum-based teacher residency program through an equity in science education lens. Poster presented at the American Educational Research Association (AERA) Annual Meeting. San Diego, CA. <https://doi.org/10.3102/IP.22.1887981>

Weinstein, M. (2021). Key findings from NYU's longitudinal impact study, January 2021. AMNH internal document,

Weinstein, M. (2023). AMNH RGGs MAT Earth Science Residency Program Year 9 Impact Report. NYU Steinhardt.

Wilson, C. (2016). Status of the Geoscience workforce 2016. American Geosciences Institute.

Windschitl, M., Thompson, J., & Braaten, M. (2018). *Ambitious science teaching*. Harvard Education Press.

