

EVALUATION REPORT

**2019-20 External Evaluation Report of
the American Museum of Natural History MAT Program:
A National Science Foundation (NSF)
Noyce Funded Project**

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Executive Summary

2019-20 External Evaluation Report of the American Museum of Natural History MAT Program: A National Science Foundation (NSF) Noyce Funded Project

The AMNH RGGGS MAT program is an innovative residency program that is designed to prepare science teachers for high need schools in metropolitan New York City (NYC) and other parts of New York. Originally approved by the New York State (NYS) Board of Regents as part of the state's Race To The Top (RTTT) award, the program is designed to prepare cohorts of teacher candidates in a residency program to earn a Board of Regents-awarded Masters of Arts in Teaching (MAT) degree with a specialization in Earth Science for grades 7-12. The 15-month, 36-credit CAEP accredited residency program is followed by two years of induction support for new teachers. In addition to a full academic year of residency in high-needs public schools, teacher candidates complete two AMNH-based clinical summer residences, one a museum teaching residency prior to entering their teacher preparation partnership schools, and a second museum science practicum residency prior to entering the teaching profession. By fall 2019, the program had prepared over 100 certified Earth Science teachers to teach in high need middle and high schools in the state of New York.

The multi-year external evaluation of the AMNH-MAT Program is currently being conducted by Silver Analytics Consulting Associates (SACA), a research and evaluation company. SACA is responsible for both the formative and summative evaluations of the project. Evaluation strategies being used include a variety of quantitative and qualitative tools, including surveys, observations, focus groups, interviews, and document analyses. This mixed-method approach assists the SACA in capturing the complexities of the project, triangulating the evaluation evidence, and providing useable and appropriate formative evaluation feedback to the project staff.

The 2019-20 evaluation evidence indicates that the innovative AMNH RGGGS MAT residency program continues to be successful in preparing beginning Earth Science teachers to teach in high need schools, to have positive impacts on middle and high students in these schools, and positive impacts on mentors in partnership schools. The evidence from the course evaluations indicate that the MAT Residents are receiving good instruction and the knowledge, skills and practice to become well prepared beginning teachers, and that the two-year Induction program is successfully supporting the beginning teachers. This claim is further supported by hiring principals who rate the MAT graduates as being very well prepared for their first teaching assignment.

The evaluation evidence also indicates that the MAT program, and its structure and processes continue to have positive impacts on the teacher partnership schools and their teachers. Mentors report that working with the MAT Residents has improved their classroom instruction and had positive impacts on their students' academic learning. Thus, the program is not only experiencing continued success in preparing beginning teachers, but also improving high need schools working with the program.

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I. Introduction

The American Museum of Natural History RGS MAT Earth Science Residency Program is an innovative and unique teacher preparation residency program that is designed to prepare Earth Science teachers for high need schools in metropolitan New York City (NYC) and other parts of New York. To date, it is the only teacher preparation residency program located in and implemented by a natural history museum. Originally approved by the New York State (NYS) Board of Regents as part of the state's Race To The Top (RTTT) award, the program was designed to prepare cohorts of teacher candidates in a residency program to earn a Board of Regents-awarded Masters of Arts in Teaching (MAT) degree with a specialization in Earth Science for grades 7-12. The 15-month, 36-credit CAEP accredited residency program is followed by two years of induction support for new teachers. By fall 2019, the program had prepared over 100 certified Earth Science teachers to teach in high need middle and high schools in the state of New York.

The MAT program partners with four high need middle and high schools in New York City and Yonkers to prepare the Earth Science teachers. Currently, these partner schools are Bronx Early College Academy for Teaching and Learning (Bronx), Midwood High School (Brooklyn), Hunter's Point Community Middle School (Queens), and Roosevelt High School (Yonkers). As members of a cohort, MAT residents complete two five-month residencies in two of the partner schools consisting of four days each week in residence in the schools, and 1-plus days of course work per week at the museum. In addition, the MAT residents complete two AMNH-based clinical summer residences, one a museum teaching residency in the summer before entering their teacher preparation partnership schools in the fall, and a second museum science practicum residency in the summer following the school year and immediately prior to entering their first year of teaching. All the courses and the clinical summer residencies are taught by teams of doctoral-level educators and

scientists from the American Museum of Natural History. Eight cohorts of students have successfully completed the program, and a ninth cohort is completing the program in 2020-21.

The initial funding of this innovative museum-based residency teacher preparation program was federal RTTT funding awarded to the state of New York, and a grant awarded from the National Science Foundation DRK-12 program to AMNH to support the program development and implementation, to conduct an on-going formative evaluation of the program over the course of a five-year grant period, and to examine the impacts of the program.

The evidence from the external evaluation of the initial AMNH-MAT program indicated that the program was successful in designing and implementing this new type of residency teacher preparation program, and copies of these evaluation reports are available upon request from the American Museum of Natural History. Based in part on this evidence, the project directors concluded that the program could be further enhanced, expanded and refined in several areas. Accordingly, the American Museum of Natural History applied for and has been awarded several grants from the National Science Foundation (NSF), and the U.S. Department of Education TQP grant program to continue to develop and refine the preparation program. Currently, the program is partially funded by a NSF Noyce grant for the preparation of Noyce Fellows.

In the past, the external evaluation of the AMNH RGGGS MAT program has been conducted by the Center for Education Policy, Applied Research and Evaluation at the University of Southern Maine. The focus of recent yearly evaluations has been to monitor and evaluate program refinements and program impacts on the MAT residents after they have graduated from the program, the students and schools they teach in their initial years of teaching, and the impacts on the program partnership schools.

The AMNH RGGGS MAT program is one of many urban teacher residency (UTR) programs across the country preparing new teachers. There are now over 50 residency programs in the United States (Guha, Hyler, and Darling-Hammond, 2016). These UTRs are seen as innovative preparation programs designed to exhibit best practices in recruitment,

admission, preparation, and the placement of the graduates of these programs into urban settings (Berry, Montgomery, Curtis, Hernandez, Wurtzel, and Snyder, 2008; Solomon; 2009). The early evidence from some of these UTRs has indicated that these programs have been successful in teacher retention and student performance (Guha et al, 2016; Papay, West, Fullerton, and Kane; 2012).

The AMNH RGGs MAT program is similar in many ways to other UTR programs, but it is also a unique UTR. It is unique in that the teacher preparation program has been designed and implemented by a major natural history museum. Secondly, the school residency portion of the program is located in partnership schools in high need urban middle and high schools. Additional features of the program are designed to have significant impacts on the partnership schools through the teacher mentoring program, and are designed to provide critical induction support to the beginning teachers during their first two years teaching in high need schools. Thus, the AMNH RGGs MAT program is similar to many other UTR residency programs in that it also uses best practices to recruit, admit, prepare, and support its graduates. But the AMNH RGGs MAT program is also unique in that the program has been developed and implemented through a major natural history museum, and, thus, the program provides an opportunity to develop, implement and evaluate a teacher preparation program within and closely connected to an informal learning institution.

Evaluation Plan and Activities

The external evaluation of the program, from inception through Cohort 7, was conducted by the Center for Education Policy, Applied Research and Evaluation at the University of Southern Maine. Currently, Silver Analytics Consulting Associates (SACA), a LLC located in Southern Maine, is responsible for both the formative and summative evaluations of the Noyce-funded project, and the evaluation evidence has, and continues to be, collected and analyzed using a variety of quantitative and qualitative tools. Evaluation strategies used over the course of the program development and implementation have included a variety of surveys, observations, focus groups, interviews, and document analyses. This mixed-method approach has assisted the evaluators in capturing the

complexities of the project, triangulating the evaluation evidence, and providing useable and appropriate formative evaluation feedback to the project staff.

The overall goals of the ongoing evaluation have been three-fold: (1) to conduct a formative evaluation of the program each year, which is designed to collect and provide timely feedback to the project staff about the efficacy of program components and activities; (2) to conduct a yearly summative evaluation which is designed to assess the fidelity to the program design; and (3) to provide project staff with quantitative and qualitative data needed to describe, interpret, analyze, and make adjustments if needed, and ultimately report and disseminate findings from this innovative program.

Focus of this External Evaluation Report

During 2019-20, Silver Analytics Consulting Associates (SACA) has continued to monitor project activities and assess progress that is being made in fulfilling the grant goals and objectives. For the 2019-20 year, the external evaluation was focused on four key components of the program: (1) program courses, and residencies; (2) the mentoring program; (3) the induction program; and (4) program impacts. Additionally, with the onset of COVID-19, evaluation evidence was also collected of the impacts of the pandemic on the delivery of the program, the program mentors and the Cohort 8 Noyce Fellows.

II. Course Evaluation Results

As the evaluation evidence has consistently shown, one of the key strengths of the program continues to be the faculty and the program courses. Consistently, when MAT residents have been asked what they thought were strengths of the program, the first and most often mentioned strength was the faculty. They feel the faculty is very responsive, and very supportive of the MAT residents, both academically and emotionally. And they feel the faculty go out of their way to share advice and resources. MAT residents indicated they like and appreciate the focus in the program on “deep science knowledge” as well as the focus on pedagogical knowledge, and they appreciate learning in and about the museum.

In terms of evaluation evidence of the program course, the MAT residents assess each course through completion of end-of-course evaluation surveys. Responses are provided anonymously, and all responses are considered confidential. The responses are

summarized by the external evaluator, and reports are provided to the program faculty teaching a specific course, and the program co-directors. Nine survey items in particular have been closely monitored by the external evaluators in recent years, and in 2019-20. The nine items include two items that historically have been found to be accurate correlates of successful courses, items dealing with course organization and instructor preparation, and seven items that focus on particular aspects of the MAT program that are key to the innovative program. These nine items are as follows:

- *The course was well organized.*
- *Instructors were well prepared.*
- *The course increased my ability to work with students with disabilities or unique strengths.*
- *The course increased my ability to work with students from diverse linguistic, cultural, ethnic, and social programs.*
- *The course increased my skills in using instructional technology.*
- *The instructor effectively integrated the use of the museum and its resources.*
- *Instructors provided prompt feedback on written work.*
- *The co-teaching format modeled in this course was effective.*
- *I was able to (or will be able to) transfer what I learned in this course into my residency placement.*

Table 1 on the next page reports the average rankings the Noyce Fellows gave these nine items for the program courses in 2019-20. The item averages could range from 1.00-5.00, with higher averages indicating greater agreement with the substance of the item. Average levels of agreement are represented by an average score of 3.00. All the MAT residents completed the course evaluations.

As may be seen from the evidence in the table, the program courses continue to be a strong component of the program, and, in fact, an overwhelming majority of the rankings were very positive, and improved from last year. In 2018-19, over 65% of the item averages were over 3.00, with over 40% of these item averages above 4.00. For the 2019-20 year, 95% of the item averages were over 3.00, and 58% of the ratings were over 4.00.

Table 1: MAT Residents' Assessments of Program Courses (N=15)

Evaluation Item	MAT Courses										
	SOS	SCI 670	EDU 610	EDU 620	SCI 665	EDU 600	SCI 675	EDU 640	EDU/SCI 660	EDU 650	EDU 630
1. The course was well organized.	4.07	4.80	3.93	4.20	4.73	3.33	4.27	4.00	4.93	3.67	3.13
2. Instructors were well prepared.	4.13	4.80	4.33	4.40	4.93	4.20	4.47	4.07	5.00	4.07	3.40
3. Increased ability to work with students with disabilities or unique strengths.	2.80	4.20	4.33	3.60	4.27	N/A	3.80	3.87	4.20	3.53	4.20
4. Increased ability to work with students from diverse linguistic, cultural, ethnic, and social backgrounds.	2.80	3.93	4.67	3.60	4.47	N/A	3.67	3.87	4.20	4.40	4.00
5. Increased skills in using instructional technology.	3.47	4.00	4.20	3.53	4.73	N/A	4.40	4.40	4.47	3.53	3.36
6. The instructor effectively integrated the use of the museum and its resources.	2.23	4.47	4.87	3.73	4.87	4.71	4.53	4.60	4.53	3.33	2.33
7. Instructors provided prompt feedback on written work.	4.27	4.93	4.33	4.47	4.73	3.73	4.67	4.00	4.87	4.33	2.07
8. The co-teaching format modeled in this course was effective.	3.13	4.40	4.27	4.20	4.73	N/A	4.33	4.33	4.73	4.13	3.36
9. I was able to (or will be able to) transfer what I learned in this course into my residency placement.	4.00	4.00	4.53	4.27	4.67	N/A	3.93	3.93	4.73	4.20	3.60

It is also noteworthy that the ratings for three courses in particular substantially improved. In the 2018-19 external evaluation report, three courses were singled out as needing some attention and modifications. These three courses were: (1) SCI665 Space Systems; (2) SCI675 Weather, Climate, and Climate Change; and (3) EDU630 Developmental Variations. As may be seen in Table 1, the ratings for the two science courses are very positive and in line with ratings given other program courses. The ratings also improved for EDU 630.

Thus, the program courses continue to be one of the real strengths of the program. Overall, course evaluations are very positive, and showing improvement as the program,

courses, and the delivery of these courses, matures over time. Another noteworthy finding in the course evaluation evidence is that even in the cases where the delivery of the courses had to be changed from in-person delivery to online delivery because of COVID-19, course rating remained very positive. This speaks to the commitment of the program directors and faculty to providing a high quality program and courses.

Candidates believe they are learning good science content, and learning about good pedagogical strategies for teaching science. As in previous years, the quantitative ratings for the courses were reinforced by the comments the MAT residents made about the various courses and course components. Typical comments include the following:

- *This course integrated use of technology (simulators, models, etc.) that added to my ability of using technology on the classroom (I'm not very tech savvy so this class really helped close that gap). I think the pre-assessment/post-assessment assignment was useful because it helps me see student progress in a different way, plus it's a good way to draw out preconceptions about certain topics students may have, as well as inform what I have to focus on in my teaching. Love the resources provided for us too!*
- *I really enjoyed the assessment of student learning exercise and the hands-on learning activities, like the angle of incidence and how we organized our own experiments... definitely will keep that method in mind for my students! I also really liked taking the time to create our own lab notebooks and how it increased motivation/ownership of the materials. Both methods increased the fun/enjoyment aspect of learning, which I think is critical in all classrooms but especially high needs one.*
- *Learning about the different needs of students and how it can impact their behavior in the classroom was really interesting and helpful. The content taught in this class has developed my understanding of how every students' actions in the classroom has a reason, and we need to identify that reason and resolve it in order to maintain an effective classroom.*
- *I feel like all of the readings - the background on earth science misconceptions, on modes of inquiry, on examples of effective curriculum design (the historic plate tectonics lesson! the tangible box of graphs/objects in climate change lessons!) are all going to help me make science relatable and relevant to student. The teaching activities were a great experience and helped ground us in the ESRT which I am going to need to be able to teach.*
- *This course really helped me learn to use different online resources for students in high needs school to access authentic science data about weather and climate. I think the resource sharing activity was very valuable for us to*

- get exposure to online simulators/data and to discuss ways in which we can effectively implement and scaffold these resources in the classroom.*
- *This is probably my favorite class in the whole program, it really modeled effective teaching of science and let us get into some amazing historic science and get to break it down, and gave us a richer, deeper sense of the process of science ourselves.*
 - *One of the most valuable things about this course that helped me be prepared for teaching in a high needs school is to structure and facilitate discussions regarding race, identity, and diverse learners in the context of education in NYC.*
 - *It was insightful to learn about the fluidity of the scientific process and how it can be applied/ discussed throughout different lens of lessons.*
 - *...I think this was the most helpful course in the program, it really modeled how to co-teach and how to build understanding through a historic progression of science ideas, and gave the educational background on a ton of useful different topics, like modes of inquiry, misconceptions, and the NGSS 3D standards. Loved it.*
 - *It was an absolute pleasure to have this amazing duo as our SCI 665 instructors. This course has left an imprint on me, and I hope to emulate their passion for the field and teaching astronomy to young people. I really am going to miss this course and being their student. This experience was truly a blessing.*
 - *I really loved the DSET Developing Scientific Explanation Tool. This tool will be very helpful in high need schools because it will challenge students critical thinking and will get them to communicate their ideas in a scientific way.*
 - *This course helped me think of different ways to relate to students lives through my lessons and also how to implement/go over safety procedures which is obviously extremely important. The most useful aspect for me, however, was learning the geology content.*

The quantitative ratings, as well as the written assessments provided by the Noyce Fellows clearly establishes that the program courses continue to receive high ratings and continue to show improvement.

Another feature of the program courses is the new and developing foci on specific teaching practices. One of the important features of the new Noyce grant awarded to the AMNH RGGS MAT program has been a renewed focus on developing culturally responsive teaching (CRT) practices and four core high-leverage practices (HLP) throughout the program and courses. During 2019-20, the program directors and faculty made a concerted

effort to begin infusing these practices in program courses. This infusion began with four courses. Table 2 reports the students' assessments of the effectiveness of the renewed focus on the two types of teaching practices in the four courses. As may be seen in the table, the program was very effective in helping students to both increase their ability to understand CRT and HLP, and in helping students increase their skills in using these practices in their teaching in the residency placements.

Table 2: Candidates' Assessments of CRT and HLP Components in Selected Program (N=15)

Evaluation Item				
	SCI 675	EDU/SCI 660	EDU 650	EDU 640
1. This course increased my understanding of CRT practices.	3.47	4.20	4.20	3.93
2. This course increased my ability to use CRT practices in my own teaching.	3.47	4.20	4.07	4.00
3. This course increased my understanding of High Leverage teaching strategies.	3.67	4.60	4.07	4.27
4. This course increased my ability to use High Leverage teaching strategies in my own teaching.	3.71	4.64	4.07	4.33

Finally, in terms of delivery of the program courses, and has been mentioned above, some courses had to be moved to an online format because of the impacts with the onset of COVID-19. Students in these courses were surveyed in late spring about the effects of these changes on their learning and skill development. Students were asked to provide an overall assessment of the effectiveness of the online instruction they were provided by the course faculty. Perceived effectiveness varied somewhat for different instructors, but still remained positive for all faculty. Perceived effectiveness ranged from 67.7%-93.3%. This suggests that, while transitioning totally to online instruction may have been difficult, students still report receiving effective instruction.

To explore students' experience more deeply, students were asked what was the biggest surprise for them in moving to online classes and instruction. Typical student comments included:

- *Seeing how lectures/lessons can be run effectively, despite the challenges of remote learning.*

- *It surprised me how smoothly we were able to transition into these online sessions. I believe this was the first class that we did have entirely online and it worked well. I would have loved to see some of the demos in person but my professors did a great makeshift version in their own kitchens and it was still great to see.*
- *I loved doing this class online. Incredible online tools.*
- *I am surprised at how well the professors were able to make the class online and make it still effective with such a short notice. Although it would be different with middle and high schoolers, I think it shows that a lot of activities are still possible with online learning. I loved how easily presentations worked with zoom! All my classmates were able to screen share from their own computers and it cause less technical delays overall.*
- *The biggest surprise is realizing how much I miss my cohort mates and being physically present at the museum with them.*
- *I found myself able to ask questions more privately in the chat settings.*
- *I was able to participate more online.*
- *I learned a lot from my peers when they modeled online team teaching. I will use some of that if i teach online in September.*
- *When it came to resource sharing and team teaching, it became easier to screen share and present because we were already on an online software.*
- *I was surprised how seamlessly we were able to accommodate being on Zoom for team teaching. I was really nervous that it was going to be almost impossible to do that activity, and it was challenging, but not impossible. This gave me hope for any potential remote teaching next year.*

As may be seen in these representative comments, students were somewhat surprised at how easy the transition to online learning was, and how they had more opportunities to learn and use online resources. Students felt they learned from the modeling their instructors and peers exhibited, and felt this was going to be very helpful in their own online teaching with students. And several students reported that they were able to focus more easily and, in some cases, increased their own participation in the courses.

Students were also asked about the biggest challenges they faced in transitioning to online learning only. Although several students reported that they experienced technology problems from time to time, overwhelmingly students indicated their biggest challenge was staying focused for long periods of time online. Even though class sessions online were similar in length to in-person class sessions, the extended screen time was difficult for

many. Students commented that their challenges were:

- *Staying focused and not getting headaches from the constant screen time.*
- *Staying focus for so many hours and trying to digest so much information during those long hours.*
- *This was a challenge overall, but the emotional and mental and physical drain of completing assignments while juggling my family's needs and stresses during the pandemic, as well as my own fears about loved ones and my future, was extremely difficult. The long zoom courses were almost impossible to focus on regardless of my interest in the material.*
- *Paying attention through long lectures/activities.*
- *Staying focused in the online sessions during all the distractions of working at home.*
- *I was surprised how difficult it is to stay focused during any class during online learning. I love the content that was in this course, but at times it was difficult to concentrate and stay engaged.*
- *Sitting down, looking at a screen for the entirety of my day.*
- *The same as it is in all of the online courses, information retention due to way too much screen time. But again that's not specific to just this course.*
- *Long hours on zoom and the inability to have what felt like authentic conversations outside of breakout rooms.*
- *The same as with the other online classes, longer screen time which meant less ability to retain information for an extended period of time. I remember the topics covered before the online switch way better than I remember the topics covered in the last class. This is NOT a comment on the instructors or the course work itself, just personal statement about online learning for me.*
- *Staying motivated during the class session. Staring at a screen triggers migraines and then I can't focus.*

Given these challenges it was not surprising to find that when asked how online courses could be improved, students consistently indicated they thought shorter individual class sessions and more breaks would be a significant improvement.

Another key feature of the MAT program, and one closely tied to the courses, is the residency placements. Students spend four days each week working in a partnership school and practice transferring what they are learning in the courses into practice with close supervision by their mentor and a program Senior Specialists. On the end-of-year survey, a majority (63%) of the students reported that assignments in the MAT program courses

were well connected to their Residency experiences, and over 8 out of 10 students indicated they felt the MAT program prepared them to work in schools similar to their Residency placements.

Clearly, the residencies experiences are seen as another major strength of the program. But these experiences were also impacted by the onset of COVID-19 and the subsequent changes in the partnership schools. The Noyce Fellows were asked how they helped and worked with their mentor as the schools switched to online learning. Many MAT Noyce Fellows reported they continued to plan and deliver lessons, assess student work, and maintained contact with students, either individually or their conferencing. And most indicated it had been a fairly smooth transition to online teaching and learning. But when asked how effective they thought the online strategies used in their mentors' classed were, they reported mixed assessments. Representative comments made by the MAT Fellows included:

- *I think there is a learning curve to online teaching if you never had it implemented in your classroom. And it's the same for the students. Some students did better with online learning and others floundered significantly. Same with teaching strategies. Some things worked and some didn't. Some worked for some students and not for others. It was a trial and error kind of situation, as it would have been in the classroom.*
- *I think it was ok for an emergency. The kids were still doing some of the same calculations for the physics labs, but they weren't really doing experiments and collecting their own data and they probably spent half the time that they would in person.*
- *I don't think they were that effective. I'm sure students learned some content, but we were receiving feedback from the principal that students were overwhelmed, so we were unable to give assignments that really required students to critically think and apply the concepts that they were learning. Not being able to conference with students I believe really hindered our ability to explain concepts to students and ensure they were understanding the content.*
- *Pretty effective. We focused on having fun while learning with the students and it seemed to pay off.*
- *We used the app "remind" to keep in touch with students but other than that, we did not.*
- *I think they were as effective as they could have been given the circumstances. I think they could have been more effective but unfortunately students are working in less than optimal conditions (re: access to technology, a home*

- situation conducive to learning, etc.).*
- *On a scale from 1-10 I would say a 6 or 7. They didn't help motivate the students to do the work, online lectures aren't exactly engaging, and they weren't efficient for sharing content back and forth. Using another platform such as Peardeck or Google classroom may have been better. However, with our involvement rates as is, I understand why trying to get students on a new platform would have been even more troublesome.*

Thus, it appears from the evaluation evidence that the effectiveness of the online strategies implemented in the mentors' classroom varied from mentor to mentor. In large measure this might have been anticipated. As is the case with the face-to-face instruction, effectiveness of mentors continues to vary somewhat across the program.

To summarize the evaluation evidence on the program courses and residency placements, is important to recognize that the course evaluation data, both in terms of survey item ratings and focus group discussions, indicate that the program courses and residency placements are key positive components of the program. At the same time, and based on the same sources of evaluation evidence, this external evaluator provides these three recommendations:

1. *Continued attention should be given to the improvement and institutionalization of the improvements in the EDU 630 course and the SCI 665 and SCI 675 science courses.*

As the course evaluations have shown, the ratings for these three courses have substantially improved, and the program directors and faculty are to be commended for work on improving these course. The EDU 630 course still has room for additionally improvements, and it is equally important to sustain the improvements made in 2019-20 in the science courses. The program directors are encouraged to discuss the course improvements with the faculty teaching these three courses in particular.

2. *The program should continue to expand and embed the CRT practices and High Leverage practices into all program courses, residency assignments, and Induction program.*

The program directors and faculty are to be commended for the significant progress they made in embedding CRT and High Leverage practices in four of the program courses. It is recommended that this work continue in 2020-21 and that it be expanded to all program courses and program components.

3. *The program review delivery practices in online courses and classes.*

The program directors and faculty are also to be commended for the attention and work given to maintaining program quality and effectiveness as some of the courses had to be moved to an online delivery. Given the uncertainty of the continuing impacts of COVID-19, it may mean more course instruction will have to be delivered via online. To better prepare for this possibility, the program directors are encouraged to review past online instructional practices and be prepared to make any appropriate changes, in case it becomes necessary to move some instruction to an online format.

III. Mentoring Program

A second major focus of the 2019-20 continuing external evaluation was the Mentoring Program. The Mentoring Program consisted of three core components: (1) a 5-6-day Mentoring Academy designed to provide the school mentors with professional development on mentoring; (2) school on-site meetings with the mentors and Senior Specialists; and (3) opportunities for the mentors to participate in additional professional development activities provided by the museum.

Each year the MAT program conducts a 5-6 day Mentor Academy for all new and returning mentors in the partnership schools. The Mentor Academy consisted of professional development days each year in which the mentors are introduced to and provided opportunities to analyze and practice well-established evidence-based mentoring strategies and skills. Additionally, the mentors are provided training in the use of a set of mentoring tools, tools designed to help them monitor the development of their MAT Noyce Residents and provide the Residents useful formative feedback for improvements.

Evaluation evidence on the Mentor Academy, and the impacts of the professional development on the mentors' practices and on the mentors' instruction, was collected through a mid-year mentor survey and a focus group with mentors, and an end-of year mentor survey.

The Mentor Academy is designed to provide professional development of the program mentors by increasing their skills to mentor the MAT Noyce Residents. At the end of each of the Mentor Academy professional development days, mentors were asked about

the effectiveness of the day’s program activities. Table 3 reports an average of the mentors’ assessments of the professional development activities over the length of the Mentor Academy for 2019-20. On average, fifteen (15) mentors provided their assessments for each session of the Mentor Academy. As may be seen from the assessments, all the mentors found the sessions helpful in multiple ways. These results were similar to those reported in other recent years, but for 2019-20 the results were even more positive. A greater percent

Table 3: 2019-20 Mentors’ Assessment of the Mentor Academy Sessions (N=15)

Activities	Strongly Disagree	Disagree	Disagree a Little	Agree a Little	Agree	Strongly Agree
This professional learning session will help me increase my effectiveness.	0%	0%	0%	0%	46%	54%
The content of this professional learning session gave me valuable tools and strategies.	0%	0%	0%	0%	46%	54%
This professional learning session deepened my thinking about mentoring and the MAT program.	0%	0%	0%	0%	46%	54%
I will use what I learned in my ongoing professional practice.	0%	0%	0%	0%	46%	54%
I feel included and heard in the MAT mentoring community.	0%	0%	0%	0%	46%	54%

of the mentors indicated they “Strongly Agreed” that all the activities were helpful. And when asked to provide an overall rating of the Mentor Academy, approximately 2/3 (63%) of the mentors rated it as Excellent.

These ratings were reinforced in comments made by the mentors in the mid-year focus group. Mentors were asked, “What parts of the Mentor Academy and program have been most beneficial to you? And why?” A key benefit mentioned by many mentors was the increased opportunities they had to meet with their mentors and to talk with them about their assignments. Additionally, the mentors noted a change in approach in the Academy that was helpful. Mentors say they had more involvement with their first semester’s mentor this year and say that it is was helpful to know more about the residents before they started and it gave them opportunity to think about how to positively support them.

Another change the mentors mentioned as beneficial was Breakout sessions where they have had the opportunity to have mentor led mini-workshop sessions where they pick what strategies they want to learn about. An additional benefit the mentors mentioned was the Ramapo program. They found it to be very helpful. They also attribute the Ramapo program team building activities with helping them to get to know other mentors more and feel more comfortable with one another. And overall, mentors who have been mentors for multiple years report that this year has not been as repetitive, and consequently more beneficial to them.

The format and substance of the monthly school meetings was also changed in 2019-20, so the mentors were asked “Have the monthly after school meetings with the Senior Specialists been useful this year? Why or why not?” The mentors reported they were much more useful because they are not just going over the rubric. They did add that it would be good in the future to have some 1-1 time with the Sr. Specialist to talk about resident. They also mentioned that it would be good for the program to be mindful of the school professional development calendar before scheduling the monthly meetings.

Another question the mentors were asked was “Has your work as a MAT mentor and involvement with the MAT program had an impact on you, your teaching, or your school? In what ways?” The mentors reported many benefits. Among them were comments like the following:

- *Residents come in with new ideas, new labs, different approaches, etc.*
- *They receive useful suggestions from the Sr. Specialists.*
- *The program adds an extra layer to help our students.*
- *When you are working with partner, you learn a lot about yourself.*
- *It has led to greater self-reflection. For example, completing the disposition tool on the resident led one mentor to reflect upon her own dispositions.*
- *Students are more excited about science because there is a scientist in the room.*
- *Residents get a positive reaction from students and that increases the students' engagement.*

Finally, the mentors were asked “What would you recommend that you think would make the Mentor Academy and program better?” Several suggestions dealt with some of

the logistics of the Academy (e.g., timing, calendar, length of sessions, etc.) with one more substantive suggestion. This involved mentee feedback. Mentors mentioned that they feel disconnected from the feedback Sr. Specialists provide to mentees. Several made comments like this: “When the Sr. Specialists meet with the mentees, it would be nice to know what was said or even be a part of the meetings.” And “It would be useful for them (the Sr. Specialists) to share their observations”.

Turning to a second aspect of the Mentor Academy, the mentors were asked about the transfer and use levels of the Mentoring tools they explored in the professional development sessions of the Academy. Table 4 reports which tools, and how often, the tools were used by the mentors in 2019-20. As may be seen in the table, use of the tools varied considerably among the mentors, and, overall, the use levels were lower in 2019-20. This might be expected, given the onset of COVID-19 and change to online teaching and learning in the partnership schools.

Table 4: Transfer and Use Levels of Mentoring Tools in Classrooms (N=15)

How often activities occurred in Mentor classrooms	Never	Less than once a month	1 to 3 times per month	1 to 3 times per week	Every day	NA
d. I used the MAT Observation Rubric to observe my MAT teacher resident.	13.3%	46.7%	26.7%	0.0%	0.0%	13.3%
e. I used the MAT Disposition Tool with my MAT teacher resident.	20.0%	66.7%	6.7%	0.0%	0.0%	6.7%
h. I used the CAL (Collaborative Assessment Log) with my MAT teacher resident.	0.0%	46.7%	33.3%	6.7%	6.7%	6.7%
i. I used the ASW (Analyzing Student Work) Tool with my MAT teacher resident.	13.3%	53.3%	20.0%	5.3%	0.0%	13.3%
j. I used the Seating Chart Tool with my MAT teacher resident.	33.3%	20.0%	20.0%	13.3%	0.0%	13.3%
k. I used the Getting to Know Students with my MAT teacher resident.	26.7%	53.3%	13.3%	0.0%	0.0%	6.7%
l. I used the Instructional Groups tool with my MAT teacher resident.	20.0%	40.0%	26.7%	0.0%	0.0%	13.3%

The mentors were also asked about some key program expectations. Last year, the external evaluation report noted a concern related to program expectations of the mentors. In 2018-19, approximately one-third of the mentors report only providing feedback to their mentee 1-3 times per month, and approximately 1 in 4 mentors co-develop plans with

their mentee only 1-3 times per month. However, for 2019-20 frequency levels improved. Table 5 reports the self-reporting of the mentors in key program expectations. As shown

Table 5: Transfer and Use of Mentoring Strategies in Classroom (N=15)

How often activities occurred in Mentor classrooms	Never	Less than once a month	1 to 3 times per month	1 to 3 times per week	Every day	NA
a. I co-developed lesson plans with my MAT teacher resident.	6.7%	13.3%	20.0%	40.0%	6.7%	13.3%
b. I co-taught lessons with my MAT teacher resident.	6.7%	13.3%	13.3%	20.0%	40.0%	6.7%
c. I provided feedback to my MAT teacher resident.	0.0%	6.7%	13.3%	40.0%	33.3%	6.7%
f. I used museum and/or other informal learning resources with my MAT teacher resident.	6.7%	20.0%	40.0%	20.0%	6.7%	6.7%
g. I helped my MAT teacher resident prepare for job searches.	13.3%	40.0%	33.3%	6.7%	0.0%	6.7%

in the table, providing feedback to mentees has increased from the 2018-19 level to 40% of the mentors reporting that they provided feedback 1-3 times per week. In terms co-developing plans with mentees, the frequency of this activity has increased from the 2018-19 level to 40% in 2019-20, and these increased have even occurred with the onset of COVID-19.

In the case of the impacts of COVID-19, mentors reported using a variety of strategies to provide online instruction to their students, including Zoom, Google Classroom, YouTube and Peardeck. When asked how effective these instructional strategies have been in helping their students learn, typical comments were:

- *For most students its been great; some not so good. Some students have rejected the online platform.*
- *It Varies. Students with good technology and self regulation are more likely to be engaged. Others, not so much.*
- *I think they have been highly effective at helping students learn, specially with the use of Peardeck where I am able to add formative assessments.*
- *On a scale of 1-10, I would say a 8.*
- *They worked IF the students looked at them. But many did not.*
- *I think they have not learned the same amount as they would of if they were*

in the classroom.

- *Nothing can beat learning in a classroom. But I think some students have genuinely benefited from moving at their own speed and being able to ask individual questions.*
- *I think that given the situation, it worked reasonably well.*
- *I feel very successful with how my online classes are going. A lot of students have shown a very positive response, some students who are traditionally good learners in the "brick and mortar" school setting have been struggling but it has been a low number.*
- *I think we tried to replicate our normal structures and procedures to the best of our ability and many of our students were able to keep up. Unfortunately, our special education and ELL populations were not getting the individualized support they needed.*

As these comments suggest, many mentors thought the online strategies were effective, but others found them to be less effective. When asked what was their most positive surprise with the switch to online instruction and learning, mentors commented:

- *The students who were passive in the classroom suddenly shined.*
- *I am more confident now in teaching remotely.*
- *I was surprised by how I could use remote tools to keep my class engaged. There are certainly things I've started because of remote learning that I would continue when we're back in the classroom.*
- *The number of students who have began excelling as a result of our online system!*
- *Finding out that I could actually do this remotely.*
- *Students can pause the video, they can rewatch things they don't understand.*
- *It has allowed me to slowdown and ensure that all students get feedback.*
- *Special ed kids did great - no distractions - no other kids.*
- *Learning about CK-12 as a supplementary resource for students.*
- *The fact that students have been engaged.*
- *How ready the kids took to it and seeing that all the work we have been putting into making our classwork available online has helped us now.*
- *The engagement from a number of struggling students. Seeing students take ownership over their own learning.*
- *Some students actually did more work in the remote period because of the more flexible timing.*

These comments suggest that the online experience was more positive than was expected. Mentors gained confidence with using online strategies and resources, and many students excelled in their learning.

At the same time, mentors did report facing several challenges. Mentors mentioned challenges such as:

- *Engaging students whom are disconnected from school.*
- *Getting the small group of students who never log in to do their work.*
- *Getting the students to do their own work, especially on assessments.*
- *Lack of technology and lack of ability to gauge student understanding in the moment.*
- *Making lessons suited for online instruction.*
- *Some kids still do not have consistent access to technology and given that earth science is spatial thinking oriented, it has somewhat limited what they can figure out in terms of their own space.*
- *Not interacting with the students on a daily basis. Online (even video chat) isn't the same.*
- *Coordinating with families that have had internet/device issues and what to do with students that went MIA when online instruction began.*
- *During live classes, some students refuse to communicate altogether. If students missed class it was almost impossible for them to be caught up in the work.*

Thus, while mentors reported that the online instructional strategies they used with their students were successful with many students, many also reported that keeping some students engaged was difficult. But mentors did report that having a MAT Noyce Resident working with them was helpful. Mentors commented that the MAT Noyce Resident helped them in several ways. Typical mentor descriptions included:

- *I have used the MAT resident to lead sessions on zoom, co-planning sessions, giving feedback to a target group of students, and assisting with contacting students and families.*
- *We shared the responsibility of making the instructional videos and grading the assignments.*

- *Yes - my MAT resident helped me to give feedback to students on work.*
- *She co taught classes with me online.*
- *My resident helped find videos and grade/give feedback on responses online.*
- *Had her develop lessons and materials and post them on Google Classroom. Also had her help grade some assignments.*
- *We had regular weekly meetings with our resident via zoom where we co-planned and created virtual materials for our students together. We also allowed our resident to lead our live zoom classes and work in small groups with our students using the zoom breakout feature.*

Finally, mentors were asked how the MAT program and the museum could be helpful to them as they prepare for the 2020-21 school year, several commented:

- *I would love more training on the technology others are using.*
- *More strategies that can be used with remote learning since this may be the new wave of teaching & learning.*
- *Google classroom friendly options. Login and assignments that can dovetail into the Gsuite.*
- *Coming up with new strategies for blended learning because that seems to be the direction we are heading.*
- *How to develop a relationship with students, get students to work in groups, if we have to continue to work remotely.*
- *Help with teaching/learning new technology.*
Aallow me to interact with my resident early on so that if we are online, I would like to co-plan with them..
- *It would be great to have a mentor academy focused on remote teaching so that the MAT mentors can share resources with each other and we can also learn what programs the faculty have used with the residents.*

In summary, and as is the case of the program courses, the Mentor Academy is viewed as an important component of the program. Mentors report that they find it to be valuable and useful to them as they work with their mentees, and the evidence indicates that many mentors are using the tools and strategies learned in the Mentor Academy during the residencies. But the evidence also shows that the transfer of the content and skills learned in the Academy into mentors' practice is not always consistent. This is similar to evidence found in recent years. And as stated in the external evaluation report last year, some of the variance in transferability may be attributed to differences in the development

stages of the MAT residents, and one expects some variance among mentors as they exercise their professional judgment and practice. This suggests that this large variance in some cases, and the feedback from the MAT residents themselves, could benefit from further exploration and analysis.

Consequently, based on the evaluation evidence for the mentoring program, the external evaluator makes the following recommendations:

- 4. Steps should be taken to modify the Mentor Academy curriculum, as appropriate, to include professional development activities around CRT and HL practices, and online instruction and resources.*

The program has been successful in expanding the curriculum in selected courses to include CRT practices and High Leverage practices. This should be extended to other program courses, as well as being embedded in the Mentor Academy curriculum. Mentors would benefit from this, and it will help them as they are working with and supporting the skill development of their mentees.

- 5. The program should continue to implement a more robust program of monitoring transfer levels and fulfillment of program expectations.*

As described in the evaluation evidence, and as was noted last year in the external evaluation report, there continues to be variation in transfer levels and completion of program expectations, and this was also noted last year in the external evaluation report. To better insure that the Noyce Fellows are receiving more consistent mentoring, it is recommended that transferability and expectations in the program continue to be monitored more closely by the PI and staff.

- 6. Steps should be taken to modify the Mentor Academy curriculum, as appropriate, to include professional development activities dealing with online instruction and resources.*

Mentors, as well as the MAT Noyce Fellows, have asked for assistance from the MAT program and AMNH in learning how to provide more effective online instruction, and better access to more online curriculum resources. A logical place for this to take place is in the Mentor Academy, where the program can draw upon the resources and experience of mentors in providing good online instruction. Additionally, mentors and Mentor Academy faculty can facilitate the exchange of online resources among the mentors and mentees.

- 7. It is recommended that the feedback loop between the Sr. Specialists, mentors, and mentees be reviewed and modified as appropriate.*

As mentioned above, mentors would like to be more involved in the feedback their mentees receive from the Sr. Specialists. By learning what the Sr. Specialists are recommending the mentees attend to in their development as teachers, the mentors can improve their ability to work with their mentees, and support the Sr. Specialists in their work with the mentees.

IV. MAT Induction Program

A third major focus of the continuing external evaluation in 2019-20 was the monitoring and assessment of the Induction component of the MAT program. Key strategies included in the two-year Induction Program are monthly meetings of the MAT resident graduate teachers at the museum, school visits and classroom observations, and opportunities for participation in other professional development activities offered by the museum (e.g., planning forums). The Induction Program staff also provides, as needed, ad hoc consultations with the new teachers. Both Cohort 6 and Cohort 7 participated in the Induction Program during 2019-20. Although all these activities are voluntary, it should be noted that the monthly meetings and planning forums were well attended, both by Cohort 6 and Cohort 7 MAT beginning teachers.

As in past years, the MAT Induction Program staff continued to use New Teacher Center tools and protocols, as appropriate, in the induction activities. The tools are used to support mentor conversations, and to provide structures for collecting classroom data and analysis of student work. The tools include lesson plan template models, support for learning about students across multiple dimensions, support for communicating with parents and administrators, and an inquiry cycle action plan.

Project staff also continued to conduct multiple school visits, particularly in the first year, of the MAT beginning teachers in the New York City area and beyond. The visits included a pre-observation conversation, the classroom observation, and a post-observation conversation. The beginning teachers welcomed these visitations, and many remarked that the classroom observations were particularly helpful.

The external evaluators conducted a mid-year focus group with teachers participating in a Induction program monthly meeting. The two cohorts were asked to

respond to two key questions in the focus group. The first question was “ What are the benefits to them for participating in the Induction Program”? The second one was “Do you have any suggestions for improving the program”?

In the case of the Cohort 7 graduates, the overwhelming response to the first question from all the cohort members was that the greatest benefit was “Support!” Many remarked that the support they receive was invaluable, both in terms of the Induction activities and through visits and observations in their classrooms. They think the Induction program faculty is good at helping them finding ways to confront many of the problems they encounter as beginning teachers.

Additionally, they particularly appreciate that they are observed in several class periods, and are offered positive, helpful suggestions about their teaching. As one cohort member remarked’ “[The Induction Faculty member] is very supportive. I don’t feel I’m under pressure to perform like when my AP visits my class”.

Cohort 7 graduates also felt the Meet Ups and Planning forums provided them great opportunities to learn from other members of their cohort, to get lesson ideas, and to get resources from their cohort and from the museum. As one remarked’ “I don’t feel alone, like I’m the only one running into this particular problem”.

In terms of the second focus group question, one of the areas the cohort would like to receive more support and help in is classroom management. They would like to learn more about a variety of tools, so they can select ones that fit best for them. They remarked that many times their mentors are not the best role models to follow in addressing classroom management problems. One of the cohort members made a particularly telling point: “Classroom management will not necessarily take care of itself. Having engaging lessons is not enough”.

A second area they would like to receive continuing support for is in adapting lessons. They recognize the tensions between the ideal and reality of the classrooms they are in, and they appreciate getting help in adapting their lessons.

Finally, some members of the cohort made a suggestion regarding the program coursework. They felt there was nothing in the program that specifically deals with

developmental psychology, and they think some coursework in this area early in the program would be helpful. Not all agreed with this assessment and suggestion.

When members of the Cohort 6 graduates were asked the same question about the benefits for them for participating in the Induction Program, they had the same answer as cohort 7; that is, “Support”. They indicated they were more confident and better able to respond to classroom issues, and more confident in their lesson planning and delivery, and they indicated that receiving continued support from the program was much appreciated.

All indicated that they appreciated the way the Induction faculty approached the second year of the Induction program. They appreciated that a needs assessment was conducted with them, and that they had played a key role in setting the meeting agendas.

As previous cohorts have said, Cohort 6 graduates also reported that one of the primary reasons they attend the Meet Ups is to be with members of their cohort, to exchange ideas, lessons, and teaching strategies. And they indicated that these types of support are important because many times they feel isolated in their schools. In many cases they may be the only Earth Science teacher in their school.

They also indicated another reason why receiving support and advice from the Induction faculty and their cohort members is very important to them. They feel that the Induction faculty and members of their cohort know them, they “ know the way I think” and therefore their suggestions and advice are more valuable to them than what they may receive from their peers, mentors, and/or AP in their schools.

Based on these analyses, the external evaluator recommends the following:

8. *The current curriculum and practices used in the first year of the Induction Program should continue, with additional emphasis placed on classroom management and lesson adaptation.*

Clearly, the program graduates find the Induction program a valuable experience. They benefit a great deal from working with the Induction program faculty and their cohort peers. The MAT program, and more specifically the Induction program faculty, is to be commended with the resources, time and commitment they have made to providing critical support to beginning teachers. The graduates did indicate they would like more help in classroom management strategies and in modifying lesson to fit the needs of their students.

V. MAT Program Impacts

The external evaluation has continued to conduct analyses in several areas related to the impacts of the program. These included: (1) the MAT teacher graduates' self-assessment of the preparation program, and for 2019-20 the impacts of COVID-19 on their instruction and students; (2) hiring principals' assessments of the MAT teacher graduates; (3) an analysis of the performance of MAT teacher graduates' middle and high school students in high need schools; and (4) the impacts of the MAT program on the mentor teachers and their schools.

Turning to the analysis of these program impacts, the MAT beginning teachers were asked to provide their own self-assessments of how well they thought the AMNH RGGGS MAT program had prepared them to begin teaching in high need schools. The beginning teachers were asked to provide this assessment at the end of their first year of teaching by reflecting on their preparation program. More specifically, the teachers were asked: *Overall, how well prepared were you for teaching upon completion of the AMNH-MAT program?* Fourteen (14) teacher graduates from Cohort 7, which represented approximately 90% of the teachers in the cohort, responded to this question on a voluntary survey that they completed at the end of their first year of teaching. This return rate was substantially higher than in previous years.

The evidence from this self-assessment indicated that a majority of the respondents felt well prepared for their first year of teaching. Over 85% of the teachers indicated they felt "Adequately" to "Very well" prepared for this first teaching job, another substantial improvement from recent years.

The teacher graduates were also asked to provide self-assessments of their preparation in eight specific areas: (1) science content knowledge; (2) student needs; (3) instructional planning; (4) learning environment; (5) instructional strategies; (6) safety; (7) school and community relations; and (8) professionalism.

Table 6 reports the teacher graduates' self-assessments for each of the eight preparation areas. For comparison purposes, the self-assessments provide last year by Cohort 6 are also included in the table. The numbers in the table are the Grand Means of the

individual items under each area on the survey. The averages could range from 1-4 (1=poorly prepared; 2=adequately prepared; 3=well prepared; or 4=very well prepared). As shown in the table, six of the averages in 2019-20 were above 3.00 indicating that the teacher graduates felt that they were Well Prepared in these areas. The two remaining area averages were above 2.90 indicating the teachers felt more than Adequately Well Prepared in these areas. Both these statistics are higher than in 2018-19.

Table 6: Teacher Graduates’ Self-Assessment of the MAT Program (N=14)

Area	Cohort 6	Cohort 7
1. Science content knowledge	3.31	3.35
2. Student needs	2.69	2.93
3. Instructional planning	3.15	3.05
4. Learning environment	2.86	3.08
5. Instructional strategies	3.06	3.13
6. Safety	2.80	3.33
7. School & community relations	2.87	2.91
8. Professionalism	3.10	3.53

Several areas exhibited substantial improvements for Cohort 7. These were: (1) science content knowledge; (2) student needs; (3) learning environment; and (4) professionalism. The program is to be commended on these improvements for the Cohort 7 graduates.

The first year graduates were also asked about their experiences with transferring to online instruction and learning in response to the onset of COVID-19. In similar fashion to responses from mentor teachers, the first year teachers reported several challenges as a result of the shift in the mode of instruction. Teachers commented:

- *The biggest challenge in shifting to online learning was reaching those kids that decided not to work. I sent personal emails, called home, contacted admin., etc, and some students just would not engage. And, these were often my students that already struggled in the classroom so I felt like I was just letting them down again.*
- *It's been difficult to gauge student interest and engagement. Many students*

have not been willing to turn on their cameras or microphones during live classes, which makes it really difficult to see or hear their reactions to the materials like I can in the classroom. Also I miss doing hands on activities and labs - I think students gain a lot of scientific understanding from those activities that is hard to recreate in an online platform, even with great interactive websites.

- *Losing engagement for many of my students, many of whom are struggling to take care of their families during this time.*
- *The biggest challenge has been encouraging active student engagement.*
- *Not being in front of students every day, being able to see them and there when a student is struggling. I love being in the classroom so the physical aspect of not being with my students was the hardest part.*

At the same time, and like the mentor teachers, the first year teachers reported some positive outcomes. When asked what was the biggest positive surprise for them, teachers commented such as:

- *The biggest positive surprise was my students' engagement and perseverance. I remember signing on to Google Meet's and the students were in a good mood, happy to be able to mess around with their friends again and talk with me. This wasn't something I was expecting. Also, some students really still wanted to get 100's on assignments, even if they knew the grade didn't matter.*
- *Some students who had very poor attendance during the school year started turning in a lot more work.*
- *Many of my students with IEPs have flourished in this online environment. I have been trying to reflect and determine what has made them more successful in this setting.*
- *Some students who were MIA before (in the classroom) actually became much more involved during video sessions.*
- *The amount of students that stayed engaged and seeing those that struggled in a classroom setting blossom in online learning.*
- *Having a virtual relationship with students who did not show up to class normally.*
- *I actually got to know some of my students a lot more - like the ones I had a hard time. I know the two students I struggled with the most in person pretty well now & I have very good relationships with both of their moms.*
- *Some students that struggled in the classroom did very well in the remote classroom.*
- *Students who seemed disengaged sometimes shared extensively online and*

had great ideas.

Given these challenges and successes, it is not too surprising that the beginning teachers indicated they would like further assistance from the MAT program and AMNH in building online resources they can use in their classrooms. Teachers typically asked for assistance such as:

- *Building an online bank of resources that we could use with our students would be super helpful.*
- *Facilitating resource sharing between cohorts and getting feedback (from outside our own schools).*
- *Continue having induction and planning events and offering wonderful support.*
- *Sending resources on how and when to prepare for next year.*
- *More on-line resources for labs.*
- *Project-based learning ideas for each unit.*
- *Continued planning forums.*
- *Possibly provide more remote learning activities offered through the museum.*

Thus, the following recommendation is made by this external evaluator:

9. *The MAT program and AMNH should provide additional assistance and resources for their program graduates.*

Since its inception, the MAT program and AMNH have provided Cohorts and program graduates extensive resources and continuing assistance, and these are highly valued. Both students in the program and graduates of the program often mention how much they appreciate receiving these resources and assistance. But, as described above, both program students and graduates face new challenges with the continued impacts of COVID-19. Thus, the program is encouraged to identify additional ways they may facilitate the exchange of resources, strategies, and assistance with and among program participants and program graduates, as well as mentors.

A second assessment of the impacts of the MAT program was provided by hiring principals, principals who had hired Cohort 6 program graduates. While the self-assessments provided by the beginning teachers are informative, assessments of the new teachers by their supervisors, supervisors who conduct classroom observations and are

required to conduct an annual evaluation of the new teachers, is particularly important. Consequently, the principals who hired and supervised the new MAT beginning teachers were surveyed about how well prepared the MAT teachers were as beginning teachers. Nine (9) principals completed the survey, for a return rate of 60%, a percentage similar to last year.

Principals were asked to assess the preparation of the MAT teachers by rating their overall satisfaction level with the MAT beginning teachers they had hired to teach in their schools. The principals could choose a satisfaction rating along a 6-point continuum: (1) Very Dissatisfied; (2) Dissatisfied; (3) Somewhat Dissatisfied; (4) Somewhat Satisfied; (5) Satisfied; or (6) Very Satisfied. In terms of the overall assessments provided by the principals, all 100% of the hiring principals rated their satisfaction with MAT teachers to be “Satisfied” or “Very Satisfied”, an increase of 20% from the previous year.

Principals were also asked to provide their assessments in the same eight areas of preparation as were asked about with the MAT teacher graduates: (1) science content knowledge; (2) student needs; (3) instructional planning; (4) learning environment; (5) instructional strategies; (6) safety; (7) school and community relations; and (8) professionalism. In this case, and as a reference point, principals were asked to provide their assessments of the MAT graduates they had hired *“compared to graduates they have hired from other teacher preparation programs”*.

Table 7 on the next page reports the principals’ assessments for each of the eight preparation areas, and comparative results from principals’ assessment of Cohort 5 graduates. As in the case of the MAT beginning teachers’ self-assessments, the numbers in the table are the Grand Means of the individual items under each area on the survey. The averages could range from 1-4 (1=poorly prepared; 2=adequately prepared; 3=well prepared; or 4=very well prepared) with higher scores indicating assessments by the principals of better preparation of MAT graduates compared to other graduates.

Table 7: Principal’s Assessment of MAT Graduates (N= 9)

Area	Cohort 5	Cohort 6
1. Science content knowledge	3.41	3.56
2. Student needs	2.70	3.08
3. Instructional planning	3.27	3.18
4. Learning environment	2.45	2.92
5. Instructional strategies	3.00	2.85
6. Safety	3.48	3.59
7. School & community relations	2.79	3.33
8. Professionalism	3.35	3.39

As may be seen in Table 7, six of the averages were above 3.00 indicating that the principals felt that the MAT teachers were Well Prepared in these areas. The averages for the other two areas were 2.85+, indicating the principals felt the beginning teachers were more than adequately well prepared. And the ratings were markedly higher in three areas: (1) student needs; (2) learning environment; and (3) school and community relations.

Thus, the overall evidence indicates that the hiring principals are very pleased with the MAT beginning teachers they have hired. This is an important indicator of the success of the program. But while it is important to find that the program was successful in the eyes of the hiring principals in preparing first year teachers, the fundamental goal of the AMNH RGGGS MAT program has been to effectively prepare beginning teachers so that they may effectively help students in high need schools learn more Earth Science and to learn it in better ways.

Over the years, the AMNH RGGGS MAT program has examined the impacts on students by tracking the impacts of the teachers on their students’ academic performance through the lens of student performance on a standardized test, the New York Regents examination in Earth Science. More specifically, the program has contracted with researchers at the New York University Institute for Education and Social Policy to conduct a multi-year study designed to provide an answer to the following research question: *How do students taught by MAT graduates during their initial years of teaching perform on the*

Earth Science Regents exam as compared to students taught by first and second year teachers who were trained in other programs?

There is substantial research that indicates that most teachers in their early years of teaching have a difficult time demonstrating positive impacts on student performance on standardized tests. Research also shows that teacher effects many times only occur with 3-5 years of teaching experience. And while these research studies have been conducted in a variety of schools, few, if any, have been conducted in high need, low performing schools like those the MAT teachers have committed to work in for at least four years. Consequently, while difficult, obtaining an answer to the research question has been very important in assessing the impacts of the MAT program.

The research evidence analyzed by the New York University researcher has clearly shown that the AMNH RGGG MAT goal of addressing the shortage of Earth Science teachers in high need urban schools in New York is being met. The analyses have found that over 90% of the MAT teachers are working in these types of schools. Furthermore, the analyses have revealed that the MAT teachers are teaching the higher need students within these high need schools. This is a very important finding, and one that bodes well for the longer-term impacts of the MAT program.

In terms of student academic performance, the results indicate that students of MAT graduates are doing as well as, or better than, students not taught by MAT graduates, including those taught by teachers who have more years of teaching experience. To paraphrase from the summary of the June 2020 New York University Institute for Education and Social Policy report entitled AMNH Master of Arts in Teaching Earth Science: Analysis of Cohorts 1-6:

MAT teachers continue to teach in high needs schools. Similar to previous years, MAT teachers continue to teach in schools with higher percentages of students who are economically disadvantaged, Latinx, or English language learners (ELL) and lower percentages of students who are Asian or white compared to schools citywide.

Students of MAT teachers are more likely to take the Earth Science Regents than students of other teachers. We find that a larger share of students of MAT teachers continue to take the Earth Science Regents each year, compared to students taught by comparison group teachers. In 2018-19, the share of students of MAT graduates who took the Earth Science Regents was 0.59 to 0.53 of student of similar teachers. The share of

MAT students taking the exam increased by 20% between 2017-18 and 2018-19.

The results continue to show no statistically significant difference in performance between students of MAT and non-MAT teachers. Overall, there is no statistically significant difference between students of MAT teachers and non-MAT teachers on performance on the Earth Science Regents.

Results from the matched student sample show a decline in performance for MAT students. In 2019, teachers of the PSM matched comparison students have an average of 8.7 years of experience, compared to an average of 5.6 years for MAT teachers. While MAT students score 0.04sd lower than their matched counterparts, this is not statistically significant.

Thus, the results from this analysis of the impacts of the MAT teachers' on their high school students indicate that even though the MAT teachers are teaching more disadvantaged students, more of their students are taking the Earth Science Regents examination, and scoring as well as students who are less disadvantaged.

One final area that was explored in 2019-20 in terms of program impacts was the impacts of the program on the mentors and their classrooms. Mentors were asked specifically about impacts on different program components (e.g., working with the Sr. specialists, Mentor Academy activities, the monthly mentor meetings, etc.). The mentors were asked about the impact of the program on their own practice and on their schools. Twenty-two (22) mentors completed and submitted the survey, and this evidence appears in Table 8 on the next page.

Several positive impacts are apparent from the evidence in Table 8, but mentor responses to three specific key survey items are particularly noteworthy. Approximately 85% of the mentors indicated they had thought that their students had benefited academically from having the MAT teacher residents in their classroom. Furthermore, all 100% of the mentors reported they had changed some of their own classroom practices as a result of participating in the MAT program, a substantial increase from 2018-19. Additionally, over 85% indicated that they have seen positive changes in their school as a result of their involvement in the MAT program. Thus, the evidence reveals that the program was not only impactful on the preparation of beginning teachers, but that it also has had significant impacts on the partnership schools.

Table 8: Impacts on Mentors and Their Classrooms (N=22)

	Strongly disagree	Disagree	Slightly disagree	Neutral (neither agree nor disagree)	Slightly agree	Agree	Strongly agree	Not applicable
My students benefited academically from having the Candidate(s) in my classroom.	0.0%	0.0%	0.0%	14.3%	0.0%	28.6%	57.1%	0.0%
Student behavior was improved by having the Candidate(s) in my classroom.	0.0%	0.0%	0.0%	28.6%	35.7%	0.0%	35.7%	0.0%
Co-teaching with the AMNH Candidate(s) was a positive experience overall.	0.0%	0.0%	0.0%	14.3%	0.0%	21.4%	64.3%	0.0%
The Senior Specialist at our school is knowledgeable.	0.0%	0.0%	0.0%	0.0%	0.0%	14.3%	85.7%	0.0%
The Senior Specialist is helpful when I have questions about the program.	0.0%	0.0%	0.0%	0.0%	0.0%	14.3%	85.7%	0.0%
Monthly mentor teacher meetings with the Senior Specialist are helpful.	0.0%	0.0%	7.1%	7.1%	21.4%	42.9%	21.4%	0.0%
(*) The mentor Notes from the Field sessions in the Mentor Academy were helpful.	0.0%	0.0%	0.0%	7.1%	21.4%	42.9%	21.4%	7.1%
The Mentor Academy activities related to diversity, equity, and inclusion were helpful in my mentoring.	0.0%	0.0%	0.0%	7.1%	7.1%	35.7%	42.9%	7.1%
I have taken my class(es) on field trips to AMNH in addition to the Fall course requirement.	7.1%	0.0%	0.0%	21.4%	0.0%	14.3%	35.7%	21.4%
The connection to AMNH has brought helpful resources to my classroom.	0.0%	0.0%	0.0%	0.0%	0.0%	28.6%	71.4%	0.0%
I have changed some of my own classroom practices as a result of my involvement in the MAT program.	0.0%	0.0%	0.0%	0.0%	0.0%	42.9%	57.1%	0.0%
I have seen positive changes in my school as a result of involvement in the MAT program.	0.0%	0.0%	0.0%	7.1%	7.1%	14.3%	64.3%	7.1%

Summary Evaluation Assessment

To summarize the evidence from the external evaluation of the AMNH RGGs MAT program, the evidence collected clearly indicates that the innovative AMNH RGGs MAT residency program is continuing to be successful in preparing beginning Earth Science teachers to teach in high need schools, and it continues to have positive impacts on middle and high students in these schools and on mentors in partnership schools. The evidence from the course evaluations supports the claim that the MAT residents are receiving good instruction and the knowledge, skills and practice to become well prepared beginning

teachers. This claim is further supported by hiring principals who rate the MAT graduates as being very well prepared for their first teaching assignment.

There is also strong evidence that the MAT teachers who have graduated from the program are having positive impacts on the learning of their high school students. MAT teachers continue to teach more high need students in high need schools, and their students are taking Earth Science courses and the Earth Science Regents examination. Further, students of MAT teachers continue to perform on the Earth Science Regents as well as students of other teachers with similar experience and certification.

Additionally, the evaluation evidence indicates that the MAT program, and its structure and processes are having positive impacts on the teacher partnership schools and their teachers. Mentors report that working with the MAT residents has improved their classroom instruction and had positive impacts on their students' academic learning.

In conclusion, this external evaluator believes the program continues to be very successful in preparing beginning Earth Science teachers, and in improving the high need schools working with the program. The evidence clearly indicates that the AMNH RGGGS MAT program is a strong program. At the same time, the external evaluators have offered a series of recommendations that we believe may lead to further enhancements of the preparation program and thereby contribute to greater success for high need students in high need schools.

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