



2020-2021

MfA REFLECTIONS

FOREWORD

Like many organizations, MfA faced major challenges during the past two years. We began the return to normal in fall 2021, only to be forced to adjust when the pandemic flared late in the year. Nonetheless, we kept the MfA program running smoothly, often in innovative ways. We learned a lot from our experience. MfA will be better for it.

At the end of 2021, MfA is a little smaller, although it will soon reach its pre-pandemic size again. We gauge success, however, not by program size but by things that are harder to measure, like the impact on teachers and schools and our reach beyond the fellows themselves.

For the past five years, we have published these brief reports — MfA Reflections — as commentary about those hard-to-measure aspects of MfA. That commentary reflects the fundamental goals of MfA:

- To foster professional growth for our teachers
- To provide opportunities for leadership, expanding MfA's reach
- To keep the most accomplished math and science teachers in the classroom
- To change the teaching profession itself, making it more rewarding and exciting

Over time, we hope the collection of annual reflections will provide a portrait of our teachers, their accomplishments, and their communities.

John Ewing
December 2021

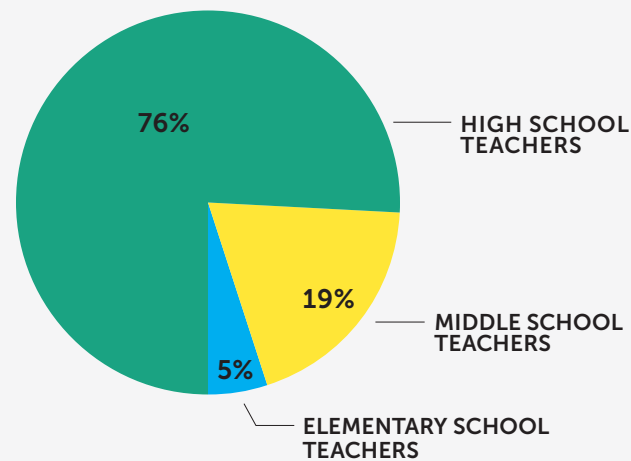


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THE MfA COMMUNITY

GRADE LEVELS



64%

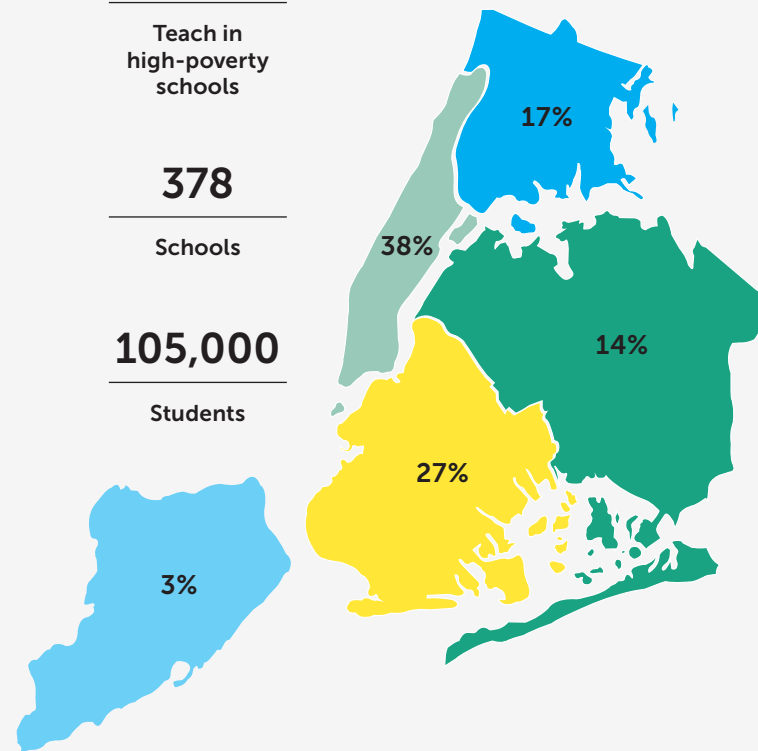
Teach in high-poverty schools

378

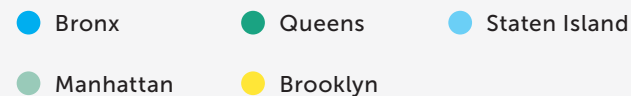
Schools

105,000

Students

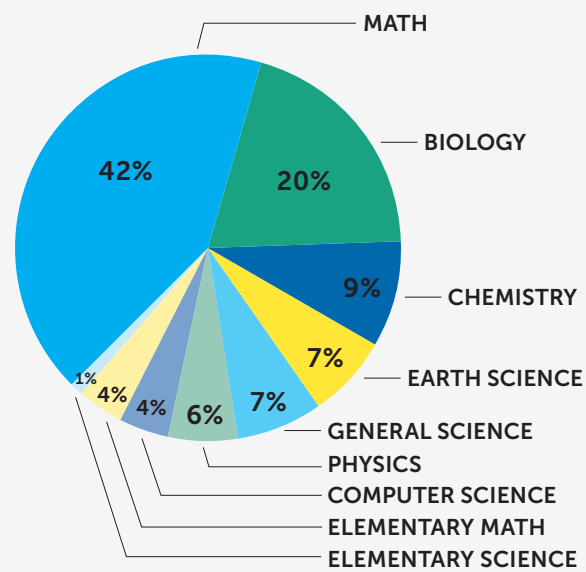


TEACHERS



Data as of October 2020

SUBJECT AREAS



TEACHER LEARNING AT MfA

A Year of Online Learning

In the 2020-21 school year, all of MfA's workshops were held online. Despite the challenges teachers in New York City faced beginning a new school year with remote instruction, attendance at MfA's online workshops in the fall semester of 2020 was 20% higher than the fall semester of 2019. In fall 2020, MfA hosted over 500 online professional development workshops, more than any other semester. Throughout the 2020-21 school year, MfA teachers continued to turn to their peers in the MfA community to collaborate and support each other across distances and differences in order to provide excellent STEM instruction to students in New York City. MfA adapted the content and structure of professional development to meet teachers' needs, innovating on our fellowship model in ways that furthered both our mission and reach.

EXPANDING THE MfA NETWORK

Hosting professional development online allowed MfA to increase capacity at workshops to include more teachers. For the first time, as part of a new recruitment initiative, MfA invited prospective applicants to participate in workshops alongside current MfA teachers. MfA introduced a new webinar series, [Wednesday Webinars](#), open to MfA teachers in New York City as well as Master Teachers from affiliated fellowship programs in other cities.

MfA also opened enrollment in the [Thursday Think](#) speaker series to teachers from the New York State Master Teacher Program. Additionally, each year, MfA runs an Emeritus fellowship for former Master Teachers to stay engaged with the MfA community. Enrollment in the Emeritus fellowship grew by 41%, from 89 teachers in 2019-20 to 126 teachers in 2020-21, and on average, Emeritus fellows participated in more professional development online than was typical when all workshops were held in person (an average of six online courses, compared to an average of three in-person courses the year prior). About 25% of Emeritus fellows teach in schools outside of New York City.

PARTNERSHIPS WITH MATHEMATICIANS AND SCIENTISTS BEYOND NEW YORK CITY

In the 2020-21 school year, MfA was able to invite more facilitators who live outside of New York City to lead online workshops for MfA teachers. Many of these opportunities for MfA teachers to connect with mathematicians, scientists, and education experts across the United States and internationally would not have been possible in person, given distance. For example, in the spring of 2021, Damian Pope, Ph.D., from the Perimeter Institute for Theoretical Physics in Canada, led a workshop introducing MfA teachers to *The Mystery of Dark Matter* curriculum. Also in the spring, Zarin Machanda, Ph.D., assistant professor of anthropology and biology at Tufts University in Boston, led a three-session workshop "Chimpanzee Behavior: A Quest for Quantification" presenting her research and discussing ways to bring scientists into the classroom. Through Budapest Semesters in Mathematics Education, a group of MfA teachers explored math pedagogy alongside public school teachers in Hungary in the online workshop "A Hungarian Approach: Teaching Mathematics Through Guided Discovery."

109

EARLY CAREER TEACHERS

823

MASTER TEACHERS

126

MASTER TEACHERS EMERITUS

1,058

TOTAL TEACHERS

The Science of Remote Learning

The transition to remote learning created a variety of instructional challenges. It also offered a host of new learning opportunities, which raised the question: How can psychology and neuroscience research inform the way teachers navigate their virtual, face-to-face, and hybrid classrooms? In the virtual MfA mini-course, “The Science of (Remote) Learning,” MfA teachers examined various aspects of learning to help their students, and one another, make breakthroughs in the virtual classroom. During the three-session course, led on Zoom by Dr. Ido Davidesco, assistant professor of learning sciences at the University of Connecticut, MfA teachers put on their student hats as they studied existing science on the cognitive, emotional, and social characteristics of learning. Together, the group gathered conclusions on how active memory retrieval supports learning, the impact of stress and social isolation on students, and how to establish effective group work in virtual environments.



“This course proves that even during remote learning, perhaps more so, group work is critical to making a human connection, which, in turn, is critical to engagement and actual learning,” said MfA Master Teacher Huan Wang, who participated in the course. “It was a breath of fresh air to hear the common struggles fellow teachers have been facing and the uncommon solutions each of us have tried.”

Communicating Across Differences

In the summer of 2021, MfA Chief Operating Officer Michael Driskill wrote a [blog post](#) about the Teaching for Robust Understanding (TRU) framework that MfA uses to foster a shared vision and language for high-quality instruction among teachers in our fellowship program:

At MfA, we believe that the best way to improve education is to get expert teachers together. We think that when teachers share good ideas with one another both they and their students benefit. But sharing good ideas about teaching is harder than it sounds. Teachers - especially in New York City - have to communicate across many differences.

Seeking to understand the dimensions of teaching that are necessary and sufficient for students to emerge as “knowledgeable, resourceful, flexible thinkers and problem-solvers,” researchers at the University of California Berkeley developed a framework called [Teaching for Robust Understanding \(TRU\)](#). The value of TRU is that it provides a common language to sharpen

our conversations about teaching, especially when we communicate across differences.

At MfA, we’ve been using TRU with small groups of teachers over the past few years, and it’s been very popular. It’s a good fit for the teachers in our fellowship since it provides an accessible language that supports conversations about teaching, without telling them how to teach. It was developed to support collegial investigations of teaching, and not to evaluate teachers. We’ve decided to adopt TRU as the common language for our entire fellowship program.

It takes time to learn any new language, and incorporating TRU into our work at MfA is a long-term goal. Alan Schoenfeld, the primary author of TRU, often says that in a sense, it’s “nothing new.” MfA agrees: expert teachers have always known what we should talk about when we talk about teaching. But when we talk about the same things in different ways, we can miss important opportunities to learn from one another. Incorporating TRU will simply enhance the ability of the expert teachers at MfA to spread good ideas about teaching in New York City and beyond.

Equity at MfA

In the 2020-21 school year, MfA’s Equity Advisory Committee (EAC) was expanded to include 13 teachers and five staff members, and met six times throughout the year to set goals for equity and inclusion at MfA, review internal data related to these goals, and advise MfA on improving existing practices and developing new initiatives. MfA’s equity goals are inspired by the [New York State Culturally Responsive-Sustaining Education Framework](#):

AT MfA, WE AIM TO FOSTER A TEACHER-CENTERED LEARNING ENVIRONMENT BY:

- Attracting and affirming multiple expressions and types of diversity, including but not limited to: race, gender, family structure, age, ability, religion, sexual orientation, class, school type, culture, geography, years of teaching experience, and political beliefs
- Developing teachers’ abilities to connect across differences
- Empowering teachers as agents of positive systemic change to serve all New York City students
- Supporting teachers’ engagement, learning, growth, and empowerment

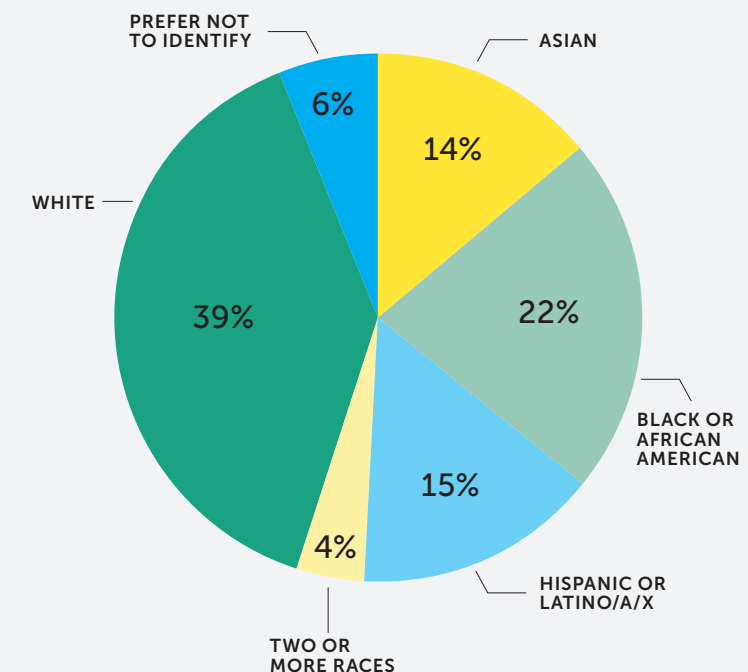
The EAC worked in four subcommittees: 1) Norms, Practices, and Policies; 2) Leadership, Courses, and Professional Development; 3) Data, Measurement, and Outcomes; and 4) Recruitment, Initiatives, and Screening. MfA teachers selected which team they wanted to be a part of based on their own interests and areas of expertise. Discussing the work of the Leadership, Courses, and Professional Development subcommittee, Uzma Shah, Program Officer for Professional Development at MfA, said: “...[we] develop[ed] ideas on how to diversify MfA’s teacher facilitators to include more BIPOC teachers and teachers from high-poverty schools. This has been an ongoing MfA goal for several years and the EAC was able to offer fresh perspectives.”

“The change in our work from last year to this year was meaningful because it shifted perspective from looking within the MfA community to considering the impact MfA teachers have on our students,” said Arah Lewis, who was part of the EAC Data, Measurement, and Outcomes subcommittee, which designed survey questions to gauge the extent to which MfA teachers work toward an equitable classroom.

2020-21 SCHOOL YEAR HIGHLIGHTS:

- 18% of MfA teachers who facilitated courses in the 2020-21 school year were Black or Hispanic, compared to 13% in 2019-20
- 70% of MfA teachers attended a credit-bearing professional development course related to equity and inclusion in the 2020-21 school year
- 800 MfA teachers said their professional learning experiences at MfA strengthened their implementation of culturally responsive-sustaining education practices at their schools
- The 2021 MfA Master Teacher cohort is the most diverse in MfA history, with teachers of color representing over 50% of the cohort

2021 MASTER TEACHER COHORT



SCHOOL IMPACT

Opening Students' Eyes to Careers in STEM

As an MfA Master Teacher of biology and earth science at Brooklyn's All City Leadership Secondary School, Benjamin Rivera encourages students to look toward their futures. His goal is not only to get them to fall in love with science, but to introduce them to exciting career opportunities they might not have considered. "When students think of a career in STEM, they think of becoming a doctor. But there's so much more," Rivera says. "I wanted to open up their minds and show them that there are so many different options — geneticist, neurosurgeon, astrophysicist — that can lead to huge contributions in society."

After taking the MfA mini-course "Frankenfoods: The Genetic Modification of our Food Supply," Rivera created a unit project in which students tested food from local grocery stores for genetically modified organisms (GMOs). They discussed the potential impact of those foods on their health, as well as the roles race and economic class play in food supply.



Taking part in a wide array of MfA courses has given Rivera the opportunity to learn from and collaborate with experienced teachers and experts in different scientific fields. He credits this experience with expanding his own knowledge, as well as his ability to get through to his students.

Over 300 MfA teachers observed an increase in students' interest in pursuing STEM in college or careers as a direct result of incorporating new resources or strategies learned at MfA into their teaching.

— MfA ANNUAL SURVEY, SPRING 2020

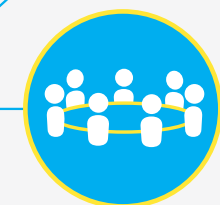
Outstanding teachers join a professional community where they explore cutting-edge content, innovative teaching practices, and research-based professional development models



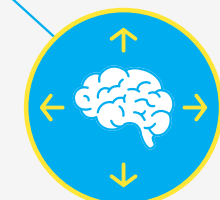
Teachers bring what they learn back to their classrooms and schools



Improved teacher retention



Better teaching and professional development in schools



Increased student learning

"I'm able to deliver information about scientific concepts more accurately and confidently to my students, and this encourages them to investigate more deeply."

Rivera does his best to connect the work students do in class to what professional scientists might do in the field. For a unit on gel electrophoresis, the lab technique used to separate DNA molecules by size, he talked about the field of forensic science. A unit on the Earth's dynamic crust included a discussion of volcanology and glaciology, among other related fields. As part of the ongoing Billion Oyster Project, Rivera's students take charge of an oyster cage located in New York Harbor in the Dumbo area of Brooklyn. "They study the structure and function of the oyster, and how it reproduces. They're actually out in the field, and they're the ones who are recording and taking all this data and bringing it back to the classroom to have richer discussions. When we measure the pH level or visibility of the water, I remind them that's what a hydrologist does."

Above all, Rivera encourages students to look for a personal reason to connect with the science they study in class, knowing this will make it hit home in a way it couldn't otherwise. His efforts have paid off, as Rivera has seen many of his students go on to major in biology, biotechnology, and other scientific fields in college. One former student, now in his first year of college, told Rivera that he had been inspired by a conversation in earth science class about the origins of the universe, and was now majoring in astrophysics. Another former student, a recent college grad, had planned to be a nurse, but is now working in the field of genetics.

"I knew real changes were occurring when I began to see more of my seniors looking to pursue a career in science," Rivera says. "Many students gave credit to their science classroom experience as having persuaded them to choose their college major and wanting to be a positive contributor to society."

Over 500 MfA teachers created new partnerships between their schools and other organizations as a result of ideas, resources, and relationships from MfA.

— MfA ANNUAL SURVEY, SPRING 2021

Girl Power

MfA Master Teacher Ramona Fittipaldi loved math and science growing up, but boys dominated the few STEM activities, courses, or clubs available to her. She eventually attended an all-girls high school, but opportunities were few and far between. After graduating college with a degree in mathematics, where classes were still overwhelmingly male, she was thrilled to begin teaching mathematics at the Young Women's Leadership School in East Harlem. "I wanted to make sure I provided an opportunity to my students that wasn't always given to me and mimic teachers that motivated me to succeed. Giving young women choices in their learning is so important because a lot of the time they're told they can't, or they shouldn't, or they won't."

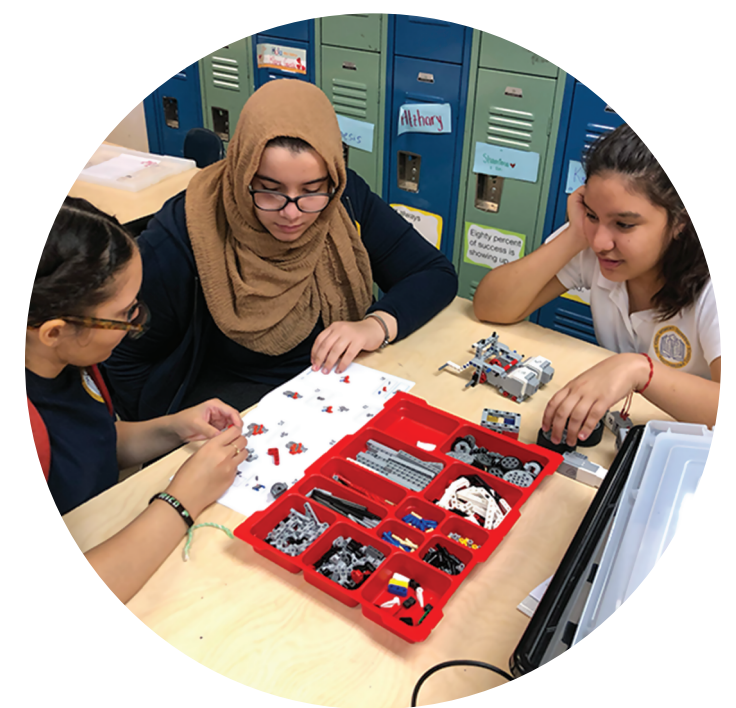
Fittipaldi felt that her school needed technology-focused, hands-on offerings for her students. To get ideas she participated in MfA professional development workshops where she learned how to create a robotics program. She discovered different approaches used by other teachers across New York City in a variety of grade levels and contexts, including Arduinos, TETRIS, and FIRST Competition robots.

Her MfA colleagues connected her with Borough of Manhattan Community College (BMCC) Professor Mohammad Azhar, who organizes and teaches training and research workshops for Educational Robotics programs. The Hispanic Serving Institute Digital Pathway Project for High School Robotics further informed Fittipaldi about how to start a robotics program at her school and even provided funding for the robots. At that point she was ready to launch a new elective at her school: Introduction to Basic Engineering with Robotics.

The elective was a big success. Students worked with LEGO MINDSTORMS Education EV3 software to create LEGO robots. Fittipaldi's students learned core concepts for design, technology, and engineering while engaging in exciting, hands-on activities such as programming a robot to complete an obstacle course.

When the COVID-19 pandemic hit New York City, Fittipaldi's school stopped all electives in an effort to lighten students' course loads during remote learning. But her students requested that robotics continue. Through additional resources and guidance provided by her MfA teacher peers and programs at BMCC, she launched a virtual after-school robotics club. In it, students use software like Calypso, a website that allows users to digitally program robots and create virtual worlds for them. "I have girls that come up to me frequently asking 'can we still join the robotics club?'" Fittipaldi said. "My answer is always 'yes, of course.' Just getting that level of interest and buy-in is a win for young women in STEM. We need to steer girls into math and science fields so they, too, can change the world."

"Nothing says girl power like powering a robot. This kind of work allows my students' abilities to flourish and it pushes them to understand that they too can be scientists and mathematicians," said Fittipaldi. "It's not only fun and exciting, but it increases their confidence and passion for STEM. That's crucial with so few female role models in the field."





93%

of MfA teachers have incorporated ideas from MfA into PD at their schools

86%

of MfA teachers have led PD at their schools

89%

of MfA teachers have modeled instruction for other teachers at their schools

MfA ANNUAL SURVEY, SPRING 2021

Teacher Retention

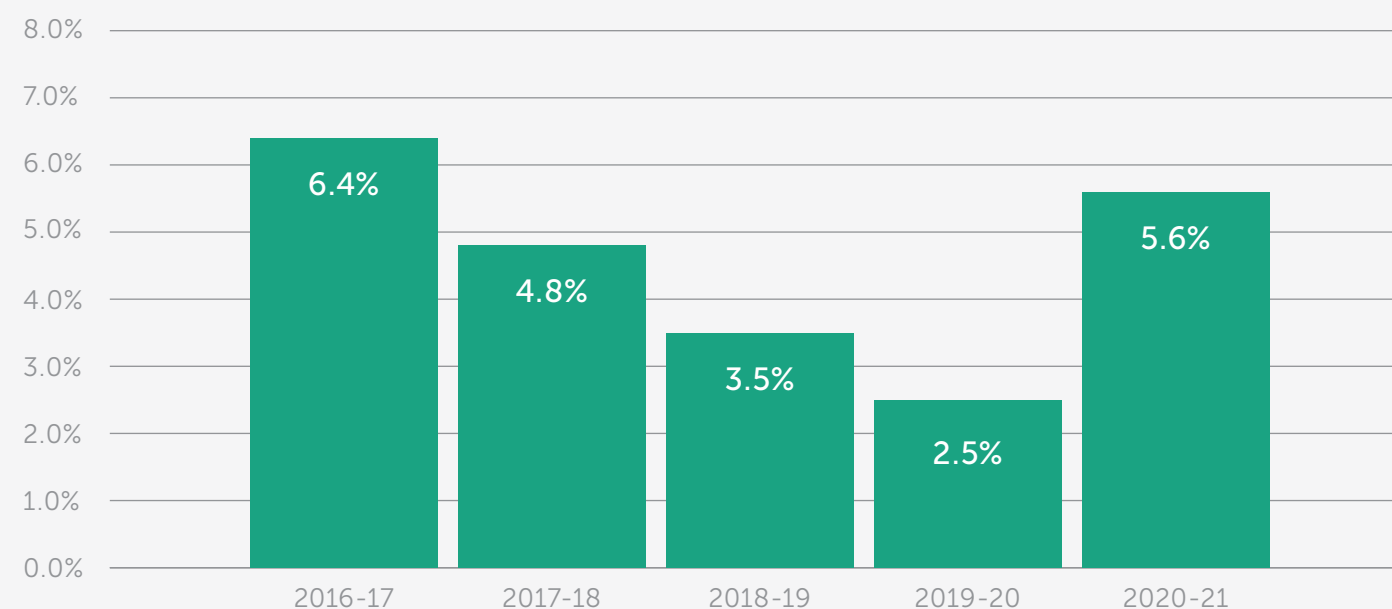
2020-21 was an unusual and especially difficult year for teachers due to the COVID-19 pandemic. During and after the 2020-21 school year, 5.6 percent of MfA teachers withdrew prior to completing their fellowships. While this is a higher fellowship attrition rate than in recent years for MfA, it is unclear how this compares to the overall attrition rate of teachers in New York City. Over a quarter of MfA teachers who withdrew from their fellowship did so because they moved out of New York City to teach in other school districts or states. In a survey of 894 MfA teachers in spring 2021, more than half said that their fellowship factored into their decision to stay in the classroom in the 2020-21 school year; 18% said it was a major factor.

MfA ANNUAL SURVEY, SPRING 2021 - TEACHER QUOTES

“Given the difficulty of this year, I know many teachers who feel burnt out and are leaving the classroom. This year has been one of my toughest years of teaching... having the MfA fellowship to support me has been a major influence in my decision to continue teaching.”

“I am thankful for Math for America providing stability and community during such trying and uncertain times. Teaching during the pandemic, I continued to feel valued through the MfA community and had ample opportunities to connect with other teachers virtually.”

FELLOWSHIP ATTRITION



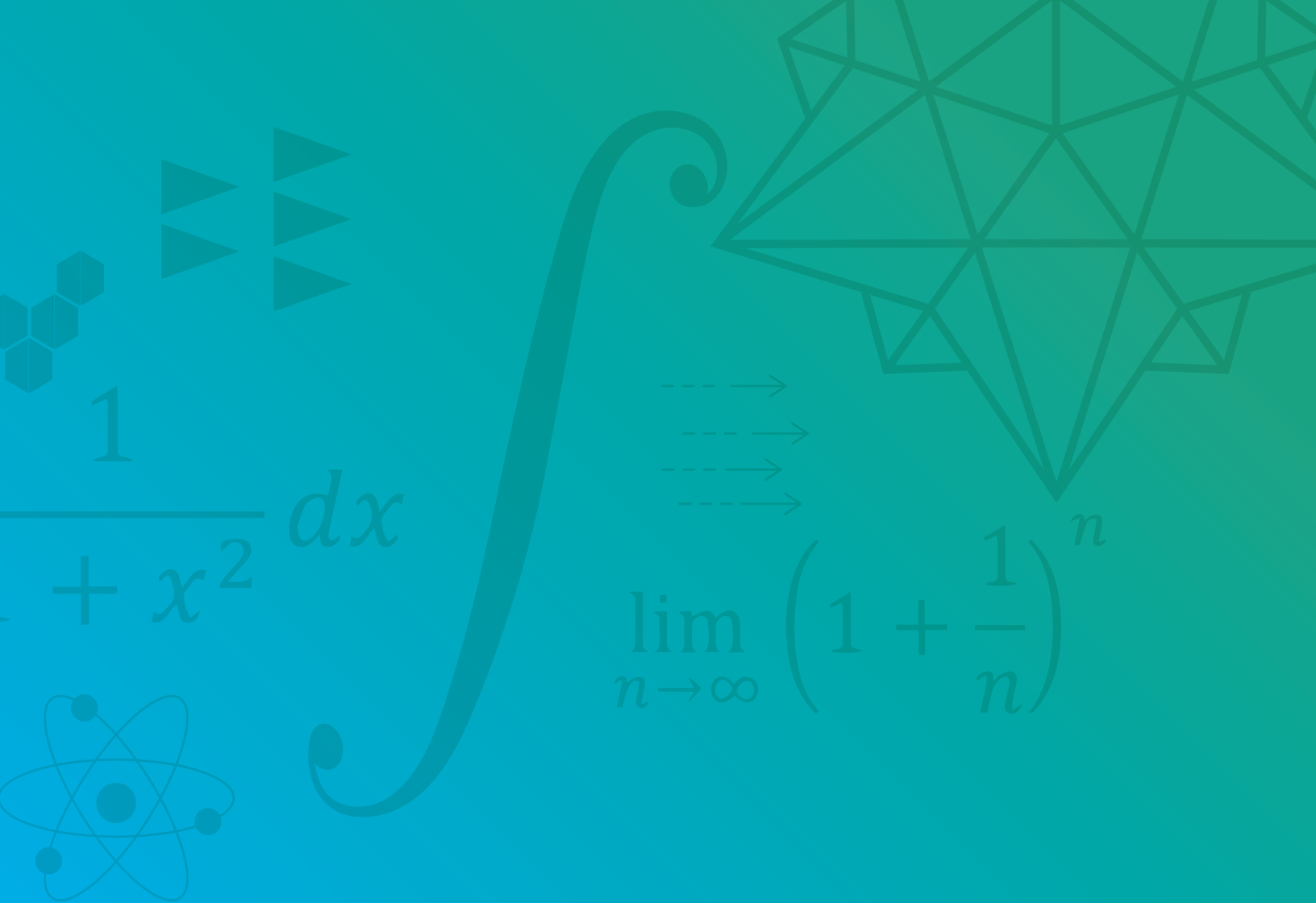
OUR MISSION

Building a community of accomplished mathematics and science teachers who make a lasting impact in their schools, their communities, and the profession at large through collaboration and continued learning.

ABOUT MfA

At MfA, we've created fellowships for accomplished mathematics and science teachers. Our model is based on the belief that collaboration, continued learning, and genuine respect enables teachers to grow professionally and provides long-term career satisfaction. This is a remarkable community of teachers who stay in the profession longer and define what teaching excellence means. These are teachers who inspire and motivate their colleagues. They change the lives of their students. Learn more at [MathForAmerica.org](https://www.mathforamerica.org).





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$$\lim_{n \rightarrow \infty} \left(1 + \frac{1}{n}\right)^n$$

MfA $4 \sum_{k=1}^n \frac{(-1)^{k-1}}{2k-1}$
For master teachers
of math and science