

MfA Reflections

2018-2019

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

The MfA Community

Early Career Teachers

144

Master Teachers I

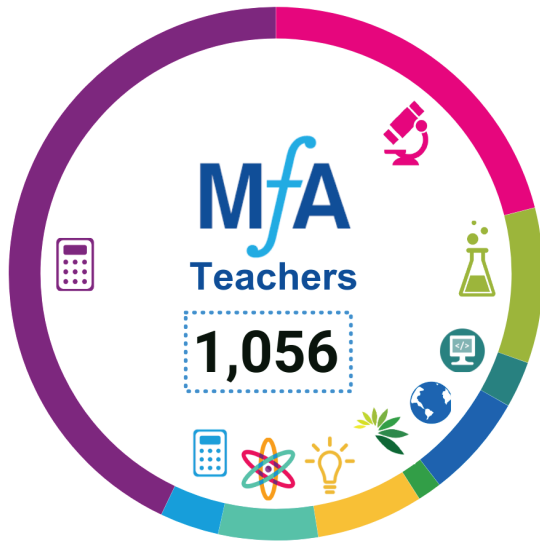
549

Master Teachers II+

290

Master Teachers Emeritus

73



	Biology.....	210
	Chemistry.....	102
	Computer Science.....	32
	Earth Science.....	69
	Elementary Science....	17
	General Science.....	71
	Physics.....	67
	Elementary Math.....	29
	Math.....	459

Schools

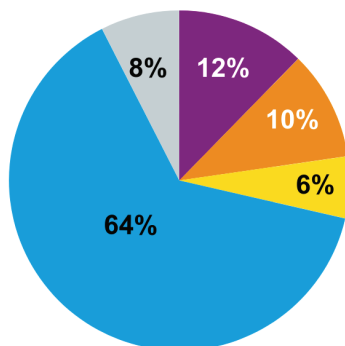
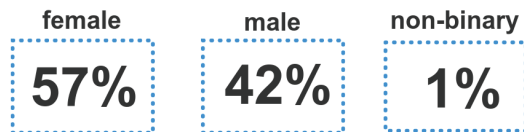
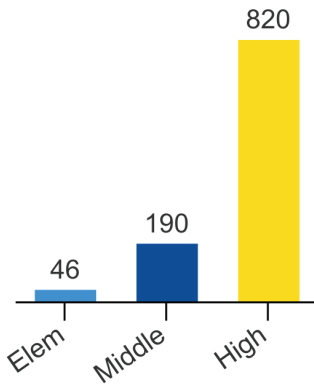
389

70%

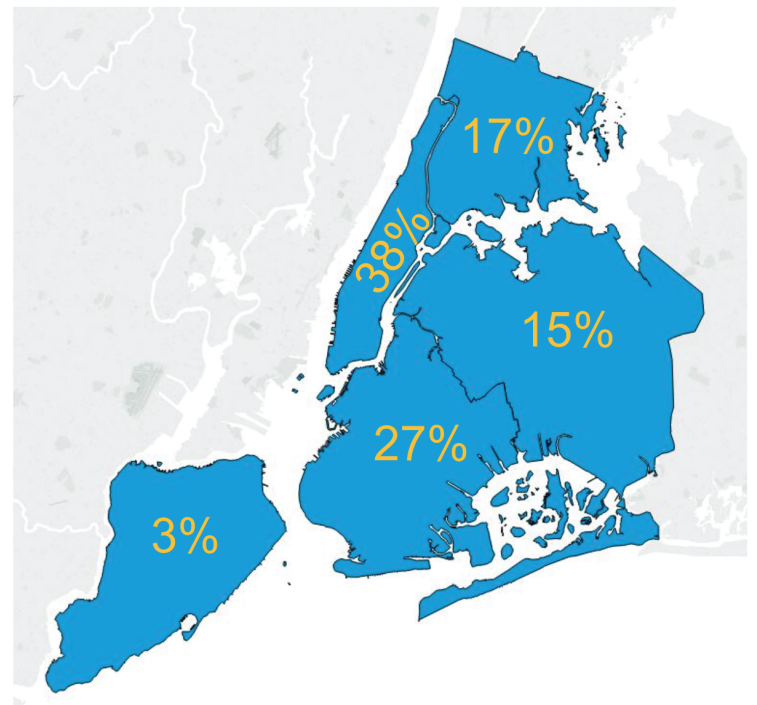
teach in high-poverty schools

6%

teach in charter schools



● Asian ● Black ● Hispanic ● White ● Other



October 1, 2018

Foreword

For the past four years, MfA has stabilized in size at about a thousand New York City mathematics and science teachers. Going forward, we hope to measure success not by the size of our program but rather by things that are harder to measure, such as efficacy and impact. We want not only to improve the program but also to extend its reach beyond the MfA teachers themselves. This collection of annual reports documents our progress in this endeavor.

These reports are organized into five key areas:


- Teacher-to-teacher Learning and Leading
- Teacher Efficacy
- Teacher Retention
- School Impact
- Spotlight on Special Activities

The organization reflects the goals of MfA:

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

Over time, these MfA Reflections will provide a portrait of our teachers, their accomplishments, and their communities. Teachers are the heart of MfA, and we can understand MfA best by understanding our teachers.

John Ewing, 2019



John Ewing, President
Michael Driskill, Chief Operating Officer
Sarah Rooney, Director of Communications and Marketing
Jennifer Hanrahan, Director of Program Evaluation
Tsamchoe Dolma, Research Associate

I. Teacher-to-Teacher Learning & Leadership

Teachers in the United States don't often get to collaborate in deep and sustained ways. Professional isolation in teaching stifles innovation and prevents new practices from spreading throughout the field. It makes the profession less attractive and leads to shortages of new teachers and attrition among experienced teachers.

MfA has a solution to this serious problem. We create a network of outstanding teachers from schools throughout New York City. We give them the space and time they need to build relationships and share ideas in an atmosphere of professional respect and

trust. In the MfA network, teachers form professional learning communities that innovate teaching from the ground up. They explore new ideas, try them in their classrooms, and share them with colleagues, ultimately benefiting students in NYC and beyond.

This report summarizes what we are finding about the value of the teacher-to-teacher learning and leadership made possible by the MfA network. Our hope is that it will inspire policymakers nationwide to take a similar approach to improving teaching by providing teachers the trust and respect they deserve.

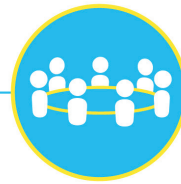
Outstanding teachers join a professional community where they explore cutting-edge content, innovative teaching practices, and research-based professional development models



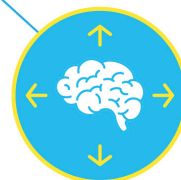
Teachers bring what they learn back to their classrooms and schools



Improved teacher retention



Better teaching and professional development in schools



Increased student learning

During the 2018-19 school year, MfA hosted over 800 professional development workshops for the 1,000+ teachers in our fellowship community. MfA teachers themselves designed and led 83 percent of these workshops; 17 percent were led by outside experts in science, mathematics, and K-12 education. The majority of these workshops were

discipline-focused, with 31 percent of workshops centered around mathematics content, 29 percent of workshops centered around science content, and 7 percent focused on computer science. The remaining workshops, 33 percent, were pedagogy-focused, designed for teachers seeking to innovate on their methods for delivering content knowledge to students.



Between December 2018 and March 2019, we held several focus groups with *MfA* Master Teachers to collect feedback about which aspects of the *MfA* fellowship had been most influential to their professional lives as educators. A consistent theme that emerged was the value of the professional networks and community of peers accessed through *MfA*.

Teachers referred to the *MfA* community as a source of energy, inspiration, and motivation that counteracts burnout and encourages them to stay in the teaching profession. One teacher who had previous teaching experience as a university professor likened the intellectual collaboration and peer environment at *MfA* to that of academic life. One teacher used the phrase “*MfA* re-energizes me” in describing how she feels leaving *MfA* workshops in the evening and getting ready for the next day of teaching. Another teacher said that after *MfA* workshops she felt “inspired to wake up the next day and teach with a passion.”

Several teachers talked about the value of having a professional and collegial environment outside of their schools, where they can talk with like-minded peers and engage in higher-level conversations about their work – it “keeps you fresh, you don’t get tired.” Drawing inspiration from peers, *MfA* teachers build creativity in delivering knowledge to their students, and many teachers credited their peers in the fellowship as a source of inspiration and motivation toward continued professional growth.

The relationships teachers build within the fellowship community create a support system for discussing and navigating professional challenges. One math teacher, who is the only teacher of her subject in a small school, felt isolated in her school and found limited opportunities for mentorship from her school colleagues, who all had instructional

experience in different subject areas. The *MfA* community gave her a sense of camaraderie with other math teachers; she pointed out that this support was especially critical when she was still in the early stages of her teaching career.

Teachers in our focus groups also highlighted the value of accessing an expanded professional network within and beyond the NYC education community. Many teachers spoke of the benefit of learning from other *MfA* teachers working in a variety of different school environments and contexts, as well as the benefit of building connections with academics and professionals in the math and science community. These relationships led to more opportunities for their students to engage in college and career-oriented STEM learning beyond the classroom.

Through collaboration with peers in the fellowship, teachers share their knowledge with one another and gain new ideas, skills, and resources to improve their craft. Teachers teach, learn from, and challenge each other at *MfA*, building connections within their content areas and across disciplines, ultimately strengthening their classroom instruction and increasing student engagement and achievement in math and science.

Workshop Spotlight: From Repeated Addition to the Quotient Rule: Multiplication and Division K-12

Many mathematics teachers wonder how and where their students learned about various aspects of multiplication and division. During our 2018 fall semester, math teachers from elementary through high school worked on discovering a better understanding of mathematical progression around multiplication and division in the “From Repeated Addition to the Quotient Rule: Multiplication and Division K to 12” course.

Considering some of the “newer” multiplication and division models that have become popular in lower grades and drawing connections to models explored in higher grades, MfA Master Teachers Scott Matthews and Crystal Thiele co-facilitated a deep dive into the standards around multiplication and division, looking for connections and common

threads throughout different grades with their MfA colleagues.

“When teachers specialize in one or two grades or subjects, it can be hard to see the big picture of what math is like for students over the many years they are in school,” said Crystal, who teaches elementary school. “This workshop offered the rare opportunity for teachers of all grade levels to work together to tailor instruction for their classrooms.” Both Scott and Crystal are excited to participate in continued opportunities at MfA where teachers collaborate across all grade levels. Scott adds, “That’s the core idea of MfA: teacher-created and teacher-inspired opportunities where we learn from each other.”





Workshop Spotlight: Get in the Flow with Groundwater Modeling

Groundwater can be a challenging concept for science students to understand, as they often think of underground streams, rivers, or lakes. MfA teachers found the best way to build their students' knowledge of groundwater flow is through visualization. In the MfA Professional Learning Team (PLT), "Get in the Flow of Groundwater Modeling," MfA teachers tested the functionality of four groundwater models and used them to create lesson plans and Next Generation Science Standards (NGSS) aligned curriculum.

Between sessions of the PLT, co-facilitated by MfA Master Teachers Marna Lehnert and Rabi Whitaker, teachers were able to borrow the models and pilot lessons in their own classrooms. "Teachers tested each model before operating them in their classrooms and created materials for students to better understand scientific terminology of various wells, and rock and soil layers," said Lehnert. By using the models, students can "learn more about groundwater pollution, porosity and permeability, and aquifers."

II. Teacher Efficacy

The MfA fellowship model creates value in two ways: the first is in enriching the professional lives of teachers within the fellowship community, increasing the prestige associated with teaching by enabling and rewarding already excellent teachers' continued commitment to professional growth. Second, MfA creates value that extends beyond the fellowship community by empowering MfA teachers to strengthen their impact on their students, their schools, the teaching profession, and ultimately district, state, and national education policies. But MfA's impact starts with an investment in teachers themselves.

Teachers in our focus groups emphasized that simply being recognized with a fellowship and stipend was impactful in their professional lives, citing the fellowship award as a source of increased confidence and commitment to the teaching profession. Several teachers referred to MfA fellowships as an "honor" and "recognition" for years of hard work in challenging school environments. Teachers are often told what they do wrong, and the fellowship award is a form of acknowledgement that teachers are worth investing in. Many teachers described getting accepted into MfA as a major professional accomplishment and a source of pride.

Teachers said that being selected for the fellowship served as a source of credibility in front of their school colleagues and administrators and noted the importance of having a stable source of external professional support, independent of the day-to-day challenges in their school environments and year-to-year shifts created by school administration and staff turnover.

Many teachers mentioned that at a certain point in one's teaching career, the path to advancement, gaining more respect, and being seen as an expert previously required getting an administrative license. Several teachers said that the fellowship had sustained them to stay in the classroom and find career and professional growth from within the classroom instead of becoming an assistant principal or principal or leaving K-12 education altogether. One teacher noted that being awarded the fellowship had changed the way her family talked about her career choice: instead of viewing her as "just a teacher for now," her family spoke with pride about her career as a teacher. Several teachers felt this recognition was particularly important for those with math and science backgrounds, where there is a sense of judgment and pressure from others that you are wasting your skills if you are "just" a teacher.



"I know I am a good teacher, I know I make a positive impact on my school, my students, and my community. Before this fellowship, I didn't have the confidence to voice these statements. MfA naming me as a Master Teacher gave me credibility among my colleagues and fights the doubtful voice in my head. Without the empowering experiences at MfA that help me know my worth, I know I would have left NYC or the teaching profession."

Teachers in our focus groups also identified the opportunity to facilitate professional development for other teachers at MfA (in particular, Professional Learning Teams) as a source of increased confidence in leading teacher learning in their own schools. For some teachers, this seemed to be a result of increased

self-confidence and a change in self-perception: prior to MfA, many teachers had not seen themselves as teacher leaders. For other teachers, it appeared to be a result of the value that their principals placed on the MfA fellowship. MfA teachers' leadership in their school communities is discussed further in section IV - School Impact.

"Now, I really think of myself as a teacher leader. MfA gives me a lot of confidence to step up and lead, try new things, work with my school colleagues, and bring resources back to my school community. It makes me feel like my impact is larger than the four walls of my classroom. I kept asking myself: 'What's next? What more?' This has given me a way to stay in the classroom but also do more."

In the spring of 2019, we surveyed 180 MfA teachers in the final year of their fellowships. We asked whether they had taken on new leadership roles in their schools over the past four years, and if so, how those leadership opportunities came about.

Mostly selection by my school principal



Mostly self-initiated/ I volunteered

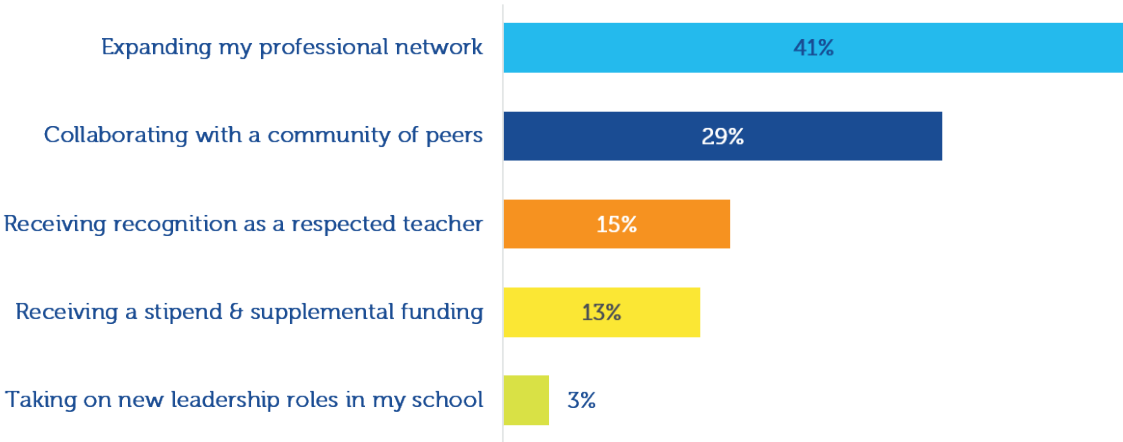


III. Teacher Retention

By awarding four-year fellowships to experienced teachers, which include annual stipends and the opportunity to participate in professional learning experiences within a community of peers, MfA aims to increase the retention of outstanding K-12 math and science teachers in NYC public schools. Each year, we track and report attrition from our fellowship program in order to monitor trends and

determine whether we are in fact keeping the best teachers in the classroom. Over the 2018-19 school year, 3.5 percent of MfA teachers withdrew prior to completing their four-year fellowship, which is lower than 2017-18 attrition rate of 4.8 percent, and lower still than the attrition rate of 6.4 percent over the 2016-17 school year.

In the spring of 2019, we surveyed 128 teachers who had just completed the first year of their MfA fellowships, and asked “Which of the following aspects of your fellowship most influenced your decision to stay in the teaching profession this year?”



Not all teachers who withdrew from their fellowships left the teaching profession. Last year, about half of the teachers who withdrew continued teaching outside of the NYC public school system. This means the actual attrition rate from teaching among MfA teachers in the 2018-19 school year was about two percent. Master Teachers who complete a four-year fellowship are eligible to apply for additional

fellowships. 80 percent of the Master Teachers who completed their first fellowships in the spring of 2019 applied for a second fellowship, and 83 percent of these applicants were awarded another fellowship starting in fall 2020. Master Teachers who do not receive an additional fellowship can continue to participate in the professional learning community at MfA through the MfA Emeritus Corps.

IV. School Impact

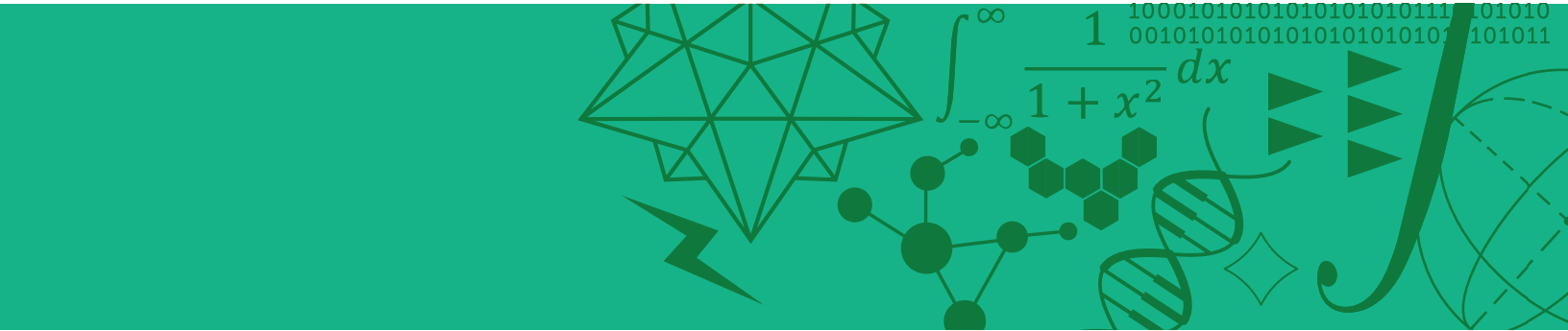
We don't focus on retention merely to increase the number of years an educator stays in the classroom but to deepen and amplify the impact they have in their schools in each extra year they commit to the teaching profession. By retaining excellent teachers in the classroom longer, MfA expects not only to have a positive impact on student learning but also on the school communities in which MfA teachers teach. Teachers in our focus groups cited numerous examples of ways in which their professional learning experiences in MfA strengthened their pedagogy and increased their students' learning. MfA's professional development courses offer an array of new content ideas, classroom activities and pedagogical strategies,

which teachers credit with refreshing their approaches to teaching. Specific examples that teachers frequently cited in the focus groups include equity-focused teaching, differentiated learning, incorporating more technology in the classroom, and new approaches to increasing students' participation and engagement. Beyond strengthening curriculum and instruction during the school day, many MfA teachers in our focus groups were able to start clubs and after-school activities to give students in their schools more access to hands-on STEM projects, with the help of information, resources, and connections available through MfA.

"It's really worth investigation: this idea that the impact of MfA is not solely within that one teacher and their own professional life. There's a sphere of influence MfA teachers have in their schools. We should look at the impact of MfA as an injection of creativity and invigoration of the teaching profession into a school, which impacts teachers beyond the fellowship - whether it's through professional development workshops or just talking to your colleagues about the profession or sharing the things that you learned."

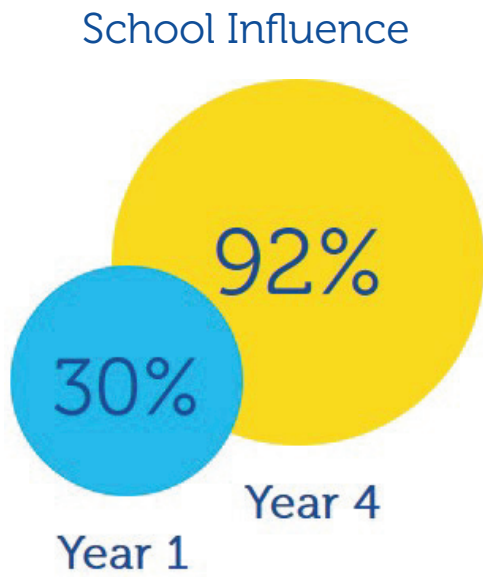
A middle school science teacher in our focus group described how a professional development course he took on project-based learning at MfA had impacted his school community:

"From this workshop, I gained a set of best practices for engaging students in hands-on learning. I decided to apply this in my classroom by transforming my physical science unit into a project-based unit to challenge my students to design their own mini-golf courses. This included blueprinting and gathering experimental data so that students could test what they built against the models they designed. Then, I turned my school's science fair into a STEM night where students could display their mini-golf courses to the rest of the school. As a result, I observed increased student engagement and mastery of the material among a diverse set of students, including students with disabilities and students who had previously struggled academically in my class. Other teachers at my school noticed my mini-golf project at the STEM night, and now three of my colleagues are implementing similar monthly STEM challenges. More and more teachers at my school are now interested in strengthening STEM programming for our students."



The majority of the teachers in our focus groups described a similar trajectory over the course of their four-year fellowships: in the beginning of their fellowships, most teachers said that they focused on their own professional growth. Teachers drew a direct connection between their fellowships, their pedagogy, and their students' learning in the first two years of the fellowship. Most teachers noted a shift in

the latter part of their fellowships toward increased influence in their wider school communities. While 30 percent of teachers in our focus groups felt that their experiences at MfA had some impact on their school colleagues even early on in their fellowships, 92 percent said that their MfA fellowships had led to a moderate or high degree of school-level influence by the fourth year of their fellowships. Teachers tended to attribute this to increased self-confidence and the development of new leadership skills; as they became more comfortable and engaged in the MfA community through collaborating with other MfA teachers and facilitating workshops at MfA, they also became more confident voicing their opinions and taking on more leadership roles in their schools.



Teachers cited both formal and informal examples of leadership within their school communities: formal examples include serving as math or science department leaders, leading professional development for their school colleagues, or starting new math or science programs in their schools. Informal examples include acting as a go-to person or resource for colleagues, mentoring and supporting other teachers, and having increased influence and "professional voice" within their schools.

"As I grew through my fellowship, engaged in more professional development opportunities, and took part in running cohort meetings, my confidence started to grow and my administration and other teachers started putting a lot more stock in my opinions. My principal started to give me more and more responsibilities: I was leading professional learning teams and book clubs, and eventually, in year four of my fellowship (this past year), our school started to enact some major changes and my principal went to me for that."

IV. School Impact

By regularly sharing resources and learning from MfA with the other teachers in their schools, many teachers in our focus groups saw increased communication and collaboration with their colleagues, which led to a stronger sense of community among staff in their

schools. Teachers noted increased collaboration both within and across departments as a result of sharing innovative practices from MfA with their school colleagues.

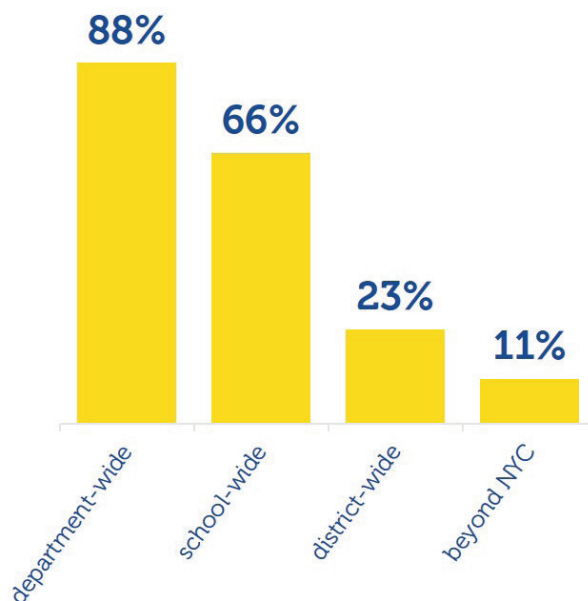
"I have a colleague who was accepted to MfA and another colleague is currently applying. We teach at an elementary school. The fellowship has given us a space to talk about math because we don't have a math department. This has had an impact on more than just those two colleagues. My colleagues and I - those of us who are interested in continuing to grow as mathematicians and math teachers - have created a community at our school because of our affiliation with MfA."

"Having our whole department in MfA has been amazing. We divide and conquer who is going to take which MfA PD courses, and then we come together, share what we've learned, and work together in school to bring it into our classrooms."

MfA teachers strive to share their learnings with their school colleagues and to "be worthy of the Master Teacher title," as one teacher put it. Many MfA teachers have become important change agents within their

schools. Their hope is to create a ripple effect through influencing their colleagues, who, in turn, influence other colleagues, thereby impacting wider school culture, climate, and student learning.

In the spring of 2019, we surveyed 180 MfA teachers in the final year of their fellowships and asked about the professional development (PD) they had led for other teachers over the course of their fellowships. The chart below shows the percentage of MfA teachers who led PD in their schools and beyond.



In the spring of 2019, we surveyed 956 MfA teachers to ask about their collaboration with their school colleagues.

The ideas from MfA that I share with colleagues in my school have encouraged others to adopt new practices.

77%

My MfA fellowship has encouraged me to open my classroom to other teachers more often.

71%

V. Annual Spotlight: Teacher-led Innovation

MfA creates the networks and communities that allow teacher-led innovation to flourish. The story below exemplifies this, demonstrating how, with the support of MfA, Master Teacher Vielca Anglin has been able to increase her students' exposure to the technology and science behind sustainability and influence other educators in NYC to do the same.

Densely populated areas are hotbeds of scientific innovation when it comes to producing produce. Consider [Bowery](#), a tech startup that grows salad greens in an old shipbuilding yard in Kearny, New Jersey. Bowery supplies grocers like Whole Foods with greens that are grown without soil: kale, cilantro, and arugula grow in vertically stacked trays, where they are carefully monitored by probes that send data wirelessly to tablet-wielding "farm hands" who monitor the temperature, lighting, and humidity. Bowery's hydroponic system uses 95 percent less water than a traditional farm and produces crops without pesticides, important developments for consumers' health and environmental sustainability.

Investors are increasingly convinced that new green technologies like this will power future economic growth. In September, [The Economist](#) reported that Amazon's founder and CEO Jeff Bezos and Google's former executive chairman and CEO Eric Schmidt joined others in committing more than \$200 million to Plenty, a "vertical farming" startup, a sign that sustainable science is fueling technology that lives up to broader societal expectations. For teachers who know the cutting-edge science behind sustainability, these developments present new opportunities to prepare students with skills for work and citizenship in the 21st century. Vielca Anglin is a prime example. Anglin uses her MfA Master Teacher Fellowship to stay at the forefront of research, and brings what she learns back to her classroom. In 2017, she used an MfA Impact Grant to spend her summer doing biological

and environmental land/place-based research in the Amazon, an experience that inspired her to teach her students the science behind sustainability. Anglin believes the key to getting students turned on to science is showing them how it can empower them to make change in the world. She puts this philosophy into action at [City-As-School](#), a Manhattan alternative high school that serves students who are transferring out of other high schools.



"Content is important to me, but I want my students to be citizen scientists," Anglin said. She currently uses a curriculum called [EcoRise](#) to engage students in the same activities that research scientists engage in while working on solutions to environmental challenges. Anglin's students collect and analyze data from "eco audits" to think critically about current ecological practices in their school, and then work in teams to propose creative solutions to the issues they encounter. It's a way to learn science while developing the [top skills](#) that the World Economic Forum say are currently needed to succeed.

Last year Anglin’s students made a case to school administrators to acquire state-of-the-art technologies for a hydroponic garden so that it could be used to provide more greens like fresh arugula and basil, increasing access to healthy lunch options for students. The technology Anglin’s students needed, however, was expensive. Anglin encouraged them to apply for a grant. Her students were skeptical.

They said: “Oh yeah right, some place is going to give us money for our work, no way,” she recalled. Grant writing, however, is a major part of real scientific work and getting declined is the most common outcome. Anglin felt her students needed to learn what it takes to put a grant proposal together, even if they didn’t succeed. “A big part of succeeding in science is learning how not to give up,” Anglin said.

Fortunately, her students didn’t need to learn from

failure. The grant came through, and today City-As-School creates produce for school lunch in-house, monitored by students employing the same equipment utilized by green-tech startups. Anglin said going through the grant process and succeeding made them feel empowered: “The experience gave them agency and ownership. It gave them an identity. They cared about a subject, applied for a grant, and got to be a part of real change.” Through MfA, Anglin is able to spread her innovative approach by offering workshops on EcoRise to top educators from schools across New York City. She believes that as more educators adopt the curriculum, they can convince teachers, students, policymakers, and the public that sustainability should be a major goal in science education. As Anglin put it: “Once you inform someone about sustainability issues, for the most part, they’ll want to do something about it. As teachers, we have the chance to be at the forefront of this movement.”

