Case Study No. 18

PRINCIPLES FOR EFFECTIVE EDUCATION GRANTMAKING

A Decade in the Making: Early Math Education Initiative Seeks Broad Impact

by RAFAEL OTTO

OCTOBER 2018

PRINCIPLES FOR EFFECTIVE EDUCATION GRANTMAKING

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2. To help members identify and prepare for what's next. With our finger on the pulse of our diverse network and eye on the broader horizon, we keep members informed of relevant and pressing issues, and equip members with the tools and knowledge required to shape the future.

Grantmakers for Education developed its series of case studies on effective education grantmaking as reflection and discussion tools. Cases are not intended to serve as endorsements, sources of primary data or illustrations of successful or unsuccessful grantmaking. In addition, to help make the case a more effective learning tool, it is deliberately written from one foundation's point of view, even though other foundations may have been involved in similar activities or supported the same grantees.

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INTRODUCTION

When CME Group Foundation (CME) was formed in 2007 with an endowment from the Chicago Mercantile Exchange Trust, its founders set out to engage in grantmaking that would improve education from cradle to career and strengthen the region's economy.

During its first decade, nearly a quarter of CME's grants targeted early childhood education with an emphasis on improving early math education. With students in the United States trailing students from other industrialized nations in math, CME's leaders believed it was crucial to address the problem in the early years. Helping low-income children in Chicago build essential math skills would not only help them succeed in school but would also further the success and economic well-being of the state and the nation.

From the beginning, CME's executive director and board recognized that improving student outcomes in math would require improving the skills and knowledge that teachers brought to the classroom. The foundation's earliest grants in 2007 were aimed at studying the field of early math education in Chicago to better understand what teachers needed. These initial investments led to the development of a grantmaking strategy designed to create lasting change for educators and students.

In 2010, equipped with the knowledge that many elementary school teachers in Chicago lacked the content knowledge, pedagogical skills and confidence to teach math most effectively, CME's leaders launched a new Early Math Education Initiative. Focused on early math learning for children birth to third grade, the strategy included early caregivers, parents and families, preschool teachers and teachers inside Chicago's K-12 system. Six years later, CME collaborated with the University of Chicago, University of Illinois at Chicago, DePaul University and Chicago Public Schools (CPS) to launch the Elementary Math Specialist Pilot (EMS Pilot). The pilot delivered graduate courses to elementary school teachers to strengthen their math knowledge as well as their instructional and leadership skills.

When CME's leaders began investing in early math education, they did not know what impact these investments would have. They did not know how their partnerships would unfold, how specific projects from their Early Math Education Initiative might evolve or what policies might be needed to achieve broader impact. But they were hopeful that their ongoing commitment to this work would spur major improvements to how teachers understood, learned and taught math to improve student learning and outcomes.

This case study examines pivotal moments in the development of CME's Early Math Education Initiative and Elementary Math Specialist Pilot, including research and data that fueled the foundation's grantmaking and perspectives from funders and educators on collaboration, partnerships and levers for change. The case also poses questions about sustainability and the potential for statewide impact.

A NEW KIND OF OPPORTUNITY

Shanteau Allen teaches third grade at Fulton Elementary School on the south side of Chicago in Network 11 of the Chicago Public School District. She is also a part-time student at DePaul University in the Elementary Math Specialist Pilot. The initiative uses a new curriculum designed for teachers to improve their math knowledge and skills, improve their ability to teach math to elementary school students and prepare them to be "teacher leaders" in their school community. The pilot, funded by CME Group Foundation, is geared toward helping teachers like Allen be more effective in their classrooms to improve student outcomes.

Allen's daily routine is like those of many elementary teachers. She teaches all subjects, manages behaviors and social dynamics, keeps her students moving on time through the day, plans and thinks about her daily teaching practice and strategies, is constantly aware of how much her students are learning and continually prepares her students for testing.

"Time management is a huge challenge," Allen said. "I'm always wondering if what I'm doing is enough for my students, if it's enough to help them grasp the concepts in the next grade and in life."

After 12 years as a teacher, Allen was eager to see more departmentalization in the elementary grades. "I love teaching math and seeing my students progress in math. I think I could be a lot more effective teaching the same subject all day."

A typical math class for Allen and her students starts with "math talks," an activity that gets students talking about a specific math problem or concept they are working on. In one class, students discussed ideas about how to categorize fellow students. Could you sort the class by girls and boys? Tall and short students? By hair color? What are the similarities and differences? Hands shot up and the class generated ideas. Then they worked in small groups to apply the thinking to a collection of shapes.

Students pulled out their geometry dictionaries, which they created in the class, to look up definitions for specific shapes and to review how to spell words like "quadrilateral."

"I didn't always love math," Allen said. "And my dislike of math started with geometry. So I'm especially interested in helping kids enjoy these lessons and learn."

"Math is my favorite subject," one student said. "And Ms. Allen makes it fun." Another student chimed in about when he likes math. "Only if it's challenging," he said.

When done with the exercise, students examined each other's work and asked questions. Some sorted shapes by the number of parallel lines, others by the number of angles, the number of sides or whether shapes have symmetry.

"This is a change in how things are taught," Allen said. "The whole idea of everyone sitting in a row has its place, but I've found that when students are given parameters and allowed to talk and discuss and debate, that's where some of the true learning occurs."

As a student in the Elementary Math Specialist Pilot, Allen said the classes helped her learn math concepts and how to teach math with new tools. "I've definitely had to step outside of my comfort zone and challenge myself."

The Elementary Math Specialist Pilot is the product of nearly 10 years of grantmaking in early math education by CME Group Foundation since 2007 and stems from multiple investments aimed at engaging teachers in more effective professional development.

Kassie Davis, executive director at CME Group Foundation, said early math education was a priority for the foundation when established in 2007. "Early childhood education was a core focus area for the foundation from the beginning. But we became interested in early math in part because of key research in the 2000s that reinforced the importance of building math skills in the early years. The research helped us focus on how to help teachers be more effective in their classrooms."

CME engaged Erikson Institute as a key partner to explore what professional development looked like for teachers in Chicago Public Schools. Researchers at Erikson discovered that many teachers lacked sufficient math knowledge to have maximum impact on student learning. They also found that teachers needed better supports and training to improve their attitudes about teaching math and their teaching practice. This attention to attitudes, practice and knowledge became a conceptual framework to address the needs of the "whole teacher" that opened multiple ways to approach professional development for educators.

By 2010, CME launched the Early Math Education Initiative with three partners, Big Shoulders Fund, Erikson Institute and Ounce of Prevention Fund. That work, alongside a range of other investments in early math education in Chicago and Illinois, evolved into the Elementary Math Specialist Pilot which launched in 2016. The pilot delivers graduate courses with new curricula for math teachers in Chicago Public Schools taught by three partner universities. University tuition for participating teachers is paid by CME during the pilot.

"I've been teaching math for a few years and noticed students weren't successful," Allen said. "We were spending too much time on procedural things and not really digging in to help them become problem solvers. I didn't know how to do that so I knew something had to change."

After years of participating in professional development opportunities provided by the district, the Elementary Math Specialist Pilot appeared to be a new kind of opportunity.

"When I heard about the program," Allen said, "I thought it could help me as a teacher."

LAUNCHING THE EARLY MATH EDUCATION INITIATIVE

Davis recalled the initial conversations at the foundation about its strategic priorities. "Early on," Davis said, "we thought we could fund early childhood health and education. But we realized we weren't big enough to have an impact in such broad areas and needed to focus."

"Relying on the research gave me leverage with the foundation board," Davis continued, referring to the growing body of research from the field. "We wanted to know that what we were doing was making a difference. The research proved that a focus on early math would be a strong leverage point."

Research indicated that young children could learn concepts and skills that serve as the foundation for more complex mathematics learning later in school.[1] But to provide that kind of learning environment, students needed more engaging, complex mathematical tasks taught by teachers with a deep understanding of math concepts and confidence in their own math skills. Ample documentation indicated that preschool and elementary teachers lacked mathematical content knowledge and sufficient teaching skills[2,3,4] and that limited knowledge could impact teacher attitudes and confidence when it came to teaching math.[5,6]

A study by Duncan et al called "School readiness and later achievement"[7] released in 2007 confirmed that early math skills upon school entry in kindergarten predicted academic success in math and reading through elementary school. The study also reinforced a key point: early math scores predict early reading and literacy, but early reading scores do not predict early math scores.

"Another study[8] from the National Research Council in 2009 helped us focus on pedagogy," Davis said. "That helped us ask grantees to think more deeply about improving content knowledge and pedagogy for teachers."

Research also suggested that high-quality professional development would only improve student learning if it adhered to certain principles:[9]

- Professional development must be content-focused[10] and include how children learn the content.[11]
- Professional development must include opportunities for teachers to be actively engaged, such as observing one another or examining student work.
- Professional development should be intensive and sustained for at least 20 hours or more during a semester.[12]
- Professional development should include groups of teachers from the same school, grade or subject, providing the opportunity to develop a strong learning community that can serve as a support system.[13]
- Professional development should attend to teachers' attitudes and beliefs about mathematics, helping them to develop a growth mindset in mathematics.
- Teachers must be supported in using what they have learned in professional development within their schools and classrooms; professional development must be job-embedded.
- Learning in professional development should be aligned with school, district and state reforms and policies as well as with teachers' beliefs and what they learn in other professional development.

CME's leaders decided to focus on early math learning for children from infancy to third grade, a strategy that included early caregivers, parents and families, preschool teachers and teachers inside the K-12 system. This approach drew attention to the myriad needs of young children, the environments in which they learn and the idea of supporting the "whole child."

"As an early childhood teacher, you can't just focus on academic learning," said Jie-Qi Chen, senior vice-

president for academic affairs and dean of faculty at Erikson Institute. "You must also focus on social and emotional needs, physical needs. You are responsible for the development of the whole child."

"We began to think about teachers in a similar way," Chen said, "as adults with many needs. If we want to shift how teachers practice, we have to think about the 'whole teacher' and the development of their knowledge, practice and attitudes."

In 2007, Erikson Institute became CME's first early math grantee with a two-year, $500,000 grant to support its professional development program for teaching mathematics in preschool and kindergarten classrooms in Chicago Public Schools. That year, Erikson Institute launched its Early Mathematics Education Project, which eventually became the Early Math Collaborative, designed to improve professional development and advance research in the field.

"The initial grant from CME was unique because they allowed us to spend a year studying early math," Chen said. "We conducted a literature review and classroom observations. We looked at the field, what was happening in cognitive development, and we came to better understand some misconceptions about kids not being capable of early math thinking."

"Erikson was especially crucial," Davis said, "because they also had long established relationships with Chicago Public Schools."

"Kassie and her board members visited our professional development sites to better understand early math," Chen said. "They came to understand that math is not just about counting numbers or naming shapes, but a set of big math ideas.[14] Math ideas are everywhere. You can mathematize an environment, but in so doing, adults have to understand the big math ideas."

Erikson Institute conducted a survey of teachers in Chicago Public Schools and found that 90 percent wanted professional development in math. Many thought they could teach math but lacked confidence in their math skills. Researchers found that math anxiety was something to address and that many teachers triggered that anxiety in their students, especially in young girls.[15]

Jennifer McCray, assistant research scientist at Erikson Institute, said that working with teachers to shift practice is so difficult because teaching is so difficult. "It's a parallel process. We want to see a shift in students, and we want the teachers to help them make that shift. But we are also asking teachers to make a similar shift. They have to be great students to help their students improve."

By 2010, Erikson had built a framework for high-quality teacher professional development and captured data about the impact on students, laying the foundation for CME's launch of the Early Math Education Initiative. The primary goal of the initiative was "to help young children in Chicago become proficient in math by third grade and prepared for success in math later in their education."

CME's theory of change for the initiative, developed collaboratively with input from Erikson Institute, Big Shoulders Fund and Ounce of Prevention Fund, included four elements:

- Improved quality of early math instruction based on early childhood teachers' increased content knowledge and confidence in teaching it in engaging, developmentally appropriate ways.
- Available tools for early childhood teachers to enhance children's early math learning.
- Among parents and caregivers, increased knowledge and confidence about introducing mathematical concepts to young children.
- Among local education policymakers and university education school deans and faculty, greater understanding about the importance of early math education, the nature of early math instructional practices and their integration into the early education system.

CME invested $2.75 million in three organizations to launch the initiative in 2010, Big Shoulders Fund, Erikson Institute and Ounce of Prevention Fund, each with a different but interrelated focus on professional development for early educators. Of those investments, $1 million provided the necessary match for Erikson's application to the Investing in Innovation Fund (i3) which, once awarded, totaled $6 million and expanded and improved professional development programming and coaching for teachers prekindergarten through third grade.

With the launch of the initiative, Davis began convening grantees to establish an atmosphere of partnership and collaboration. "None of my grantees knew the others were also working on early math professional development," Davis said. "I saw it as an opportunity to bring people together and get them talking about their work, sharing ideas and going deeper on the issues and challenges."

On Davis' work in Chicago, Chen said, "Kassie not only brings all of her early math grantees together each year, she engages the business community, she sees and makes opportunities to bring stakeholders together. She has an eye on engaging partners and doing so for the long term."

NEW STANDARDS, SHARED INTERESTS

Chicago Public Schools began the transition to the Common Core State Standards during the 2011-2012 school year. Almost immediately, the district struggled with providing adequate professional development for teachers who needed to shift their practice. This was primarily because the Common Core asked students to engage with more rigorous content in more challenging ways while building a deeper understanding of concepts and procedures. For math, the standards deemphasized skills like rote memorization and following mathematical formulas and connected classroom work with real world problem solving. Many teachers in Chicago did not have the skills to facilitate that process, and elementary school teachers had an even greater skill deficit compared to their middle and high school peers when it came to teaching math.

With implementation of the Common Core, teachers and teachers' unions raised concerns about the value and purpose of new assessments from the Partnership for Assessment of Readiness for College and Careers (PARCC). Teachers expressed concerns about having to "teach to the test," an issue that remains problematic for teachers in CPS and in other states. Across the country, state leaders raised concerns that the federal government was too aggressive in identifying what students should learn, undermining states' rights and local decision making. But while adoption of the standards was controversial in many states, the standards generally found support in Illinois.

"Common Core put a name on what we knew needed to happen in terms of standards and teaching," said Lizzie McDermott, mathematics manager for Chicago Public Schools in the Department of STEM (Science, Technology, Engineering and Math). "But until the change (in the standards) took place, and until the change in assessment took place, there was little motivation to shift practice."

While the district had a history of working to improve math achievement and instruction going back to the early 2000s, adoption of the Common Core created an opportunity to focus specifically on teaching practices in the classroom. The Department of Mathematics in Chicago Public Schools, which eventually became the Department of STEM, sought ways to better prepare teachers for improved math instruction. They found partners in the local philanthropic community.

"It wasn't until the roll-out of the Common Core and greater attention on the needs in the preschool through grade five area that we gained a deeper understanding of what teachers needed," Davis said. "Thanks to Jessica Mahon and her good work...she helped the funders realize there was a lot to do there," Davis said of the executive director for the CPS Department of STEM.

With Common Core, new literacy and math standards were to be implemented at the same time. CPS decided to stagger implementation and chose to roll out the literacy standards first and the math standards in the second year. This gave the district time to develop and offer additional supports for teachers and get a better understanding of what elementary teachers needed for implementation.

"We found that many teachers were very open to the changes and support because of their understanding of how young children learn and explore," Mahon said. "Our supports and guidance aligned with much of the pedagogy they already believed in. During that first year, the district worked to organize funders and university partners to launch the districtwide work the following year that would address content, pedagogy and teacher leadership."

"The standards altered the work we were doing as grantmakers," said Gudelia Lopez, former senior program officer for education at The Chicago Community Trust. "The Trust had supported professional development in math for a few years before Common Core arrived. We were reaching a small number of teachers in a small number of schools. But the adoption of the standards forced everyone, district and school leaders and teachers, to examine mathematics teaching and learning in a new light. Suddenly teachers needed a lot of real support to understand research-based math instruction and teach to the new standards. The standards influenced what needed to happen in the classroom in terms of how the teachers taught math and the kind of work students were being asked to do."

Davis worked with The Chicago Community Trust and the Robert R. McCormick Foundation—each with a history of early math investments in Chicago—to develop partnerships with three key universities, DePaul University, University of Illinois at Chicago and University of Chicago. The universities helped the funders better understand the needs of educators in CPS.

Lopez said, "We needed to understand how to support elementary school teachers to improve their math pedagogy. We had conversations for a year and recognized that elementary teachers were in a different place than middle school math teachers who hold math endorsements."

Kathleen Pitvorec, instructor at the University of Illinois at Chicago, said Common Core was a motivator, but that was not the only factor. "The district wanted to get kids ready for algebra in middle school, so changing what was happening in the earlier grades was part of the equation."

Funders recognized that they could increase their investments and reach more teachers and students, but more strategic planning was essential to have systemic impact, and therefore lasting impact. They needed to better understand the existing landscape of partnerships within the district to find true leverage points.

Davis, because of her foundation's Early Math Education Initiative, was interested in funding professional development for early educators preschool through fifth grade. "I remember working with the other funders and three universities and meeting with the Department of Mathematics at CPS and discussing strategy. High school teachers got training on the Common Core first, so we spent a lot of time looking at logistics and trying to figure out how to get elementary teachers the training they needed."

"As funders we also had to understand these new math concepts," Davis said. "We had to understand what the instructional shifts meant, who needed to be involved and what that meant for changes in teaching."

That took time. It also required CME to understand which universities were engaged with which networks, the work they were doing around professional development and why, what approaches were most effective and what challenges were in place to then maximize the impact of CME's early math investments.

Lynn Narasimhan, director of the STEM Center at DePaul University, said the adoption of the Common Core created an opportunity to provide professional development supporting high quality mathematics instruction. "Over a period of four years, we were able to work in four different networks in CPS with the Erikson Institute to develop and refine ideas that would change how we approached professional learning. With the new funding from CME Group Foundation, we had the chance to put this new approach into practice."

DISTRICT AND UNIVERSITY PARTNERSHIPS

The Chicago Public School District is the third-largest in the United States and is overseen by a chief executive officer. It is divided into 13 networks, each with its own chief of schools which functions like a traditional superintendent. It serves 372,000 students—about one fifth of the students in Illinois—with more than half of all students in elementary grades one through eight. The district employs approximately 21,000 teachers.

Nearly 80 percent of all students are considered economically disadvantaged. That fact, combined with large budget deficits and disproportionately low levels of state funding, creates enormous challenges for those working to improve student outcomes and create systemic changes.

Despite the district's size and complexity, the math community is recognized as being small and closely connected. Only a handful of staff work at the Department of STEM (previously the Department of Mathematics) in the district. That team has worked closely with funders and universities, stimulating investments geared toward impacting the entire CPS system.

Over the years, most of the investments and partnerships had been relatively small. One university might work with one or two CPS networks with funding to support professional development in math for several years at a time, an approach that reached a limited number of teachers.

While CPS was fortunate to have university and research partners who have remained committed to working with the district, in some cases for nearly 20 years, moving the needle on improving teacher skills and knowledge for math content and pedagogy was a slow process.

Lopez said, however, that long-standing partnerships created some consistency in shaping how the district approached improving math instruction. "In northeast Illinois, there are probably more partnerships around math than any other subject. But working with leading universities like these, because they are distinct institutions, takes time and energy compared to working with just one university. Things take longer to develop. You have to learn the norms and culture of each institution and that can slow things down. You have to be willing to have many conversations. If you can be patient you will get better results."

By 2015, other funders had pivoted away from investments in early math professional development. The Robert R. McCormick Foundation continued funding early math professional development but funded the archdiocese's low-income schools. The Chicago Community Trust shifted its strategy to invest in postsecondary education.

These changes in the funder environment created a new opportunity for CME to increase its support for CPS, and its investments in relationships with district staff provided a strong foundation for the Elementary Math Specialist Pilot.

LEVERAGING COLLABORATIVE EFFORTS: THE ALGEBRA INITIATIVE

"The beginning of this work goes back to Arne Duncan working as CEO of CPS in the early 2000s," Lopez said of the former U.S. Secretary of Education. "The Office of Mathematics and Science developed the Algebra Initiative, a project that served as a model and helped The Chicago Community Trust engage university partners to develop the Elementary Math Specialist work."

The Algebra Initiative, which still operates in CPS, brought the University of Chicago, DePaul University and the University of Illinois at Chicago to the table in 2002 to create a new curriculum for eighth grade teachers. At that time, only seven percent of CPS eighth graders had the opportunity to take algebra. The initiative was designed to increase the number of teachers prepared to teach algebra so more students had the opportunity to study the subject. Teachers who complete a series of mathematics teaching courses at one of the three universities (a two- or three-course sequence depending on the quarter or semester structure at the university) can take the City of Chicago Algebra Exam. If they pass the exam, teachers earn a certificate that allows them to teach algebra to select eighth grade students.

"I credit the algebra work for helping lay the foundation for the EMS Pilot," McDermott said. "The group has been meeting every other Tuesday for the past 10 years, so it's given us something to build on."

This emphasis on improving access to algebra courses and improving student achievement in math in middle school (students must still qualify to take algebra in eighth grade) gradually moved the focus onto what was happening in earlier grades. CPS looked at developing more supports for teachers in the elementary grades so that students would be prepared for algebra by the time they reached eighth grade.

"That shift in middle school magnified problems in math instruction," McDermott said. "Teaching needed to shift and the Common Core required alignment of curriculum across grades with a deeper understanding of content by teachers."

With middle school teachers developing more content and pedagogy knowledge for teaching mathematics, funders could turn their attention to the elementary grades. "We knew that teachers in the elementary grades needed something similar to a middle-grades math endorsement," Lopez said. "When The Chicago Community Trust funded the initial development of the coursework for the Elementary Math Specialist Pilot, we required partnerships between the math department and the education department. We ensured the education department was focused on improving subject matter expertise and we sought cross-department collaboration."

Mary Jo Tavormina, an instructor at the University of Illinois at Chicago and former director of mathematics at CPS, said that while working with a district the size of CPS can be challenging, it also has an upside. "CPS has the ability to put policies in place that affect all of its schools and impact thousands of students. Because of the Algebra Initiative, the district can offer the algebra credential. This is more challenging for other districts throughout the state."

CPS is the only district in Illinois that has an algebra policy to date. Some hoped that the algebra certification in CPS could be adopted by the Illinois State Board of Education (ISBE) to reach more teachers and improve student learning and opportunity in more districts, but other districts around the state have not yet demonstrated a need for something similar.

LEVERAGING COLLABORATIVE EFFORTS: CHICAGO P12 MATH COLLABORATIVE

Another collaborative effort underway in Chicago Public Schools, also supported by CME Group Foundation, is the Chicago P12 Math Collaborative. In 2014, the collaborative began providing structured professional development for the entire district in more than 650 schools. Implementation partners include Erikson Institute's Early Math Collaborative which has focused on preschool through fifth grade teachers, and DePaul University which has focused on grades six through 12.

"The Chicago P12 Math Collaborative has allowed our team to work with teachers from preschool through fifth grade across the district," Mahon said. "Through informal and formal evaluation, we were able to identify common needs of teachers. We immediately recognized the need for content development as the Common Core State Standards expected PreK-5 teachers to address mathematics concepts in ways that had not been expected previously. This collaborative work also focused heavily on teacher leadership and we saw the power of strong peer relationships for making change in schools."

Professional development in all grades uses the TRU (Teaching for Robust Understanding) Math Framework,[16] a tool from the Mathematics Assessment Project at the Mathematics Assessment Resource Service that identifies five dimensions to create powerful classrooms. The framework is based on research about classroom functioning[17] and aims to organize that knowledge with these dimensions:

- ***Content:*** Classrooms provide opportunities for students to become knowledgeable, flexible and resourceful disciplinary thinkers.
- ***Cognitive Demand:*** Students grapple with disciplinary ideas while being challenged in ways that support growth.
- ***Equitable Access to Content:*** Classroom activity supports engagement of all students.
- ***Agency, Authority and Identity:*** Students contribute to conversations, build on others' ideas and develop a sense of agency and ownership related to the content.
- ***Formative Assessment:*** Classrooms elicit student thinking, interactions and dialogue to deepen understanding.

Staff from the University of Chicago also participate in delivering professional learning structures for teachers and administrators, working with Network 9 in CPS. These learning structures include:

- Individual and collaborative coaching focused on preschool through fifth grade teachers.
- Professional Learning Communities for preschool through fifth grade teachers.
- Math Team Learning Communities for preschool through eighth grade teacher leaders and administrators.
- Administrator Institutes.
- Teacher Leader Institutes for preschool through fifth grade teacher leaders.
- Access to resources and supports for network and school leaders.

"The Chicago P12 Math Collaborative is really the next iteration of preparing teachers to better implement the Common Core," Davis said of CME's investments to support the collaborative. "Jessica Mahon at CPS in the Department of STEM also wanted us to focus on networks with higher needs...high poverty, more mobility, kids entering kindergarten unprepared for school. She knew teachers would need additional supports to close the achievement gaps."

Alanna Mertens, a math education specialist at DePaul University's STEM Center leads the professional development work for the Chicago P12 Math Collaborative. "What's unique and fun is that the collaborative looks at what's happening in the school and across the grades. We focus on what can cut across grades from preschool to eighth, and that's really a new idea."

In the past, she said, teachers have not generally had opportunities to think about mathematics across all the grade levels in their school. Primary teachers have few opportunities to engage with intermediate or middle school math teachers within their schedule. With the collaborative, teachers from each grade band gather and get to think about what math teaching should look like throughout their school using the TRU Conversation Guide.[18] Teachers might meet to think about how to raise the cognitive demand of their lessons by considering questions like, "What opportunities do students have to make their own sense of mathematical ideas? How can we create more opportunities?" Mertens added, "They build a vision for what this looks like in each grade and then what it looks likes in a continuum across the grades. Middle school teachers visit primary classrooms with these questions in mind and leave thinking about ways they

can incorporate collaborative strategies with their students. Primary teachers visit intermediate teachers and see how their work with number sense grows into algebraic thinking. We are working towards vertical alignment not only of math content but of a vision for school-wide change."

"I'm working with teachers in their classrooms, coaching them and discussing problems of practice," Mertens continued. "We use the five dimensions from the TRU Math Framework, and that gives our conversations great structure. Teachers want their kids to see themselves as great math doers. The collaborative, and now the EMS Pilot, really allow us to get to know the teachers and allow them to go deep and improve their practice."

Mertens continued, "Another powerful aspect of this work, and about the longevity of these kinds of programs, is that you build relationships with teachers and you can see their professional growth. Teachers feel valued, they feel empowered. And they get the time to practice, to try things out and see what works for them and in their classrooms."

DePaul University is involved in both the Chicago P12 Math Collaborative and the Elementary Math Specialist Pilot. Narasimhan, a seasoned mathematician, teacher and professor, in addition to serving as the director of the STEM Center at DePaul, said she is continually learning how to improve professional learning for teachers. "Having both projects in my center has been beneficial, since what we learn in each project influences our work in the other project."

DATA FUEL THE INITIATIVE

CME Group Foundation, working with Arabella Advisors, created a data dashboard to capture baseline data from grantees participating in the Early Math Education Initiative. From 2010 to 2017, this data showed the initiative reached 18,000 children from birth to grade five with 75 percent of those children enrolled in kindergarten through fifth grade. Eighty-two percent of children showed improvements in their early math skills and understanding. CME's grantees also trained more than 2,500 early learning educators who reported significant results:

- 84 percent reported improvement in progress indicators.
- 85 percent improved confidence in teaching early math.
- 84 percent refined pedagogical knowledge.
- 84 percent reported positive changes to their instructional practice.
- 82 percent had better approaches to incorporate math into their overall practice.

The most recent dashboard assessment data from August 2018 on teachers participating in the EMS Pilot from each of the three universities showed positive skill gains: 100 percent of teachers demonstrated improved confidence in teaching early math and improved pedagogical knowledge, and 98 percent reported or demonstrated changes in their instructional practice.

The percentage of students at or above the national average performance in third grade math also steadily improved, from 46 percent in 2013 to 57 percent in 2017.

These results fueled CME's investments in early math, as well as additional data from CME's partners that demonstrated the effectiveness of a range professional development approaches.

Researchers at Erikson Institute, starting in 2011, worked with 500 preschool and kindergarten teachers in CPS with an early math professional development protocol for a year. Between 2011 and 2014, teachers who participated in the yearlong program significantly improved their math teaching practice, and their students demonstrated skill gains. Preschool students gained three additional months of math skills in a school year; for children who were behind the national average, the gain was five months.

A leading early childhood program known as Educare, developed by the Ounce of Prevention Fund and initiated in Chicago, demonstrated the effectiveness of improving math teaching practice with high-quality, job-embedded professional development. Focused on serving low-income families, the Educare approach was able to narrow the achievement gap between low- and high-income children. Results showed Educare teachers were also more effective in the classroom. Using Erikson's High Impact Strategies for Early Mathematics (HIS-EM) assessment tool, teachers demonstrated dramatic improvements to their math teaching practice.[19]

In 2010, Erikson Institute's Early Math Collaborative launched Innovations in Early Mathematics (Innovations), an intensive professional development program to help high-needs students reach or exceed math learning standards. A $1 million grant from CME helped secure $5 million from the Investing in Innovation (i3) Fund of the U.S. Department of Education. Innovations targeted schools where all teachers serving preschool to third grade students, as well as administrators, could participate.

The five-year grant engaged eight CPS schools, 19 administrators and 226 teachers serving 5,238 students with five interventions: learning labs, summer institutes, individual coaching, grade-level meetings and leadership academies. This approach allowed Erikson evaluators to study the mathematics content at the schools, examine individual teaching practices, focus on administrative and management techniques to drive changes in math teaching, and guide collaboration among teachers across school sites. The impact on teachers and students was significant.

Innovations teachers reported higher levels of confidence after two and four years of intervention, exhibited high levels of pedagogical content knowledge in mathematics after three years of intervention, and demonstrated higher quality mathematics instruction after one and four years of intervention.

Significant improvements in math scores were recorded for students who were in preschool when the intervention began, and children who were in kindergarten when the intervention began showed marginally significant effects.[20]

Davis said the data captured by Erikson has helped fuel the Early Math Education Initiative and the development of the Elementary Math Specialist Pilot. "Thanks to Erikson, we learned that it took teachers a full year to integrate their learning into practice. Then we wouldn't see changes in student outcomes until the end of the second year."

Looking back on Erikson's work that supported teachers with intensive professional development for a year, Davis said that many teachers demanded a second year. Erikson delivered that additional year to teachers who volunteered and continued to assess their skill gains and impacts on students. "We looked at kids' test scores in year three and could see them continue to shoot up. The learning was that sustained, intensive professional development...well, the more the better."

For Chicago Public Schools as a whole, test scores continued to rise.[21] From 2008-2014, the average test scores for students grew 19 percent faster than the national average, higher than 96 percent of all districts in the U.S.[22] Chicago also had the highest growth rate between third and eighth grade of any district in the U.S.[23] Between 2003 and 2015, and especially since 2007, test scores in Chicago in both fourth and eighth grade math have improved faster than the national average.[24] Those scores held steady into 2017.[25] Patterns of improvement were also similar for all cohorts of students, including male and female students and all racial and ethnic subgroups, with the highest rate of improvement among Latino students.[26] Because Latino students' scores increased rapidly, the white-Latino achievement gap narrowed significantly. But because all students showed improvement, achievement gaps remained constant and large between, for example, black and white students.

"It speaks to everyone's commitment," McDermott said of the results in CPS. "Our partners are invested in making things happen and doing things right."

CREATING ELEMENTARY MATH SPECIALISTS

In 2015, The Chicago Community Trust funded the development of new coursework at DePaul University, University of Chicago and the University of Illinois at Chicago. The 2015-16 school year was designed as a planning year to build full course sequences, review what other states had developed (such as Virginia, Vermont, Missouri and Maryland), consider best practices for adult learning, child learning, pedagogy and mathematics, and initiate conversations with the Illinois State Board of Education. The hope was that this new coursework would lead to an ISBE endorsement for an elementary mathematics specialist modeled after existing Illinois endorsements for reading teachers and reading specialists.

Lopez, who was working for The Chicago Community Trust in 2015, recalled talking with Davis when the trust changed its priorities and would no longer fund the efforts. "I knew that one year of support would not be enough to sustain this project and keep the momentum going. I shared our work with Kassie and she saw an opportunity to fill in the gap."

By 2015, CME Group Foundation had invested more than $7 million in early math projects in the Chicago area. Many grants focused on professional development for teachers, but they also included projects that engaged families to improve math learning in children, recognizing that parents and families serve as a child's first educator and play a crucial role in building early skills and establishing a positive relationship with learning. Additionally, CME's grants influenced early childhood math policy, expanded online learning and digital math tools and supported evaluation and research. The groundwork for the Elementary Math Specialist Pilot had been established, the result of nearly 10 years of early math investments.

Davis met with CPS staff directly about CME's role in the transition and CME assumed the role of lead funder so the universities could create and launch pilot courses in 2016. CME's 2016 request for proposals cited nearly 20 studies that reinforced the rationale behind improving early math learning for children from infancy through grade five and improving teaching practices with high-quality professional development. Their goals of changing how math instruction was delivered in the elementary grades presented the opportunity to work toward a new endorsement from the ISBE.

Davis awarded funding in the spring of 2017 to support the pilot courses. The university partners had crafted coursework to fit into a sequence of seven quarters or five semesters to prepare existing teachers to become elementary math specialists.

Narasimhan said the process of developing and offering the courses for the Elementary Math Specialist Pilot took time and planning. "Our intention has been to share in developing the curriculum. We met for about a year on guidelines and then each university created their own course documents to fit the needs of their respective institutions. Now some of our instructors are working together and comparing notes on progress." Narasimhan said that they reviewed research from the Association of Mathematics Teacher Educators (AMTE) where there has been interest in supporting states to move toward early math specialist endorsements. AMTE's past president, Skip Fennel, was collaborating with the universities on strategy and next steps. While it was tempting to look to models in other states or universities, Narasimhan said it was not that simple. "It's really difficult to take what others have done and replicate it so that it fits our needs. We can use ideas and then adapt them to our needs, but we had to create something of our own." The goal, she said, was to build the curriculum to meet the needs of Illinois school districts and universities to foster systemic change.

The universities also used a "specialized teaching assignment" model that allowed elementary math specialists to teach in a departmentalized arrangement, an approach that minimized district costs and restructured the time for existing teachers rather than requiring additional personnel. The model also helped districts improve mathematics instruction without having to engage all teachers, and it provided schools with well-prepared teachers who can assume a leadership role in mathematics instruction for the school community.

"One of the nicest things about this pilot," Davis said, "is that the university professors are going out to the network schools so teachers don't have to travel in to campus." Narasimhan and others said that this approach strains the capacity of its instructors but the promise of better results because of stronger teacher commitment and engagement remains a motivator to continue community-based instruction. Davis added, "We have to figure out how to incent universities to continue doing that."

The courses focus on improving the content knowledge for participating teachers and pedagogical skills for teaching math in kindergarten through sixth grade in three main areas:

- ***Numbers and Operations.*** One academic year is dedicated to a deeper understanding of numbers and operations and associated pedagogical content. The courses connect to "Operations and Algebraic Thinking" and "Number and Operations in Base Ten" in the Common Core.
- ***Geometry and Measurement.*** One academic year is dedicated to examining mathematical content and teaching for geometry and measurement in the elementary and middle grades with an emphasis

on how students understand the concepts across grades. The courses connect to "Mathematical Practice" in the Common Core.

- ***Leadership.*** One course focuses on developing mathematics leadership using methods to advocate for high-quality mathematics instruction, enhance collaboration within and across grades and support professional learning around high-quality math instruction.

Courses are taught by teaching teams that include a mathematician and a math educator or master teacher. Outcomes for teachers participating in the pilot include:

- Participants will be confident mathematics teachers and have deep knowledge of mathematics and of how children learn mathematics.
- High-quality mathematics instruction in classrooms may provide a laboratory-like setting where participants can make their teaching accessible to the public (for observers or other stakeholders) in well-planned and deliberate ways.
- Participants will have a vision for what a Common Core mathematics classroom looks like.
- Participants will be prepared to work collaboratively with their colleagues to design and provide professional development and support individual teachers, schools and districts in improving mathematics instruction.

Partnership was a key component in bringing the pilot to fruition. The Department of STEM at CPS met monthly since 2015 with representatives from all three universities. As of 2018, those meetings are ongoing as teachers complete the program and partners look to add more teacher cohorts and expand access to the courses. Partners also worked together to secure commitments from principals, examine potential collaboration with other districts and universities, develop and manage the teacher application process, identify areas of need for kindergarten through fifth grade mathematics, ensure alignment with district priorities, secure resources for quality implementation and more deeply engage the ISBE.

University partners, paired with one or two CPS networks, worked closely with district staff to recruit teachers. In the fall of 2017, CME's funding supported the first full cohort of 45 teachers while its grantees continued to make progress on shaping the elementary math specialist endorsement. Recruitment for the first cohort resulted in teachers from grades three through six, based largely on principal recommendations. Given CME's elementary math focus and interest in recruiting teachers from kindergarten through fifth grade, and the potential to impact math instruction and learning throughout the elementary grades, the lack of kindergarten through second grade teachers opens the door for future work. CME will likely emphasize the need for expanded recruitment tactics that could include messaging for principals about recruiting teachers from the earlier grades.

For CPS, the Elementary Math Specialist Pilot will help the district achieve its vision for math education. With an emphasis on what happens in designated STEM classrooms, the vision says all students will:

- Actively make sense of and construct solutions to complex problems.
- Productively contribute to the learning community to support a culture of collaboration, risk taking and innovation.
- Regularly reflect on and communicate their understanding of disciplinary ideas.

"Every student should have these kinds of learning experiences while at CPS," McDermott said. "And I really do think that the key is focusing on what is happening in the early grades. It's truly easier to give them better learning opportunities in the earlier years and build on that than use a remedial approach."

"CME is really working closely with the district to meet our needs and solve problems," McDermott said. "They are listening to CPS and we've developed a strong partnership. CME really does have a good understanding of what should be happening and where we need to go."

EDUCATOR PERSPECTIVES

Shanteau Allen, a student in the EMS Pilot and third grade teacher introduced above, reflected on the Common Core as a tool to stimulate critical thinking in students and saw the standards as having had a role in pushing teachers to help their students build that skill. "The only way to get there is to shed some of the old ideas of learning, the old process of learning."

She also said that the Elementary Math Specialist Pilot is helping her take her teaching in new directions. "At the beginning of the school year, I give directions and parameters. My students take responsibility and can evolve that opportunity. They take ownership and build that throughout the year. They learn to talk and discuss, and I can step back and take notes. I can see what a group needs, or an individual needs and adjust."

On the EMS Pilot, Allen added, "The program has been informative and allows me to be reflective about my practice. I really love collaborating with other teachers and learning to use different strategies."

Tavormina, instructor at the University of Illinois at Chicago and former director of mathematics at CPS, said an important task of the pilot is changing mindsets. "Some elementary teachers have had bad experiences learning mathematics. Many have learned math as a set of rules, but we are working to help teachers deepen their understanding of the big ideas and see the relationships. Changing their mindset and their perspective can change how their students experience math. Getting teachers to engage with mathematics helps them see how they can achieve it and can lead to changes in the work they are doing in their classrooms."

Elena Arroyo said the first year of the EMS Pilot changed her teaching. "When I started this class in the winter of 2017, my first reflection paper was about my Catholic school education as a great foundation to my teaching. Now, I believe the opposite. I see how learning the way I was taught lacked a focus on why we were doing the work. Teaching concepts rather than teaching methods, tricks or arithmetic has improved my students' mathematical thinking skills and they can carry those with them for future success. I feel a lot stronger in math than I ever have, and my outlook has carried through to my teaching. I believe I am a better teacher and my principal has noticed my growth as well."

Reflecting on applying some of her lessons from the courses to her classroom, Arroyo said, "I really pause and think about why my students might be getting these problems wrong. Was it my teaching or delivery? Was I not clear? Did I go too fast? Is it because they need to work on their math fluency? All of these questions really help perfect my teaching and gear my instruction to individual or small group needs."

Marybeth Murphy, with 15 years of teaching experience in CPS and 10 years of experience in the Chicago Archdiocese in grades one through five, said her experiences in the pilot courses have been humbling. "I thought I knew a lot about math and teaching math but I really didn't. As a math leader for my school, I've attended most of the professional development classes offered by the district. It's typically been redundant and, I think, really designed for inexperienced teachers," Murphy added, in reference to the district-sponsored professional development.

Working in a school with a principal who sees the value of departmentalization in the early grades, Murphy has the rare opportunity to teach fourth grade math all day. "The longer I teach I see less drive in kids overall. They don't want to work or think about the problems, they want the answer right away. Sometimes I think I was not allowing enough think time because I was worried about preparing them for the standardized tests. I have learned through my classes at UIC that allowing this time helps children tremendously."

Her involvement in the EMS Pilot has given her new tools for her classroom to improve how her students learn and engage with the content. "The courses are highly interactive and they push us to really learn the content. Then I bring things back to my classroom to create positive experiences for my kids."

Murphy described wrestling with geometry using the Geometer's Sketchpad, an interactive software for learning and teaching math and geometry. "It was extremely challenging for older teachers, and it made me think about how kids think about math and what their experience is like. The more I practiced the easier it became, but it takes time and patience."

"And this is related to what the Common Core asks us to do," Murphy added. "There is more than one way to solve a problem, and I like that side of it. It helps us expose kids to different ways of thinking so they have more tools to solve problems."

She also said that the focus on process and discussion is helpful for students who are struggling because it makes them feel safer to make mistakes. "I've learned to take a step back and let students do more work. I put the problems out there and the kids have to work to get to the point of understanding. I feel like I'm a better teacher because of it. Ask any of the kids and they would say they love my class."

While Murphy said she looks forward to potential opportunities to serve more effectively as a teacher leader, she said there is simply no time to make it happen. "It's a great idea on paper, for me to bring my learning back to the school and work with other teachers, but we just aren't able to do it. It would take a mandate of some kind I think for it to happen."

Several teachers said the courses in the pilot have helped them understand that children need time to explore new topics and wrestle with concepts to strengthen their understanding. Carmela Rodriguez said she understands the importance of that kind of shift. "I admit that with limited time I tend to just tell the students what they need to know." But the courses in the EMS Pilot provided ideas to help her students explore and think for themselves. "I just have to be better at planning time in the day for exploring more."

Barb Geibel said that the courses in the EMS Pilot provided her with opportunities to explore concepts and build her understanding of geometry and that she will provide the same opportunities for her students. "I will no longer just tell my students that sum of the angles of a triangle equals 180 degrees. I will give them the opportunity to figure things like that out for themselves because I now know that is what will help them be academically successful with geometry."

Catalina Sanchez, in her eleventh year as a teacher, also teaches math throughout the day in grades six and seven due to a school decision to departmentalize middle school classes. In the EMS Pilot, Sanchez likes the consistent, ongoing schedule for the courses and the quality of the instruction. "I feel like I've grown more as an educator and improved the way I think through things for my students. Now that I've had this opportunity, I want to learn more. I want this kind of learning for every subject and every grade."

She also appreciates that her instructors from DePaul University teach the courses off campus, saving her travel time with a busy daily schedule. She said that demands on her time are a significant source of stress and that she thinks online learning options could help bring the classes to more teachers. But she also knows the pilot is designed to help figure out what works and what does not and that she is part of that process. "There has to be an example for people so they can see what it looks like and what you can really learn as a teacher. I was skeptical at the beginning and I told myself that if I'm not learning anything after the first semester I'll drop it. Clearly I'm still in it and I love it."

Sanchez's principal saw her leadership potential and nominated her as a teacher leader for the school, an opportunity that will build on her experience in the EMS Pilot. For the upcoming school year, Sanchez will participate in the interview process for new teachers and will be a designated teacher leader for grades five through eight. "I never really saw myself in that role of being a leader until I started seeing people ask me for help. I tend to stay in the background but I'm learning to take that on. It's also a great opportunity to have some influence on who will be hired and brought in to the school."

Alison Whittington, director of school support services at UChicago STEM Education at the University of Chicago, said they have organized the specific courses on teacher leadership to help teachers be advocates for math instruction in their school. That includes learning how to seek and build collaboration, support high-quality learning, secure buy-in from the principal and build a school action plan. "It's also important to understand that teachers can't be leaders in isolation. Context is really important, and teachers will have to connect their school to the big picture, to what the district is trying to accomplish." She added, "One of the hardest parts about teacher leadership is that you have to take the teacher hat off for a bit and wear the leader hat."

Mertens, with 20 years of experience in CPS as a math teacher and now an instructor at DePaul University, said the funding from CME triggered momentum to create a proof point with the Elementary Math Specialist curriculum and build toward the state endorsement. "I think CPS understands that elementary math achievement is lacking. The EMS Pilot acknowledges that teachers really want pedagogical and content knowledge to improve their practice. Let's build a critical mass of teachers that love math and teach it well."

SECURING A NEW STATE ENDORSEMENT

In December 2017, a working group[27] led by Debbie Leslie of University of Chicago, Lynn Narasimhan of DePaul University, and Kathleen Pitvorec of University of Illinois at Chicago organized a working meeting to discuss strategy and next steps for establishing, and then implementing, an elementary math specialist (EMS) endorsement (also called a certification) in Illinois. Nearly 70 people attended representing dozens of school districts and universities from the Chicago area and from around the state.

The meeting used three levers to build momentum toward an elementary mathematics specialist endorsement:

- The Elementary Math Specialist Pilot, which is serving as a prototype for a certification program.
- Numerous recommendations from education leaders and professional organizations that stress the need for math specialists in preschool through fifth grade.
- The fact that 20 states[28] have already established EMS certification requirements.

After the meeting, a subset of participants continued drafting language for two endorsements:

- An elementary math teacher endorsement which would emphasize direct work with students.
- An elementary math specialist endorsement which would build on math content and pedagogy and include additional coursework on coaching and leadership.

The group worked to submit the proposal to the Illinois State Board of Education by August 2018, knowing that the review and approval process for the state could take about 18 months.

"We've been drawing on the experiences of several other states," Leslie said. "Whatever we do in Illinois, we will try to leave tracks so others can learn from our efforts. We're also starting to pivot away from this as an internal implementation project to one with a communications need. We recognize that we need to start offering resources for teachers, principals and administrators to help build the case for using specialists in their particular local contexts."

If secured, the endorsements could have wide-ranging impacts on teachers and student achievement across Illinois, and much broader impact than district-sponsored certifications that exist, for example, in CPS.

"The endorsements would open up opportunities for teachers," Pitvorec said. "Many simply want to be better math teachers, which would be a core feature. But it would also create leadership and academic opportunities."

Teachers working to secure an EMS endorsement could earn university credit toward a master's degree if they do not already have one, use earned credits to step up in their pay scale and shape new teacher leadership standards related to math instruction.

Emily Fox, division administrator for the Division of Educator Effectiveness at the Illinois State Board of Education, said that there are two scenarios to consider in terms of state rollout and university participation. "If the math specialist endorsement is proposed to be earned through a state-approved program, institutions of higher education would need to develop programs and bring these programs to the State Educator

Preparation and Licensure Board and the State Board of Education for approval. The development of a program could take time as institutions of higher education would need to secure faculty, develop courses and ensure other necessary resources are in place."

Fox added, "If the math specialist endorsement is an 'add-on', or subsequent endorsement for any educator who currently holds a professional educator license endorsed in a teaching field, the process could be shorter as institutions would only need to develop courses. No program approval from ISBE would be necessary."

Narasimhan said she feels confident that the proposal to ISBE will be strong but recognizes there are still no guarantees. "We're all wondering what will happen with the endorsement. If it goes through, will districts have funds to help teachers take the required courses? Will there be any funding for it? Will the universities keep offering the courses? And if the endorsement is empty (available through ISBE but not adopted by schools and networks as a viable position), will any teachers complete it?"

TOWARD BROAD IMPACT

The goal of CME's Early Math Education Initiative and the Elementary Math Specialist Pilot is to change math instruction in the early grades across the state of Illinois. To get there, CME invested millions of dollars in early math initiatives to improve early math instruction and teaching. Those investments focused on improving learning opportunities for teachers. The Elementary Math Specialist Pilot, a decade in the making, advances that work with university partners while aiming for statewide change with a policy agenda.

"In philanthropy you have the flexibility to build on existing work to develop an idea, to take it further and to scale it," Davis said. "The EMS Pilot is an example of that."

Lopez said that foundations are well-positioned to focus on projects that last more than just a few years. "You have to build relationships and get to know the institutions. You have to develop your own knowledge on how to do this work well. Then you have to have an ability to think strategically no matter who the partners are or whether or not you are working with new leadership."

Leadership changes can undermine or slow progress, and CPS has seen plenty of transition in recent years. CME Group Foundation has positioned itself as a reliable partner for the district. The EMS Pilot, however, can also help serve as a buffer in times of transition to ensure progress is made on math instruction for the district simply by creating more skilled teachers and advocates.

"Over time, philanthropy is building the math capacity of the districts in the Chicagoland area," Lopez said. "Teachers will eventually become leaders and principals giving us more people on the ground to advocate for sustaining this work."

Chen said it is important to remember the challenge of working with so much complexity and layers of interests and needs, from students and teachers to school communities, networks and the entire district. "It's not always easy to work with more partners. But CME and The Chicago Community Trust have worked together and made sure that all of us are focused on making sure that there is system-wide change."

"It has been a great learning experience for me," Davis said. "I've never had a set of individual grantees that came together as a collaborative program working with schools and universities. I've never had this kind of collaboration turn into a policy agenda either. It's going to influence the entire state, impacting many more teachers and students."

Ultimately, the pilot is not sustainable if funded only by private philanthropy. "My next challenge," Davis said, "if the pilot is successful, is to see if we can impact more teachers with a reasonable amount of funding. We are the only funder, so we have to consider how to make the project sustainable and affordable."

CME invested $600,000 across three universities to support the final development of the pilot and the first cohort of teachers. But that kind of investment is difficult to sustain for the long-term and engages a relatively small number of teachers. Although the pilot has potential to positively impact teacher and student skill gains, CME leadership will have to commit to ongoing work with the universities and CPS to explore how to bring down the cost of university tuition and support teachers with professional development dollars from the district.

That said, Davis is committed to providing support for the pilot. Participating teachers have their tuition paid and the universities appear to be committed to bringing the courses to the teachers. Davis is also interested in stimulating teacher demand with subsidized tuition or scholarships.

Lopez suggested that funders, working with the district, needed to consider how to protect the infusion of knowledge gained by teachers. If many teachers who opt for the endorsement and complete the coursework, she said, are teachers with less experience or just starting their career, the district could opt to protect them in times of turnover.

Marybeth Murphy, a CPS teacher and student at the University of Illinois at Chicago, reflected on her growth mindset as a motivator for participating in the EMS Pilot. "If I can improve my instruction and become a better math teacher, then my test scores will improve and my whole class environment will be better."

"I'm really focused on helping my students have a great math experience," Murphy said, "and everything should stem from that."

LESSONS LEARNED

The effectiveness of the Early Math Education Initiative and the promise of the Elementary Math Specialist Pilot are directly connected to the way Davis and CME Group Foundation have engaged partners and remained committed to helping CPS change teaching practices and math outcomes for early learners. CME leadership has taken the time to develop relationships, understand institutional norms and processes and listen to what its grantees need to be effective in their schools and communities.

Mahon, commenting on Davis' approach to grantmaking, said, "She trusts the district and our university partners to thoughtfully address needs that are priorities for the both the foundation and Chicago Public Schools. She understands the need to fund projects over multiple years to build and refine strong programs."

Mahon said that when a funder takes the time to understand the needs and then helps develop a strategy or support an existing strategy, that strategy has a better chance of becoming a regular part of the work of the district. "Funded projects shouldn't feel like something extra or something that a CPS department does on the side. They should live as part of the department's long-term strategic plan."

CME employed several tactics over the past decade to ensure their grantmaking remained focused, strategic and responsive to the needs of Chicago students and teachers. CME leadership built its strategies on research and incorporated input and expertise from local partners and thought leaders such as Erikson Institute, Big Shoulders Fund and Ounce of Prevention Fund. They created a funding initiative that targeted early math education and focused on the crucial role and needs of teachers. CME also captured essential data and input from grantees to monitor outcomes and bolster support for the initiative. And they sought leverage points to help effect broad, systemic changes, such as capitalizing on Common Core implementation to advance and embed high-quality professional development in CPS and maximize existing momentum and partnerships from projects like the Algebra Initiative and the Chicago P12 Math Collaborative. CME also helped create conditions for its grantees to lead and advance the work. The EMS Pilot now serves as a prototype to help secure an ISBE endorsement, a process led by representatives from CME's university partners and stimulated by CME's investments, support and confidence in its grantees.

CME's effectiveness is also due in part to sustained leadership. Davis has served as the organization's executive director for 12 years, and CME's board has experienced very little turnover. In addition, both Davis and her board are committed to the same long-term vision for what early math investments can accomplish in CPS. Without that alignment and perseverance, the EMS Pilot may have never come to fruition.

"Looking back," Davis said, "specific steps helped the trustees really understand what we were accomplishing. We worked with Arabella Advisors to help us understand the outputs and outcomes from our grantees and tell the data story. We discovered that our grantees were working toward similar goals, so we developed measures for common outcomes in their work. Now, our data picture is clear and concise and captures key points each year that rolls up into our data dashboard. This makes it much easier to communicate internally about our outcomes and strategies, and it keeps us focused on the work."

Davis said that the development of the EMS Pilot was dependent on longstanding partnerships and a sound relationship with CPS, the Department of STEM and the university partners. CME positioned itself in a way that serves as an example of how to maximize the impact of a foundation dedicated to change in specific communities: philanthropy can help build and sustain long-term relationships, engage other foundations as partners and ensure the work continues. "It makes a lot of strategic sense to ensure those relationships remain strong and effective. They are really the foundation. They are what allow us to evolve the work, to seek better outcomes and to create solutions that really impact teachers and students."

SELF-STUDY QUESTIONS

1. What were the pivotal grantmaking moments for CME Group Foundation during the 10 years that led to the creation and launch of the Elementary Math Specialist Pilot? Is there anything else you might have done had you been on the foundation leadership team during this period?

2. How did the CME Group Foundation use research in its grantmaking? To what extent does research affect your grantmaking? How else could you use research in your work?

3. What partnerships were especially important in CME's work? What aspects of partnership stood out for you? Is there anything you would do differently? What characteristics did Davis and CME possess to make the partnerships effective?

4. How would you characterize the relationship between CME and the Chicago Public School District? How can funders work closely and effectively with districts beyond issuing checks and reviewing reports?

5. What impact did the Common Core State Standards have on teaching practices in Chicago Public Schools? What do you think about this impact? To what extent did CME and others use the Common Core as a lever for systems change?

6. In reading and reflecting on educators' perspectives, what stood out for you? Do you incorporate educator perspectives into your grantmaking strategies, and if so, how?

7. If the partners secure an endorsement from the Illinois State Board of Education, how could that impact teaching throughout the state?

8. How did consistency in leadership at CME help the foundation remain a stable partner for its grantees?

9. What observations and/or concerns do you have about the sustainability of the pilot?

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[27]Working group members include: Debbie Leslie, Andy Isaacs, Marty Gartzman and Alison Whittington from the University of Chicago; Lynn Narasimhan and David Jabon from DePaul University; and Kathleen Pitvorec and Mary Jo Tavormina from the University of Illinois at Chicago.

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PRINCIPLES FOR

Effective Education Grantmaking

principle no. 1

Discipline and Focus

In education, where public dollars dwarf private investments, a funder has greater impact when grantmaking is carefully planned and targeted.

principle no. 2

Knowledge

Information, ideas and advice from diverse sources, as well as openness to criticism and feedback, can help a funder make wise choices.

principle no. 3

Resources Linked to Results

A logic-driven "theory of change" helps a grantmaker think clearly about how specific actions will lead to desired outcomes, thus linking resources with results.

principle no. 4

Effective Grantees

A grantmaker is effective only when its grantees are effective. Especially in education, schools and systems lack capacity and grantees (both inside and outside the system) may require deeper support.

principle no. 5

Engaged Partners

A funder succeeds by actively engaging its partners — the individuals, institutions and communities connected with an issue — to ensure "ownership" of education problems and their solutions.

principle no. 6

Leverage, Influence and Collaboration

The depth and range of problems in education make it difficult to achieve meaningful change in isolation or by funding programs without changing public policies or opinions. A grantmaker is more effective when working with others to mobilize and deploy as many resources as possible in order to advance solutions.

principle no. 7

Persistence

The most important problems in education are often the most complex and intractable, and will take time to solve.

principle no. 8

Innovation and Constant Learning

Even while acting on the best available information — as in Principle #2 — a grantmaker can create new knowledge about ways to promote educational success. Tracking outcomes, understanding costs and identifying what works—and what doesn't—are essential to helping grantmakers and their partners achieve results.

Grantmakers for Education is a national network of hundreds of education philanthropies, united by a passion and commitment to improve public education and learning for all learners of all ages, cradle to career. Grantmakers for Education is a force multiplier, harnessing the collective power of education grantmakers to increase momentum, impact and outcomes for this nation's learners. We are proud to promote a culture of learning among education funders and provide a forum for interaction and engagement that builds upon and deepens the impact of our member's individual investments. Grantmakers for Education and its members believe in the power of what we can all achieve when we work together and learn from each other's successes and challenges.

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