Math for All Pilot Study:
Lessons Learned about Recruiting Schools and the Implementation of the Professional Development

Babette Moeller, Ph.D., bmoeller@edc.org, Education Development Center, Inc.
Barbara Dubitsky, Ed.D., dubitsky@bankstreet.edu, Bank Street College of Education
Marvin Cohen, Ed.D., mcohen@bankstreet.edu, Bank Street College of Education
Nesta Marshall, M.S.Ed., nmarshall@bankstreet.edu, Bank Street College of Education
Matt McLeod, M.Ed., mmcleod@edc.org, Education Development Center, Inc.
Karen Rothschild, Ph.D., Karen.Rothschild@gmail.com, Bank Street College of Education

Paper presented in B. Moeller (chair), *Math for All: Lessons Learned from Piloting an RCT in a Large Urban District,* symposium conducted at the Annual Meeting of the American Educational Research Association, Washington, D.C., April 10, 2016.

The research reported in this paper was supported by a grant from the U.S. Department of Education, Institute of Education Sciences (Grant No. R305A140488). Any opinions, findings, conclusions, or recommendations expressed here are those of the authors and do not reflect the views of the U.S. Department of Education.

1. Objectives or purposes

Standards-based reform holds great promise for increasing the rigor and quality of mathematics education for all students. The Common Core State Standards in Mathematics (Common Core State Standards Initiative [CCSSI], 2010) clearly recognize that all students "must have the opportunity to learn and meet the same high standards if they are to access the knowledge and skills necessary in their post-school lives" (CCSSI, 2010). To date, however, this promise has not been readily fulfilled. Even though research shows that teacher quality is the single most powerful influence on student learning (e.g., Darling-Hammond & McLaughlin, 1995; Nye, Konstantopoulos, & Hedges, 2004; O'Dwyer et al., 2010; Rivkin, Hanushek, & Kain, 2005), teachers often are not well prepared to implement standards-based mathematics education with the heterogeneous groups of students who are being served in general education classrooms, including students with disabilities and students with different capabilities, needs, and learning styles.

While there is a great need to improve the professional preparation of teachers, there is little rigorous evidence available to guide this process. A review of research on teacher professional development (PD) (Yoon, Duncan, Lee, Scarloss, & Shapley, 2007) attests to the paucity of relevant studies that link PD to student outcomes. Math for All (MFA) is one among a small number of PD programs that have been developed to help improve teachers' ability to support students with and without disabilities in achieving high-quality, standards-based learning outcomes in mathematics (e.g., Brodesky, Gross, McTigue, & Palmer, 2007; Moeller et al., 2012). While small-scale pilot and field tests have accompanied the development of these efforts, they have yet to be evaluated rigorously and on a larger scale. In Fall 2014, the Institute of Education Sciences (IES) funded an efficacy trial of MFA to help build the knowledge base on the impact of PD interventions. The purpose of this study is to examine the impact of MFA on both teacher outcomes (i.e., knowledge, skill, and classroom practice) and student outcomes (i.e., academic achievement in mathematics and perceived self-efficacy). The MFA efficacy study is being carried out in collaboration with Chicago Public Schools over the course of four years. During the 2014–2015 school year, the first year of our project, we conducted a small-scale pilot study to pilot-test our research instruments and procedures. Findings from this pilot study will be the focus of this and the other papers in this symposium.

The purpose of this paper is to set the stage for the other papers in this symposium by providing background about the MFA PD program and our current study. As the developers and facilitators of the program, we also will share our initial experiences with implementing the MFA PD during our pilot study. We will describe how recruitment and PD implementation were affected by the local context of Chicago Public Schools and will discuss how our findings informed our subsequent work during the efficacy study.

2. Perspective(s) or theoretical framework

MFA is a PD program created by Bank Street College of Education and the Education Development Center, Inc. (EDC) with eight years of funding from the National Science Foundation (NSF). The purpose of this program is to enhance the preparation of grade K–5

teachers to help all students—including those with disabilities—in general education classrooms achieve standards-based learning outcomes in mathematics. The MFA program consists of video case-based curriculum materials and learning activities that form the core of two workshop series for teachers, one focusing on grades K–2, and the other on grades 3–5.

Building on a neurodevelopmental framework for learning (Barringer, Pohlman, & Robinson, 2010; Levine, 2002; Pohlman, 2008), and utilizing a lesson-study approach (e.g., Fernandez, 2005a, 2005b; Lewis, 2000; Lewis, Perry, & Murata, 2006), the program supports teams of general and special education teachers in collaboratively planning and adapting math lessons to help all students achieve high-quality learning outcomes in mathematics. MFA helps teachers deepen their understanding of how to formatively assess students' strengths and needs; identify and reflect on possible barriers for students' engagement with standards-based math learning experiences; and use a variety of instructional strategies to teach standards-based math concepts and practices to support individual students' strengths and needs.

The MFA PD consists of five day-long sessions, and is intended to be implemented during a full school year to make it possible for participants to apply what they have learned and to complete assignments in their classrooms between workshop sessions. Each workshop series involves 30 hours of class time, plus 20 hours devoted to workshop-related assignments that participants carry out in their classrooms, for a total of 50 hours of PD during the course of one school year. Ideally, PD participants comprise teams of general and special education teachers who serve the same students at their schools. Where applicable, these teams also can include paraprofessionals or instructional aides, math coaches, and instructional support specialists who work with the teachers. MFA is intended to be co-facilitated by both a mathematics and a special education staff developer. The PD is facilitated either by the developers or by district-based staff developers who utilize the published PD materials.

Each of the five MFA sessions is organized around a standards-based case lesson. Learning activities are designed to deeply immerse participants in the mathematical activity of the case lesson. Participants use a neurodevelopmental framework to analyze the learning demands of the activity, observe a student engaged in the activity to assess the extent to which the student does or does not meet the demands of the activity, and analyze teaching practices and instructional strategies that build on individual students' strengths and address their weaknesses. After in-depth analysis of the case lesson in this fashion, participants connect what they have learned to their own classrooms. Working with the members of their team, they examine the mathematics of a lesson they will teach between workshop sessions, analyze the demands of the core mathematics activity, discuss the strengths and weaknesses of one or more focal children in relation to that activity, and plan adaptations to the lesson to support student learning. Workshop assignments require participants to implement their lessons plans, observe their focal students within that lesson, and reflect on and revise the adapted lesson. Participants also have reading

assignments to familiarize themselves with a neurodevelopmental framework of learning. During follow-up meetings, participants continue the collaborative lesson planning process, and reflect on the adaptations that they have implemented previously.

MFA differs from other commonly used approaches to PD in several important ways. PD in mathematics typically focuses on helping teachers deliver a particular curriculum. PD for helping teachers better meet the needs of students with disabilities often focuses on the delivery of instructional strategies (e.g., behavioral management, use of assistive technology, inclusion teaching), regardless of content area. Often, general education teachers and special education teachers do not attend the same PD (Birman et al., 2007). MFA represents a different kind of approach:

• Rather than focusing only on students with disabilities, MFA is designed to help enhance teachers' preparation to better reach all students, including students with and without disabilities. The underlying assumption is that students with disabilities are not fundamentally different from those without disabilities. Helping teachers to better understand the strengths and needs of individual students, and to differentiate instruction based on deep understanding of mathematical goals and different students' strengths and needs, is expected to benefit students both with and without disabilities.

• MFA is designed for both general and special education teachers, and the collaboration between teams of special and general education teachers is an integral part of the PD. This contrasts with approaches that target general education and special education teachers separately, typically with general education teachers receiving PD in content areas and special education teachers in the delivery of instructional strategies (Birman et al., 2007).

• MFA deeply integrates learning about differentiating instruction into the context of specific, standards-based mathematics content. MFA focuses on enhancing teachers' preparation to make decisions about how to adapt math lessons based on careful consideration of individual students' strengths and needs and the demands of the mathematical activities, while also maintaining the standards-based learning goals of the lesson. This contrasts with other approaches, such as PD in differentiated instruction, that focus on the delivery of instructional strategies across the curriculum.

• MFA is more comprehensive and intensive than the PD in which teachers typically participate to learn how to better meet the needs of students with disabilities. On average, teachers spend only 3.4 hours on this topic, typically in a single session (Birman et al., 2007). MFA involves 50 hours of PD conducted over the course of one school year.

• MFA is not focused on the delivery of a specific curriculum. Instead, MFA uses standards-based case lessons that were selected from various K–5 math curricula to engage teachers in reflection on how to make standards-based mathematics content accessible to diverse learners in different contexts. MFA also introduces teachers to a process of collaborative lesson planning that they apply, as part of the PD, to the particular standards-based

curriculum they are using in their school district.

The MFA professional development model has been extensively field-tested in more than 30 school districts in 10 different states. Results from the research attest to the feasibility of using the model in a variety of settings and to its promise for affecting teacher and student outcomes. Our research showed that the model has a significant effect on teachers' knowledge and classroom practices, regardless of whether it is implemented by the EDC and Bank Street program developers or by district-based staff developers—a finding that attests to the scalability of the program. Building on this broad evidence base, the next step within our program of research was to rigorously test MFA against a counterfactual using a randomized control trial (RCT) design, which is the goal of our current study.

3. Methods, techniques, or modes of inquiry

In 2014, EDC, in collaboration with Bank Street College of Education, ICF, Indiana University, and Teachers College, Columbia University, received funding from the Institute of Education Sciences (IES) to carry out an RCT study of MFA efficacy. The focus in this study is on teachers and their students in grades 4 and 5. Our research is designed to address the following four main questions:

(1) Does participation in MFA PD, compared to business-as-usual experiences of a control group, result in greater teacher mathematical content knowledge for teaching after the completion of the PD?

(2) Does participation in MFA PD, compared to business-as-usual experiences of a control group, result in greater knowledge about individual students' strengths, needs, and learning potential after the completion of the PD?

(3) Does participation in MFA PD, compared to the business-as-usual experiences of a control group, result in improved mathematics classroom practice in the year after the completion of the PD?

(4) Does the use of an MFA approach in the classroom result in improved 5th-grade student achievement at the end of the study (focusing only on students who were in the study for two years)?

Our study utilizes a cluster RCT, with schools serving as the unit of analysis and treatment. The collaboration of teachers under coordinated instructional leadership requires school-level assignment. MFA's focus on collaboration requires teachers to work together in a planned and coordinated manner, rendering infeasible a design that assigns teachers within schools to intervention and control groups. The school-level assignment also serves to minimize contamination effects between treatment- and control-group teachers. A requirement of this type of design is that all 4th- and 5th-grade general education and special education teachers who serve the same students within a school must participate in the study.

The MFA efficacy is being carried out in three phases. During phase 1, (2014–2015 school year), we conducted a small-scale pilot study to pilot-test our research instruments and procedures. During phase 2, we are carrying out the main study. Phase 2 spans two years:

the 2015–2016 school year, during which the PD is implemented, and the 2016-2017 school year, during which we will measure the impact of the PD. The main study involves 29 schools from Chicago Public Schools (CPS), 130 4th- and 5th-grade general and special education teachers, and approximately 2,500 students. The third phase of our project will be devoted to data analyses and dissemination, and to providing the MFA PD—if proven successful—to the control-group teachers.

Our focus in this symposium is on findings from the pilot study, which we conducted between January and June, 2015. Twenty teachers (ten general education, ten special education) and 339 students from four Chicago Public Schools (CPS) participated in this study. The teachers participated in the Math for All workshop series between January and April, 2015, and in baseline and follow-up data collection activities in January and June, 2015. Participating teachers' students were included in data collection activities in January and June, 2015, as well.

4. Data sources or evidence

Our study incorporates multiple measures for both teachers and students. Teachers' knowledge about mathematical content for teaching, individual students, and instructional strategies are being measured using teacher assessments (Hill, Schilling, & Ball, 2004; Meier et al., 2008). Classroom practices are being measured using the CLASS observation tool (Pianta, Hamre, & Mintz, 2012), and through logs that teachers submit at periodic intervals throughout the school year. Teachers also complete pre- and post-surveys and session feedback questionnaires to collect additional information about their backgrounds and their responses to the PD. Student measures include standardized mathematics achievement measures (PARCC, NWEA map test) and a student survey that combines a mathematics efficacy subscale from the Student Motivation Questionnaire (Karabenick & Maehr, 2007), and the Grade 3–5 Colorado Student Perception Survey (Colorado Education Initiative, 2014), which measures students' perception of their math instruction.

The findings that we are reporting on in this paper draw primarily on teachers' pre- and post-surveys, and their PD session feedback questionnaires. In addition, we utilized attendance records, facilitator notes, and notes from meetings with principal and district personnel as data sources.

5. Results and/or substantiated conclusions or warrants for arguments/point of view

Overall, we found the opportunity to conduct a pilot study extremely helpful. Not only did it allow us to pilot-test our research instruments and procedures, it also made it possible for us to learn about the context for the implementation of the PD and how we needed to fine-tune our recruitment strategies and the delivery of our program to be responsive to local circumstances. Below we summarize the key lessons learned.

Recruitment

• **We learned about recruiting in CPS.** Recruiting schools and teachers for our pilot study allowed us to learn about the approvals required and the process for recruiting for our RCT. We had to obtain approvals at various levels within the school system. Our initial contact was with the Director of the Department of Mathematics, who secured approvals from the District Leadership (the Chief of Teaching and Learning), and who introduced us to the Network Chiefs and their staff. The Network Chiefs who were interested in participating in the study put us in touch with Instructional Support Leaders (ISL), who serve as intermediaries between CPS' networks and individual schools. The ISLs put us in touch with schools, and facilitated their application process.

• **The pilot served as a means for recruitment.** Our pilot sessions themselves provided an opportunity to support recruitment for the RCT. We invited interested district and network staff to attend one of our workshop sessions so they could get a sense of the nature of Math for All professional development. Several district and network staff took advantage of this opportunity. Given the success of providing decision makers with "hands-on" demonstrations of our program, we subsequently conducted informational sessions for principals and assistant principals (APs) at monthly principal/AP meetings hosted by the networks. We used these meetings to provide information about the study, to provide brief demonstrations of PD activities, and to distribute recruitment materials. We asked those principals/APs who expressed nterest in the study to provide us with contact information. We also were able to conduct informational sessions at the annual CPS summer principal institute. These sessions were quite successful in generating interest among the school leaders, gave us contact information, made it possible for the school leaders to get to know us, and facilitated our follow-up with individual schools.

• **We learned about recruitment challenges.** Math for All builds on the collaboration among general and special educators who serve the same students, which requires the participation of teams (ideally pairs) of general education and special education teachers. In addition, our RCT design, which utilizes school-level random assignment, requires us to involve all general and special education teachers from our targeted grade levels (grades 4 and 5). Our recruitment efforts therefore were aimed at involving all 4th- and 5th-grade general and special education teachers who serve the same students from the participating schools. Meeting these recruitment criteria proved to be challenging, and we ended up with an initial pilot sample that was less than ideal. For some schools and grade levels, we had more general education teachers than special education teachers sign up for the PD, which implied a greater burden on the special education teachers, as they had to work with more than one general education partner. Another issue that we encountered was that the teams of general and special education teachers who attended did not necessarily serve the same students (e.g., a general education teacher was paired with a special education teacher who taught in a self-contained special education classroom). Not sharing the same students provides less of an incentive for general and special education teachers to plan together. Yet another challenge we encountered was that teachers changed schools or left the district

entirely—even in the middle of the school year. In some cases, we were able to follow up with principals and recruit additional teachers to more closely match our study requirements. These experiences helped to inform the refinement of our recruitment materials and procedures so that requirements for participation are clearly communicated and adhered to, and helped to ensure that the composition of our study sample is most productive for the PD and meets the requirements of our research design.

Implementation of the PD in CPS

The context of CPS influenced the implementation of the MFA program in several ways:

• First, the school district required us to conduct the PD on Saturdays. This is standard practice in CPS, to minimize impact on instructional time. While we were able to offer teachers compensation (at their regular CPS rate) for their participation in the PD, their attendance was voluntary. Principals were only able to recommend that teachers attend the PD, but could not make it a requirement. We found that some of the teachers we had targeted for the PD had scheduling conflicts or other obligations (e.g., child care) and were not able to attend the PD at all. Other teachers had to miss one or more sessions, resulting in a weaker immersion in the PD. These findings made us realize the need to offer additional PD opportunities (e.g., additional PD sessions offered on different dates) to allow teachers to make up sessions they have missed.

• Second, our PD brings together teams of teachers from multiple schools, offering the possibility for sharing of experiences across school buildings. However, we found that the teachers who participated in our pilot showed very little interest in connecting and sharing with teachers from schools other than their own. These findings helped us to refine our PD activities to foster more community building and exchange across schools, and to form cohorts of teachers based on common experiences—such as a shared math curriculum—to create incentives for cross-school collaboration.

• Third, teachers participating in the pilot invited us to visit their schools. Specifically, they asked that we provide them with feedback on their teaching, and that we connect with their principal so that they would be aware of what teachers are working on in the PD and support their efforts. These school visits proved to be very helpful in our work, as it gave us a better understanding of what each teacher required to make his or her math instruction more accessible, and how we could connect the PD to the work that he or she is doing in his or her classroom and to ongoing initiatives at his or her school. Through our meetings with principals, we learned that they would benefit from information about the specific topics and classroom and lesson planning strategies covered in the PD, so they could check in with teachers about this work, support the Math for All lesson planning process during shared prep times, and know what to look for when they visited teachers' classrooms. Based on the success of these visits and what we have learned from them, we are continuing the school visits as part of our larger study. We also are now using various communication strategies to keep the principals in the loop about our ongoing work with the teachers. We invite principals to join our PD sessions (and several principals have taken advantage of this offer), we provide regular email updates about each PD session for principals and share the tools

and assignments that we give to teachers, and we are planning further meetings with principals to engage them in planning how to support teachers' ongoing collaboration and lesson planning using the Math for All model.

6. Scientific or scholarly significance of the study or work

Conducting rigorous studies in the context of the complexities of large urban school districts is challenging, and there is a need to build a knowledge base about how to do this. Our findings contribute to this knowledge base.

Conducting a pilot study prior to the full implementation of a large-scale study offers many advantages. For us, as developers and facilitators of the PD, the pilot helped us to learn about the context of the school district in which we are working and allowed us to fine-tune our recruitment strategies and delivery of the PD based on this understanding.

Our findings also show how the implementation of an intervention such as ours interacts with the context of a local school district. They highlight the importance of documenting the implementation circumstances, of adapting programs to local conditions, and of understanding how and why interventions work.

References

Barringer, M-D., Pohlman, C., & Robinson, M. (2010). *Schools for all kinds of minds: Boosting student success by embracing learning variation*. Hoboken, NJ: John Wiley & Sons, Inc.

Birman, B., LeFloch, K.C., Klekotka, A., Ludwig, M., Taylor, J., Walters, K., Wayne, A., & Yoon, K.S. (2007). State and local implementation of the No Child Left Behind Act, volume II—Teacher quality under NCLB: Interim report. Washington, DC: U.S. Department of Education, Office of Planning, Evaluation and Policy Development, Policy and Program Studies Service.

Brodesky, A. R., Gross, F. E., McTigue, A. S., & Palmer, A. (2007). A model for collaboration: Study groups are an effective way to plan math instruction for students with special needs. *Educational Leadership 64*(5). Retrieved from: http://www.ascd.org/publications/educational-leadership/feb07/vol64/num05/A-Model-for-Collaboration.aspx

Colorado Education Initiative (2014). *Student Perception Survey, Grades 3–5*. Retrieved from www.coloradoedinitiative.org/studentsurvey/

Common Core State Standards Initiative. (2010). *Common core state standards for mathematics*. Retrieved from www.corestandards.org/Math

Darling-Hammond, L., & McLaughlin, M. W. (1995). Policies that support professional development in an era of reform. *Phi Delta Kappan*, *76*(8), 597–604.

Fernandez, M. (2005a). Learning through microteaching lesson study in teacher preparation. *Action Teacher Education, 26*(4), 36–47.

Fernandez, M. (2005b). Lesson study: A means for elementary teachers to develop the knowledge of mathematics needed for reform-minded teaching? *Mathematical Thinking and Learning 7*(4), 26.

Hill, H. C., Schilling, S. G., & Ball, D. L. (2004). Developing measures of teachers' mathematics knowledge for teaching. *The Elementary School Journal*, *105*(1), 11–30.

Karabenik, S. A., & Maehr, M. L. (2007). *MSP-Motivation assessment program: Tools for the evaluation of motivation-related outcomes of math and science instruction*. Ann Arbor, MI: University of Michigan.

Levine, M. D. (2002). *A mind at a time*. New York, NY: Simon & Schuster.

Lewis, C. (2000, April). *Lesson study: The core of Japanese professional development*. Invited address to the Special Interest Group on Research in Mathematics Education at the annual meeting of the American Educational Research Association, New Orleans, LA.

Lewis, C., Perry, R., & Murata, A. (2006). How should research contribute to instructional improvement? The case of lesson study. *Educational Researcher*, *35*(3), 3–14.

Meier, E., Powell, K. A., Hollands, F. M., Mineo, C., Moeller, B., & Dubitsky, B. (2008, March). *Math for All: An opportunity to develop our civic responsibility to inclusion students*. Paper presented at the annual meeting of the American Educational Research Association, New York, NY.

Moeller, B., Dubitsky, B., Cohen, M., Marschke-Tobier, K., Melnick, H., & Metnetsky, L. (2012). *Mathematics for All: Facilitator guide for grades 3–5.* Thousand Oaks, CA: Corwin Press.

Nye, B., Konstantopoulos, S., & Hedges. L.V.. (2004). How large are teacher effects? *Educational Evaluation and Policy Analysis*, *26*(3), 237-257.

O'Dwyer, L. M., Masters, J., Dash, S., DeKramer, R. M., Humez, A., & Russell, M. (2010). *e-Learning for educators: Effects of on-line professional development on teachers and their students: Findings from four randomized trials*. Chestnut Hill, MA: Boston College, Technology and Assessment Study Collaborative.

Pianta, R. C., Hamre, B. K., & Mintz, S. (2012). *Classroom Assessment Scoring System (CLASS): Upper Elementary Manual.* Charlottesville, VA: Teachstone.

Pohlman, C. (2008). *Revealing minds: Assessing to understand and support struggling learners*. San Francisco, CA: Jossey-Bass.

Rivkin, S. G., Hanushek, E. A., & Kain, J. F. (2005). Teachers, schools, and academic achievement. *Econometrica*, *73*(2), 417–458.

Yoon, K. S., Duncan, T., Lee, S. W-Y., Scarloss, B., & Shapley, K. L. (2007). *Reviewing the evidence on how teacher professional development affects student achievement* (Issues & Answers Report, REL 2007-No. 033). Washington, DC: U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance, Regional Educational Laboratory Southwest. Retrieved from http://ies.ed.gov/ncee/edlabs