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INTRODUCTION

Education Development Center (EDC), in collaboration with Bank Street College of Education, National Louis University, New Mexico State University, Salish Kootenai College, Illinois Resource Center, Illinois Regional Office of Education 47, and our evaluation partners Westat, ICF, and EdResearcher, is pleased to submit this proposal for an expansion grant to broaden the use of the Math for All (MFA) program. MFA is an intensive professional learning (PL) program **designed to help general and special education teachers in grades K–5 personalize rigorous mathematics instruction for a wide range of learners, including students who are performing below grade-level expectations, and students with disabilities**. MFA was developed by Bank Street College of Education and EDC with funding from the National Science Foundation and is published by Corwin Press (Moeller, et al., 2011; 2012, 2013a, 2013b). The program embeds multiple components that are supported by strong evidence that meets What Works Clearinghouse (WWC) standards without reservations.

The overall goal of this project is to implement, test, and refine strategies for expanding MFA to high-need schools that serve diverse populations in a variety of settings (urban, rural, suburban) across five different states from different geographic regions within the U.S. (Illinois, Montana, New Jersey, New Mexico, and New York). We define ***high-need schools*** as those with more than 14% of students with disabilities, more than 50% of low-income students, or more than 50% of grade 5 students performing below their state's proficiency level in math.

Building on Coburn's framework for scale (Coburn, 2003; Morel et al., 2019), our strategies are designed to enhance local capacity among school and district staff and teacher educators from educational service agencies (ESAs) and teacher education programs to support (1) the deep use of MFA instructional practices, (2) the sustainability and spread of these practices to new populations, including teachers of grades 6–8 and their students, and (3) a shift in responsibility for supporting MFA use to school staff. We anticipate that this project will result in **160 teacher leaders** who will implement MFA with **960 teachers of grades 3–6** to enhance their ability to personalize rigorous mathematics instruction and **improve mathematics**

achievement for the approximately 44,800 high-need students they are serving.

The research that will accompany this effort includes **a primary randomized controlled trial** (RCT) with 80 schools (across four cohorts) that is designed to determine if MFA's impacts can be successfully replicated in new settings and with different populations, to identify the conditions under which the program is most effective. A **scale-up study** that will follow the RCT includes 60 schools initially assigned to a business-as-usual (BAU) condition in the primary RCT and will investigate the effectiveness of our scale-up strategies. In addition, the research will examine **if impacts on teachers and students are sustained over time**, and provide information about the **cost-effectiveness** of the program when scaled across different geographic regions and locale types.

A. Significance

A.1. Urgent Need to Address Inequities in Mathematics Education

Educators have long been concerned about performance gaps in mathematics between students with and without disabilities (e.g., Judge & Watson, 2011) that are the results of systemic inequities in our education system. The COVID-19 pandemic has further amplified these concerns. As illustrated in Exhibit 1, results from the 2022 National Assessment of Educational Progress (NAEP) in mathematics showed both a dramatic decline in the percentage of all students who score at the proficient level compared to data from 2019, and a persistent gap in performance between students from the general population and those from low-income backgrounds and those with disabilities. Moreover, performance gaps arise early and often widen

Exhibit 1

2019 and 2022 NAEP Mathematics Assessment Results

Student Group Scoring Proficient or Higher	Grade 4		Grade 8	
	2019	2022	2019	2022
All students	41%	36%	34%	26%
Low-income students (National School Lunch Program)	26%	20%	18%	13%
Students with disabilities	17%	16%	9%	7%

as students progress through the grades.

These data are alarming. Mathematics is essential to our functioning in everyday life and is a prerequisite to many 21st-century careers. Research has shown that mathematics performance is closely linked with overall student success, such as achievement in high school, high school graduation, college readiness, and students' career aspirations (e.g., Balfanz et al., 2007; Lee, 2012; Shapka et al., 2006; Siegler et al., 2012). Thus, low mathematics performance threatens to limit students' opportunities to excel in life.

The learning needs created by the pandemic are multifaceted; they are not just academic in nature and often vary from student to student. For example, some students may have missed out on academic content (e.g., geometry) because teachers were unable to cover topics they may have considered less essential during emergency remote teaching. Some students need to work on listening and discourse skills in order to have productive conversations in math (e.g., Sparks, 2023a; Withers & Marchese, 2023), and many students struggle with mental health or social-emotional issues (Educators for Excellence, 2023). A variety of behavior issues also rose during the pandemic (EdWeek Research Center, 2023). Addressing these diverse needs requires comprehensive and personalized approaches that focus on the whole child and on nurturing a sense of belonging in mathematics in each learner (Moeller, 2023).

Supporting students during the pandemic recovery, addressing learning gaps, and going beyond a focus on recovery to *Raising the Bar*[1] to improve the education system by promoting academic excellence and boldly improving learning conditions are key national priorities for education (Cardona, 2023). A high-leverage solution to addressing the *Raise the Bar* priorities is to focus on teacher PL. Research shows that **teacher quality is the single most powerful influence on student learning** (e.g., Nye et al., 2004; O'Dwyer et al., 2010; Rivkin et al., 2005). High-quality PL is especially important for teachers to support students who are performing below grade level. Teachers must know how to appropriately personalize and scaffold lessons to

[1] *Raise the Bar: Lead the World* spells out the current vision for the direction of the U.S. Department of Education.

support students in accessing grade-level materials and accelerate their learning (The New Teacher Project, 2021).

Focusing on teacher PL promises to have more sustainable and longer-lasting effects than interventions designed directly for students, such as tutoring, after-school learning opportunities, and summer programs (Hill, 2021). These efforts are falling short for multiple reasons: Staffing shortages and scheduling challenges result in interventions being implemented with lower intensity and fidelity than recommended, and an intensive focus on academic remediation can make it difficult to engage students in these extra supports (Carbonari et al., 2022).

Improving the preparation of teachers to accelerate learning offers several advantages: It allows students to receive direct support with the curricular content they are experiencing in the classroom, it doesn't require students to spend a lot of time outside regular school hours to engage in learning, and teachers often know their students in multiple contexts and can use this knowledge to engage students and personalize instruction. Investing in teacher PL may also be more cost-effective, as teachers will be able to reach many students across multiple years.

However, despite the promise of PL for improving mathematics teaching and learning, teachers often do not have the support they need to address learning gaps and to support learners with unique needs, such as students with disabilities (e.g., Routten, 2023; Wang et al., 2023). In a recent survey conducted by Educators for Excellence (2023) with a nationally representative sample of public school teachers, only 24% of respondents strongly agreed that they have the training and resources needed to help students overcome learning setbacks due to COVID. The two areas for which most respondents wanted more PL and support were **supporting unique learners** (e.g., students with special needs) and **effectively collaborating with other school staff** who support their students (e.g., co-teachers, counseling staff). These findings attest to the high demand for more extensive and better teacher PL to improve mathematics education for high-need student populations.

A.2. MFA: An Effective Approach to Addressing Inequities in Mathematics Education

MFA is a PL program that is uniquely suited to address the need for improved PL on meeting

the needs of diverse learners in elementary school mathematics classrooms. Building on a neurodevelopmental framework for learning (Barringer et al., 2010; Fuller & Fuller, 2021; Pohlman, 2008) and using a lesson-study approach (e.g., Fernandez, 2005; Lewis, 2000; Lewis & Perry, 2017), MFA helps teachers better understand the strengths and challenges of individual students, the demands of math lessons, and instructional strategies that support students in gaining access to high-quality mathematics instruction. MFA also supports teams of general and special education teachers in applying their learning by collaboratively planning and personalizing lessons from their schools' math program to support the achievement of **all** students, including those with disabilities.

The MFA program consists of video case-based resources and experiential learning activities that form the core of two workshop series for teachers—one focusing on grades K–2, and one on grades 3–5. Each workshop series involves 30 hours of PL time and 10 hours devoted to workshop-related assignments that participants carry out in their classrooms (see Appendix G for the logic model and Appendix J.1 for more details about MFA content). In this project, we are planning to expand the use of MFA to teachers of grades 6–8 and develop materials that support facilitators in implementing MFA PL with teachers from this grade band. Our research will assess the impact of MFA on teachers from grades 3–6.

MFA has an extensive research base. It incorporates several components that meet strong evidence standards that have been highlighted in the WWC practice guide on *Assisting Students Struggling with Mathematics* (Fuchs et al., 2021). These include planning for systematic instruction to develop students' understanding of mathematical ideas, supporting the development of students' mathematical language, and using representations to support students' learning of mathematical concepts and procedures. Numerous studies attest to the effectiveness of these strategies for improving mathematics outcomes for diverse populations of elementary and middle school students with mathematics difficulties in different settings and regions across the U.S. (see Fuchs et al., 2021 for a review). MFA also incorporates several components that rigorous studies have shown to be effective for teacher PL, particularly teacher collaboration for

instructional planning and peer coaching across multiple subjects, including mathematics, resulting in improved student mathematics outcomes for diverse groups of students, including special education students, ranging from elementary school to high school age (e.g., Bos et al., 2019, which met WWC 4.0 standards without reservations, and Stevens & Slavin, 1995, which met WWC 3.0 standards with reservations).

Previous research on the efficacy of the MFA program conducted with funding from the Institute of Education Sciences (IES) demonstrated (1) statistically significant positive effects of MFA on teacher preparedness and comfort in teaching diverse students and on their classroom practices (respective effect sizes [ESs] were 0.583 and 0.712), and (2) promising findings regarding impact on students' performance on standardized achievement tests, with ESs ranging from 0.106 to 0.327 (Duncan et al., 2018).

We are currently completing a Mid-Phase EIR project focused on the regional expansion of MFA in three Midwestern and Northeastern states. As with many EIR grants, the implementation and research of our project was severely impacted by the COVID-19 pandemic. While we were able to continue to implement MFA and to support teachers as they struggled with teaching online and in socially distanced classroom, we were unable to collect student data for our first two cohorts of participants because state assessment tests were cancelled. We just completed MFA implementation for a third cohort of teachers, and will be able to collect and analyze administrative student assessment data this fall. However, we were only able to utilize a quasi-experimental design with our third cohort, because schools could not commit to random assignment during the height of the pandemic (spring of 2021) when they were recruited.

Although we were unable to carry out our Mid-Phase research as planned, MFA still uses practices that have been studied extensively, and are supported by strong evidence meeting WWC standards without reservations (see the Evidence Review Form). Furthermore, our Mid-Phase project has resulted in several important findings:

- We have **replicated positive impacts on teachers' self-efficacy** (perceived comfort and

preparedness to teach mathematics to students with disabilities) across two RCTs of MFA, our IES-funded efficacy study and the first cohort of our Mid-Phase project. ESs ranged from 0.380 to 0.541 for preparedness and 0.285 to 0.666 for comfort with teaching mathematics to diverse learners (Duncan et al., 2022a; Moeller et al., 2023). We also found that teachers' comfort and preparedness was modestly but consistently related to self-reported mathematical instructional practices across both studies, and in our IES-funded efficacy study to improvements in students' mathematics achievement. With similar results across the two RCTs even though the modes of delivery differed (PL was led by MFA developers in RCT #1 and by local facilitators in RCT #2) speaks to the scalability of MFA and the success of local capacity building as a strategy for scaling up.

- During the pandemic, we had to deliver MFA via online modes, which provided us with opportunities to formatively test the feasibility of implementing MFA in this way. We found that we were able to **deliver MFA online with a high degree of fidelity** to the program goals and content and with similar teacher outcomes as in the face-to-face version (Moeller, 2022). As a result, we can now offer MFA in-person, exclusively online, or as a hybrid, supporting the adaptability with a greater variety of implementation contexts.
- We have been able to conduct follow-up interviews with some teachers, local facilitators, and school leaders who participated in our first two cohorts to better understand longer-term impacts one and two years after participating in MFA. Key findings from this research include that **teachers continued to be mindful** of the (1) need to better understand their students' neurodevelopmental strengths and challenges, (2) utility of using concrete representations, and (3) importance of supporting the development of students' mathematical language. Interviewees also mentioned that MFA influenced their adoption of a new math program, vertical planning, peer observation, and instructional

planning in curriculum areas other than mathematics (Meier et al., in preparation).

A.3. MFA: An Innovative Alternative to Existing PL Approaches

MFA differs from other commonly used approaches to PL in five important ways: (1) MFA is designed to help **enhance teachers' preparation to personalize instruction using a neuro-developmental approach so they are able to better reach *all* students,** rather than focusing only on students with disabilities and other high-need students. Helping teachers hone their instruction to better understand the neurodevelopmental strengths and challenges of individual students, and to adapt instruction based on a deep understanding of mathematical goals and different students' strengths and challenges and how they learn best, benefits **all** students. (2) MFA is designed for **both** general and special education teachers, and **collaboration between the two is an integral part of the PL**. This contrasts with approaches that target general and special education teachers separately, typically with general education teachers receiving PL in content areas and special education teachers receiving PL in the delivery of instructional strategies (Birman et al., 2007). (3) MFA **integrates learning about personalizing instruction within a specific academic content area** (mathematics). This contrasts with other approaches, such as PL in differentiated instruction, that focus on the delivery of instructional strategies across the curriculum (e.g., behavioral management, use of assistive technology, inclusion teaching). (4) MFA is **more comprehensive and intensive** than PL 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). For this project, teachers will engage in 40 hours of PL over the course of one school year to embed MFA PL in their regular work schedules. (5) MFA engages teachers in **considering the whole child and the strengths each child brings**, rather than narrowly focusing on remediating deficits in academic performance when planning instruction.

By focusing on the scale-up of MFA, this project represents an exceptional and innovative approach for addressing both of the Absolute and the Competitive Preference Priorities of the

EIR program. We address **Absolute Priority One (Strong Evidence)** by scaling up an intervention that incorporates evidence-supported components that meet WWC standards without reservations that have been found effective with populations and in settings that overlap with those included in this project. We address **Absolute Priority Two (Field-Initiated Innovations)** by focusing on MFA, an intervention designed to improve low mathematics performance especially for high-need students, a problem of critical importance to many school districts across the country. We address **Competitive Preference Priority (Promoting Equity in Student Access to Educational Resources and Opportunities: Implementers and Partners)** by partnering with teacher education programs from two minority-serving institutions (MSIs) of higher education (National Louis University, headquartered in Illinois; and New Mexico State University), and Salish Kootenai College, a tribal college located in Montana. The partnership with these institutions provides us with exciting opportunities to expand our reach to schools that include a high proportion of teachers and students from traditionally underserved groups and to help us fine-tune MFA implementation for these populations with input from local teacher educators. These partnerships allow us to explore how MFA resources and strategies can be integrated into teacher preparation courses to further expand our work to pre-service teacher education.

B. Strategy to Scale

B.1. Specific Strategies to Scale that Address Past Barriers

Three key barriers we have encountered to scaling up MFA and ensuring the depth, sustainability, spread, and local ownership of its implementation are (1) the use of program developers rather than local facilitators to implement the PL, (2) insufficient local capacity to sustain and scale up MFA, and (3) a lack of MFA PL materials for middle school teachers. To address these barriers, we will take a **systems-based approach** to implementation, using three interconnected strategies, guided by Coburn's framework for scale (Coburn, 2003; Morel et al., 2019): (1) training local teacher leaders to serve as MFA facilitators, (2) building organizational capacity to support MFA PL, and (3) developing MFA PL resources for use with middle school

teachers. Each strategy is described in more detail below.

1. Training local teacher leaders to serve as MFA facilitators. School districts conduct the vast majority of their PL internally (e.g., The Boston Consulting Group, 2014), and this approach offers multiple advantages over having PL conducted by external consultants, who may have limited capacity to provide ongoing support and who may be geographically separated from teachers. Local staff developers and teacher leaders often have established ongoing relationships with teachers and schools and are familiar with school district priorities, which allows them to provide sustained and contextualized support. Consistent with Coburn's (2003) framework for scale, training local facilitators helps schools and districts build internal capacity and ownership of the intervention and enables them to spread the use of MFA within and across schools over time. In fact, MFA was developed with local facilitators in mind. Corwin Press published program materials that support facilitators in implementing the program.

Our Mid-Phase EIR grant demonstrates the promise of this approach. We trained more than 80 local facilitators from three different states and provided them with MFA program materials. We found that local facilitators implemented MFA PL with a high level of fidelity (Moeller et al., 2022) and were able to achieve impacts on teacher learning that mirrored those that were achieved when MFA developers facilitated the PL (Duncan et al., 2022 a, b).

A key focus of our continued scale-up efforts, therefore, will be on building the capacity of local teacher leaders to support, sustain, and expand MFA. Each participating school will select two teacher leaders (one general and one special education teacher) to be trained as local facilitators. Drawing on research on best practices in PL and leadership development (e.g., Darling-Hammond et al., 2017; Learning Forward, 2022), our MFA PL activities for facilitators use a content focus that (1) is aligned with professional standards and focused on instruction, organizational development, and change management, (2) uses problem-based learning strategies, such as case methods and inquiry into practice, (3) includes mentoring and coaching that support modeling, questioning, observation of practice, and feedback, and (4) incorporates collaboration among MFA facilitators and school leaders to facilitate teamwork and mutual

support. We will engage the teacher leaders ("local facilitators") in the following PL activities:

- **A two-day MFA summer institute.** We will build on and refine a previously developed summer institute for facilitators (see Appendix J.1) to give teacher leaders the opportunity to learn about MFA PL goals and activities, key PL content, and facilitation issues and to work with school leaders to adapt MFA with integrity for local schools. School leaders will be expected to join the summer institute for at least one day. We will also invite district administrators and staff from teacher education programs to attend. The summer institutes will be offered in person, but can be conducted online if preferred.
- **Participation in and facilitation of MFA teacher PL.** During the school year following the summer institute, MFA staff will model the implementation of the first three MFA workshops with teachers. Teacher leaders will also attend these sessions to learn about PL from a teacher's perspective and how it is facilitated (as modeled by MFA team members). The last two workshops will be facilitated by the local facilitators. At least one MFA team member will observe these sessions, support the local facilitators as necessary, and offer feedback on implementation. The MFA teacher PL can be offered in-person, online, or in a hybrid fashion, based on participating schools' and facilitators' preferences.
- **Ongoing support.** During the MFA implementation year following the summer institute, local MFA facilitators will receive ongoing support from MFA staff throughout the school year, to plan for and debrief MFA teacher PL sessions. This support will be provided online and will be driven by the needs and concerns of the local facilitators (e.g., adapting PL activities based on teachers' needs, providing feedback on teachers' work). We also will virtually reconvene the entire cohort of local facilitators who participated in the summer institute at least twice a year to foster a professional learning community (PLC) to share strategies for adapting the program to local contexts, and continued discussion of maintaining the integrity of MFA implementation.
- **Enhanced support for local facilitators.** While we were able to demonstrate through our Mid-Phase EIR research that local facilitators were able to implement MFA PL with a

high degree of fidelity, we found some differences in the perceived comfort with and preparation for leading PL among facilitators who differed in their prior experience with facilitating PL (Moeller et al., 2023). We are therefore interested in exploring if more sustained PL and coaching for teacher leaders will help to improve their comfort and preparation and the impact they can achieve for teachers and students. For this purpose, we will conduct a multi-cohort scale-up study (in addition to a primary impact study) to compare our standard version of support for local MFA facilitators (MFA-Standard: one year of support, including summer institute, participation in MFA PL for teachers, ongoing planning and debriefing of MFA PL sessions for teachers, facilitation of and coaching for two MFA workshops) to an enhanced version of support for local MFA facilitators (MFA-Enhanced: a second year of support, including ongoing planning and debriefing of MFA PL sessions for a new cohort of teachers, and facilitation of and coaching for five additional MFA workshops).

2. Building organizational capacity to support MFA PL. School and district leaders are essential for ensuring the depth, sustainability, and expansion of MFA. To allow for adequate depth of the MFA implementation, leaders need to (1) provide local facilitators and teachers with sufficient PL and planning time for the workshops, including the collaborative lesson planning sessions, (2) perceive MFA as a school-wide effort to foster collaboration among general and special education teachers within and across grade levels, and (3) help teachers and local facilitators connect MFA to other ongoing initiatives. Helping school and district leaders understand what implementing MFA involves and how they can support it, and having them work with local facilitators to create a plan for integrating the PL into their schools' existing PL schedules, helps all key stakeholders assume ownership of the program (cf. Clifford & Mason, 2013; Fink & Resnick, 2001; The Wallace Foundation, 2013).

To help school and district leaders (e.g., curriculum directors, special education directors, instructional support specialists) learn about MFA, they will be expected to participate in at least one day of the summer institute and at least one day of the MFA PL for teachers. In addition, we

will conduct quarterly meetings with these leaders to plan for and reflect on MFA implementation. As we have in our Mid-Phase grant, we will continue to develop resources (e.g., videos, podcasts, a monthly newsletters) and conduct webinars and mini-workshops to familiarize leaders with key ideas embedded in MFA, and will create tools (e.g., protocols for learning walks, fidelity of implementation [FOI] checklists) to help leaders, local facilitators, and their school communities reflect on implementation.

Local intermediary organizations that provide support to schools and school districts, such as **ESAs and teacher education programs**, can play important roles in deepening and sustaining the impact of MFA and expanding its reach. We successfully pilot-tested this approach as part of our current EIR Mid-Phase project by collaborating with the IRC (a regional PL provider in Illinois) and Illinois Regional Office of Education 47 (ROE 47), which proved to be highly productive for supporting program implementation, helping to sustain MFA practices, and expanding MFA PL to new audiences. As Chu et al. (2022) noted, local intermediary organizations represent an enormous, yet typically untapped, scaling potential, given their broad reach and influence. In this project, we will expand our collaboration with local intermediary organizations by including staff from teacher education programs from MSIs and additional ESAs in the PL we offer teacher leaders, as well as in meetings and PL sessions for school and district leaders, to build the capacity of their institutions and agencies to support MFA implementation and to incorporate MFA PL services into their catalogue of services after grant funding ends. Staff from these local institutions will be able to make important contributions to adapting MFA to the local contexts of the schools they work with, and to further expanding the use of MFA resources and strategies by integrating them into pre-service teacher education courses and supervised fieldwork experiences in school settings.

To support the implementation of MFA and facilitate the exchange of ideas, experiences, and resources, we will establish **an online PLC** that will connect stakeholders (local facilitators, school and district leaders, teachers, teacher educators, and staff from ESAs) with the MFA team members and with one another. We will use adaptive, mobile-friendly virtual support tools, such

as Articulate 360's Rise platform, to ensure asynchronous access to technology-based supports that can be readily embedded into participants' work schedules. We will provide micro-PL resources, such as short videos, animations, checklists, and other tools that provide immediate benefit to the staff. A resource section will include links to further readings, models for integrating MFA PL into various school contexts, video-based virtual visits to model classrooms and schools, alternative activities and extensions for PL sessions, and work samples, such as personalized lesson plans from teachers. Math for All will also host live and recorded webinars focusing on such topics as facilitation issues, mathematics content, and the specific needs of diverse learners.

3. Developing MFA PL resources for use with middle school teachers. Many schools and districts we have worked with previously have asked for MFA PL for teachers of grades 6–8 to allow for school- and district-wide implementation and to help ensure continuity and sustainability of accessible, systematic mathematics instruction for students as they move through the grades. The need for PL for middle school teachers is particularly acute, as middle-schoolers were especially hard hit by the pandemic, showing the largest drop in mathematics performance (NCES, 2022; Yoder, 2022). To address this need, we will develop two 20-hour MFA middle school PL modules during the first nine months of this project. The design of the models will incorporate strategies we have found effective in our work with K–5 teachers. We will seek input from participating teacher educators from our various partner organizations, including MSIs, to help guide the design and refinement of these modules and to ensure their relevance to different populations of teachers. The modules will focus on two topics that are critical content for learning middle school math (CCSI, 2010): ratio and proportion, and functions and equations. The resources for the grades 6–8 MFA modules will be pilot-tested in pre-service and in-service courses offered during the spring and summer 2024 by the participating teacher education programs (Bank Street College, National Louis University, New Mexico State University, and Salish Kootenai College) as well as in summer workshops for in-service teachers. The pilot tests will gather data about implementation feasibility and the impact

on teachers and their students, and these findings will guide further refinement of the program materials. This work will result in revised versions of the two grades 6–8 MFA modules and related resources (e.g., slide decks, videos, teacher handouts, facilitation guidelines) which will be ready for use with Cohort 1 teachers in fall 2024.

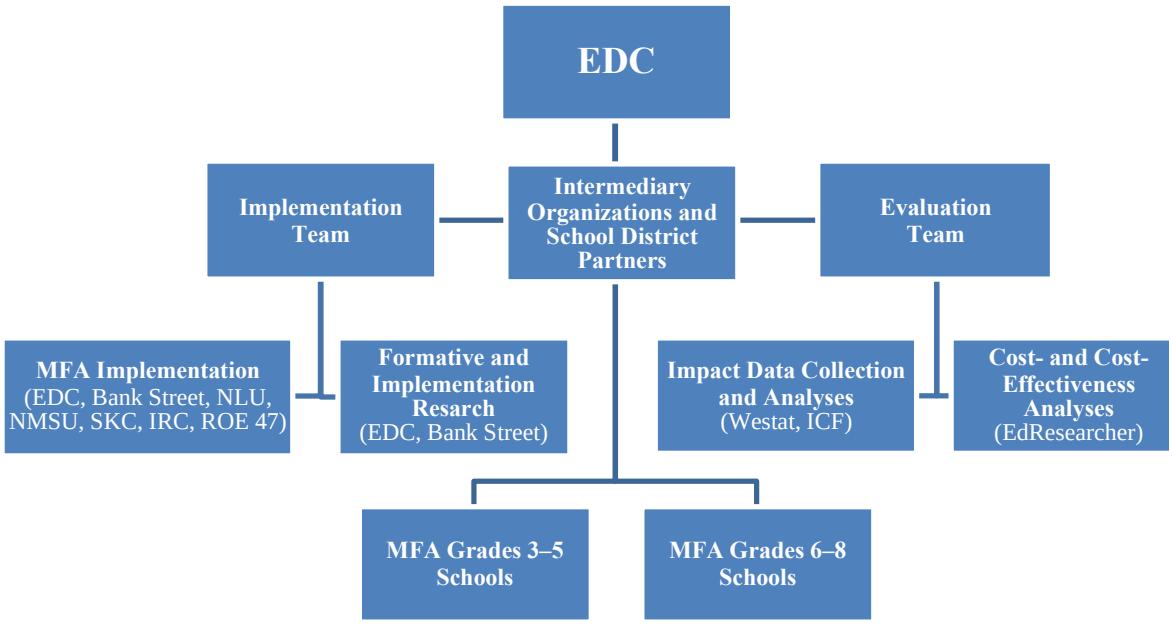
B.2. Management Plan: Responsibilities, Timelines, and Milestones

The project will be led by EDC, a nonprofit educational research and management organization with an exceptional 65-year track record in managing large-scale projects and completing them on time and within budget. Annually, we are entrusted with more than $150 million in grant and contract revenue to manage more than 250 programs. Staff are supported by strong business and technical services. EDC has made an institutional commitment to sound project management practices and has trained and certified 180+ staff in PMD Pro, including members of the EDC team leading this work.

Exhibit 2 shows our organizational chart. We will leverage our ongoing, successful partnerships with several organizations to serve on the implementation team: Bank Street

Exhibit 2

Organizational Chart



College of Education (BSC), a graduate school for education; ROE 47, a regional superintendency that provides supervision and support services to school districts in Illinois; and Illinois Resource Center (IRC), a nonprofit organization that provides PL and technical assistance (TA) on working with multilingual student populations to districts and schools across Illinois. We will be joined by new partners who will help us broaden our reach to new and diverse populations in different geographic regions: National Louis University (NLU) and New Mexico State University (NMSU), two Minority-Serving IHEs; and Salish Kootenai College (SKC), a tribal college in Montana. Together with these entities, we are submitting a group application, as described in EDGAR part 75.127. Our external evaluators Westat and ICF will be subcontractors to EDC, and EdResearcher will serve as a consultant to conduct the cost research.

Major milestones, timelines, and the entity responsible for each project activity are detailed in Appendix J.4, and Exhibit 3 lists the responsibilities of key project staff. A management plan is included in Appendix J.5. As the lead organization, EDC will oversee all project activities and serve as the contact to the U.S. Department of Education**.**

Exhibit 3

Roles, Experience, and Primary Responsibilities of Key Personnel

Role in Project	Experience and Primary Responsibilities for Project
[redacted], **PhD (40% FTE in Yr. 1, 70% FTE in Yrs. 2–5)** Principal Investigator (PI)	• Distinguished Scholar at EDC • More than 35 years of experience conducting educational research; served as PI for an IES-funded RCT and an EIR Mid-Phase project • Lead developer of the MFA program • **Will oversee all project activities, co-direct the implementation team, and contribute to formative data collection and analyses**
[redacted] [redacted] **MA (20% FTE in Yrs. 2–5)** Director for Strategic Partnerships	• National expert in science, educational technology, and policy • Extensive experience in philanthropy • **Will develop strategic partnerships with organizations related to mathematics education and PL to grow the reach and impact of MFA; lead the development of digital resources to engage communities of users**
[redacted], **MEd (40% FTE in Yr. 1, 70% FTE in Yrs. 2–5)** Co-PI	• Mathematics educator and expert in K–12 instructional design and PL • Extensive experience in writing and field-testing curriculum, assessments, and guiding district policy related to mathematics education • **Will co-direct the implementation of MFA PL, the development and refinement of MFA program materials including the online PLC**
[redacted], **MSEd (40% FTE)**	• Special education faculty member at Bank Street • **Will co-direct the implementation of MFA PL and the development and**

Role in Project	Experience and Primary Responsibilities for Project
Co-PI	**refinement of MFA program materials including the online PLC**
[redacted], **PhD (20% FTE)** Director of NLU Team	• Associate Professor, Elementary and Mathematics Education, NLU • **Will coordinate NLU staff participating in MFA implementation and pilot-testing of MFA resources and strategies in pre-service courses**
[redacted], **PhD (20% FTE)** Director of NMSU Team	• Director, School of Teacher Preparation, Administration, and Leadership, NMSU • **Will coordinate NMSU staff participating in MFA implementation and pilot-testing of MFA resources and strategies in pre-service courses**
[redacted], **EdD (20% FTE)** Director of SKC Team	• Director, Secondary Mathematics Program, SKC • **Will coordinate SKC staff participating in MFA implementation and pilot-testing of MFA resources and strategies in pre-service courses**
[redacted] **(5% FTE),** Co-PI	• Director of professional learning for ROE 47 in Sterling, Illinois • **Will coordinate MFA implementation in schools served by ROE 47**
[redacted], **MA (5% FTE),** Co-PI	• Director of graduate studies, PL, and TA for teachers, administrators, and parents of multilingual learners/ELLs offered by IRC • **Will coordinate IRC staff participating in MFA implementation**
[redacted], **PhD (21% FTE)** Director, External Evaluation	• Westat, Associate Director, with extensive experience leading large federally funded RCTs, meeting WWC evidence standards • Served in leadership roles for WWC since 2003 • **Will direct the MFA external evaluation team overseeing data collection and analysis for the quantitative impact analyses**
[redacted] **PhD (13% FTE)** Lead Analyst	• Research analyst at ICF with more than 22 years of experience • Special expertise in research design, multilevel modeling, statistical programming, data management, and data and statistical simulations • **Will help refine the evaluation design and conduct randomization of schools and statistical analyses**
[redacted], **PhD (16% FTE)**	• Founder and Managing Director, EdResearcher • **Will oversee the cost and cost-effectiveness analyses**

EDC and BSC staff will be responsible for establishing a productive two-way partnership with teacher educators from our new partners (NLU, NMSU, and SKC) during the first nine months of the projects. The focus of these efforts will be on helping partners learn about MFA, and for EDC and BSC (MFA developers) to learn about the partner organization and their local contexts. Staff from EDC, BSC, NLU, NMSU, SKC, ROE 47, and IRC will serve as the implementation team, responsible for conducting the summer institutes for teacher leaders and school leaders and leading the MFA PL for teachers. They will contribute to the development and refinement of new PL resources and materials. EDC and BSC staff will contribute to formative and implementation research. To ensure the objectivity of the evaluation, Westat will lead the impact evaluation in collaboration with ICF and EdResearcher; these organizations were

not involved in the development of the MFA program and have no financial interest in the outcome of the evaluation. The evaluation team, under the leadership of Westat and ICF and in collaboration with EdResearcher, will refine the evaluation design, assign schools to study conditions, and collect and analyze the data. Westat and ICF will lead the study design and quantitative data collection and analyses. EdResearcher will conduct cost and cost-effectiveness analyses. Staff from all collaborating organizations will contribute to dissemination activities.

The partners participating in the implementation and evaluation teams will each conduct weekly meetings to coordinate project activities. In addition, monthly meetings will bring together representatives from all partner organizations to update one another about the ongoing work, reflect on program implementation and emergent research findings, review progress toward meeting objectives, and plan next steps.

B.3. Capacity to Bring the Project to Scale

As detailed in Exhibit 3, project staff are highly qualified and have extensive experience in teacher PL, math education, special and bilingual education, qualitative and quantitative research, product development and dissemination, and the management of large-scale collaborative research and development efforts. We also have commitments from five distinguished advisors, who will add additional expertise with PL, teacher education, high-need student populations, and education business development and scale-up (see Appendix C for letters of commitment and Appendix J.6 for biographical information): [redacted] Vice President of Academic Services at the Northwest Evaluation Association (now a division of HMH); [redacted] Vice President of Math Product Management and Marketing at Savvas Learning Company; [redacted] Vice President of TODOS: Mathematics for All and Professor of Bilingual and Bicultural Education, University of Texas at Austin; [redacted] Distinguished Professor Emeritus of Mathematics at the University of Arizona, and co-founder and CEO of Illustrative Mathematics; and [redacted] Founder and Executive Director of Beyond100K. We will consult with the advisors both individually and as a group through web conference calls, and face-to-face meetings. Advisors

will spend one day per year providing technical advice.

Our project team has **considerable capacity** to implement the project at the proposed scale. Our implementation team consists of 12 highly experienced staff developers who have previously supported the training of more than 150 MFA facilitators and more than 1,000 teachers across nine different states. Our **partnership with teacher education programs and regional PL providers** will add to this capacity and allow us to establish an infrastructure for supporting and expanding MFA implementation across five different regions, beyond the duration of this grant. In addition, we will explore how partnering **with one or more K–8 mathematics curriculum developers and PL providers** could enhance our capacity for even larger distribution. Our scale-up efforts will be supported by [redacted] who will serve as Director for Strategic Partnerships. He will contribute to our expansion efforts by building collaborations with other organizations in the field that can expand the impact and reach of MFA, and lead business planning efforts to sustain MFA once federal funding ends.

We believe it is highly feasible to expand MFA implementation to a larger scale because: (1) **Resources to support local facilitators in the implementation of MFA are published and readily available**, and we will develop and refine additional resources as part of this project. (2) The **online version of MFA** we developed during the pandemic as part of our EIR Mid-Phase grant allows us to now offer MFA in-person, exclusively online, or as a hybrid, supporting adaptability to a greater variety of implementation contexts. (3) Through our previous work, we have demonstrated that **local staff developers can implement MFA PL with fidelity** in various settings and with diverse populations of teachers (Moeller et al., 2022 b).

B.4. Dissemination Activities to Support Further Development or Replication

Numerous dissemination activities will help us to: (1) widely **disseminate our findings** to other PL programs, PL providers, mathematics educators, administrators, researchers, and policymakers to guide future PL development, implementation, and research, and (2) create a variety of assets and resources to **engage past, current, and future participants** in MFA content, to build an active community of users who can help support future expansion of MFA.

The **research findings** this project will generate have the potential to make important contributions to the knowledge base. We will use a variety of strategies to broadly disseminate findings, including **presentations at regional and national conferences** (e.g., regional meetings of the National Council of Teachers of Mathematics, annual meetings of the National Council of Supervisors of Mathematics and the American Educational Research Association), **publications in peer-reviewed journals** (e.g., *Journal for Research on Mathematics Education*, *Exceptional Children*, *Journal of Mathematics Teacher Education*), and participation in **webinars** hosted by the EIR TA team or by EDC and our partner organizations. We will also create **research briefs** that will be available through the MFA website, and produce brief **videos** that we will disseminate through our website and social media channels. All research reports will be submitted to ERIC, and all publications and products, including our final evaluation report and the PL resources we develop, will be 508-compliant, openly licensed, and made publicly available through the MFA website. We will **leverage the large regional and national communication networks** of the partner organizations participating in this project to share information about the availability of these resources and to amplify our efforts.

We also are participating in several **research-practice networks**, which will allow us to share our findings through networking with other PL researchers and practitioners, present at meetings, and contribute to collaborative publications. These networks include the **communities of practice hosted by the EIR TA team**, **Beyond100k**, and the recently established **Research Partnership for Professional Learning (RPPL)**—a network of PL providers, researchers, and funders working to build a strong evidence base about PL that meets the needs of teachers, students, and school systems. MFA was recently selected as an affiliate of the RPPL network. The research questions we will address in this project are well-aligned with the RPPL agenda and will offer us opportunities to contribute findings to a larger shared research effort.

A second focus of our dissemination efforts will be on continuing to build a **community of past, current, and future MFA users to support both sustainability and future scale-up**. Our mailing list currently has more than 1,200 subscribers, and is steadily growing. As in our Mid-

Phase project, we will continually generate new MFA content (e.g., videos, podcasts, blogs, classroom activities, PL resources) and use various dissemination channels (the MFA website, social media channels, monthly e-newsletter) to engage this community with MFA ideas and share free resources. We maintain a database of our subscribers with detailed information about their roles (e.g., teacher, teacher leader, administrator), geographic location, grade level, etc., allowing us to target our engagement efforts based on subscribers' specific information needs.

B.5. Utility of Products and Their Potential for Use in a Variety of Settings

This project will result in a number of **products and resources that will support local facilitators and administrators in implementing MFA**. The MFA program for grades K–5 teachers was developed prior to our receiving funding from the EIR program and is published and distributed by Corwin Press. The resources and materials we will develop for implementing MFA with middle-grades teachers will be openly licensed and made available through our website. We will use various dissemination channels (e.g., social media, webinars, conference presentations) to make staff developers, teacher leaders, school and district leaders, and teacher educators aware of the availability of these resources. The design of the PL resources for grades 6–8 teachers will be guided by the design of our K–5 materials, which have been successfully used in various settings and with diverse populations of teachers across multiple states and have supported local facilitators in the implementation of MFA with high fidelity (Moeller et al., 2023). To help ensure that our K–5 and 6–8 resources are used with high fidelity, we will develop checklists to allow local facilitators and administrators to self-monitor FOI. We will also provide additional implementation support by offering facilitator training institutes on a fee-for-service basis through Bank Street's Continuing Professional Services program.

We anticipate that our **research findings** will make important contributions to the knowledge base and will advance the field's understanding of (1) **effective PL strategies to help teachers personalize rigorous mathematics instruction for students with diverse strengths and challenges**, including those from traditionally underserved student populations, (2) how a PL program like MFA **fits into different school contexts** and what supports are necessary to

implement it with fidelity, (3) **effective strategies for scaling and sustaining** a teacher PL program like MFA across different geographic regions and locale types and with different populations, (4) approaches for integrating effective PL strategies into **pre-service teacher education**, and (5) the **cost and cost-effectiveness** of a PL intervention when implemented at a large scale. Our efforts to openly license and broadly disseminate reports and articles to share these findings will inform a large number of education leaders (e.g., staff developers, teacher leaders, and school and district leaders) about effective approaches and strategies for supporting teachers in making high-quality mathematics education accessible to all students. Education leaders also will find our research findings useful to make decisions about MFA adoption and whether the program is suitable for their setting, their student and teacher population, and their available financial resources. Researchers may use our findings to contribute to theory building about PL and to guide future research. Policymakers may use them to guide decision making about policies, such as teacher PL requirements or how to prioritize which types of PL are critical for districts to make time for during teacher's regular working hours.

C. Project Design

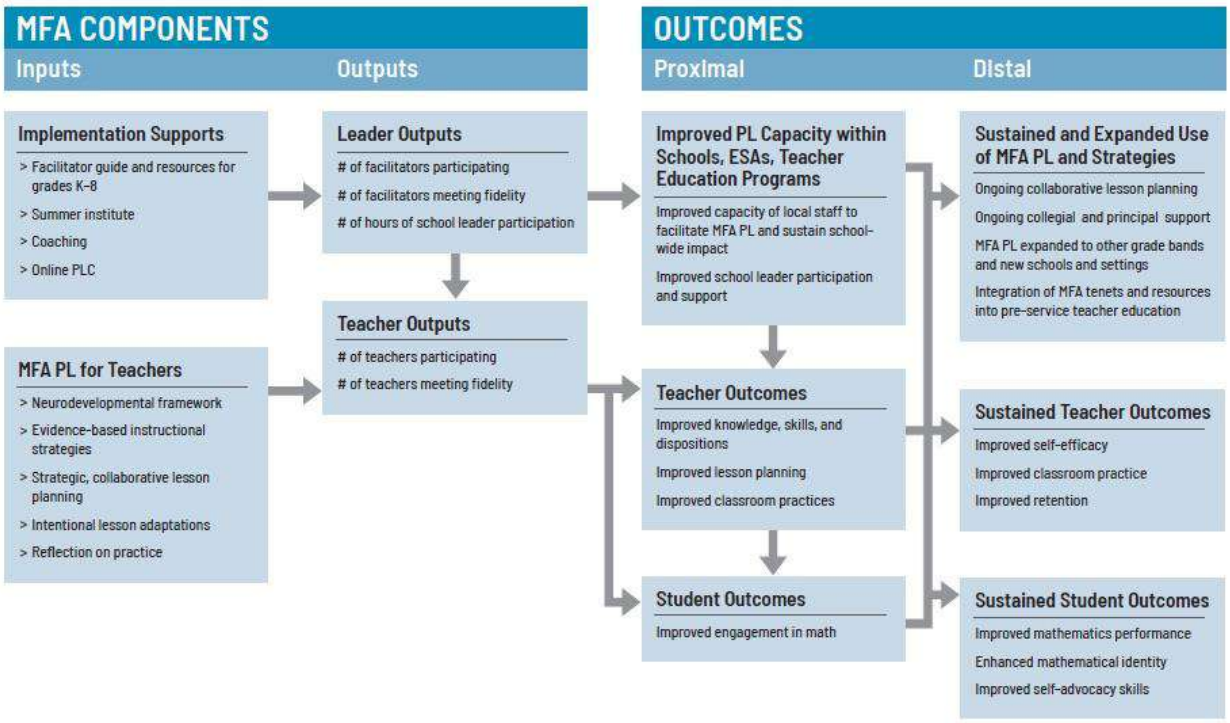
C.1. Conceptual Framework

Exhibit 4 illustrates the logic model for this MFA expansion effort, which guides project implementation and evaluation. We anticipate that the resources, PL, and support provided to teacher leaders will enable local facilitators to **implement MFA for teachers** with a high degree of fidelity, while adapting the PL to each school's specific context. Including school leaders and staff from intermediary organizations in the PL will help to ensure that teacher leaders have the **support they need to implement MFA PL** and teaching practices with high quality. The MFA PL, in turn, will enable teachers to plan and implement systematic, **high-quality mathematics instruction**, and to make intentional choices about the use of evidence-based instructional strategies based on an understanding of individual students' strengths and challenges, the goals of the lessons they teach, and the neurodevelopmental demands of mathematical activities. Improved, personalized mathematics instruction will result in **enhanced engagement and self-**

confidence, and improved mathematics performance of their students. See Appendix G for the logic model and theory of change for the MFA PL for teachers and more details about anticipated teacher and student outcomes and the variables that may moderate outcomes.

Exhibit 4

Logic Model for MFA Expansion Project



Our efforts to scale up MFA and the choice and design of implementation supports are guided by Coburn's framework for scale-up (e.g., Coburn, 2003; Morel et al., 2019), which acknowledges the **multiple dimensions of scale** that are needed for interventions to create deep and lasting change: (1) depth of implementation, (2) sustainability, (3) widespread use of an intervention (i.e., spread), and (4) shift in reform ownership. See Appendix J.2 for details about how our scale-up strategies align with these dimensions of scale.

C.2. Goals, Objectives, and Outcomes

The purpose of this project is to rigorously test and refine strategies to support MFA implementation, sustainability, and broad expansion working across four cohorts of 20 schools from 2024–2028. **We plan to implement MFA with 160 teacher leaders (two per school), 80**

school leaders, and approximately 960 teachers of grades 3–8, who work with an estimated number of 44,800 students. A timeline of activities is included in Appendix J.4. Exhibit 5 gives an overview of the goals and objectives we will pursue, and the measures we will use to establish outputs and outcomes. See Appendix J.5 for a detailed management plan.

Exhibit 5

Goals, Objectives, Measures, Outputs, and Outcomes

Goal 1: Prepare Local Facilitators and School Leaders to Implement MFA PL		
Objectives	**Primary Measures**	**Outputs and Outcomes**
Conduct two summer institutes per cohort	Attendance records, surveys, PL implementation plans, interviews, observations	160 MFA facilitators, 80 school leaders, and 20 IHE/ESA staff trained
Provide one year of support to 80 pairs of MFA facilitators	Attendance, surveys, interviews, and observations	160 MFA facilitators receive support
Second year of coaching to a subsample MFA facilitators	Attendance, surveys, interviews, and observations	60 MFA facilitators receive follow-up support
Refine facilitator supports using formative and fidelity of implementation (FOI) data	Project meeting notes, annual report on revisions made	Improved facilitator institute and ongoing support
Goal 2: Local Facilitators Implement MFA PL for Teachers with High Fidelity		
Objectives	**Primary Measures**	**Outputs and Outcomes**
Develop, pilot-test, and refine PL resources for grades 6–8	Resources developed	Facilitator guide and teacher resources for two modules
Local MFA facilitators implement MFA PL	Attendance, observations logs, teacher work samples	Facilitators implement MFA PL; teachers are prepared
Goal 3: Evaluate MFA Impact; Meet WWC Standards Without Reservations		
Activities	**Primary Measures**	**Outputs and Outcomes**
Collect and analyze student and teacher impact data	Teacher surveys and logs, student achievement data	Teacher impact findings; mediator/moderator analyses
Collect and analyze FOI data	Facilitator/teacher logs and checklists, work samples	Implementation findings across facilitators and teachers
Analyze data to establish treatment contrast	MFA and Business-As-Usual (BAU) surveys, logs, interviews	Understand teachers' non-MFA PL experiences
Collect and analyze cost-effectiveness data	MFA/BAU descriptions; interviews, surveys	Cost-effectiveness findings for both RCTs
Refine study materials and procedures	Records from weekly research team meetings	Improved materials and annual report on revisions made
Goal 4: Build Infrastructure for Continued MFA Expansion and Disseminate Findings		
Activities	**Primary Measures**	**Outputs and Outcomes**
Stakeholder meetings to plan for expansion	Attendance records, meeting notes	Long-term implementation plans

Explore how MFA can be integrated into IHEs	Course descriptions, faculty reflections	Descriptions of MFA integration into IHEs
Create online community for MFA stakeholders & supportive digital resources	Number of participants; participation frequency; resources access frequency	MFA stakeholders learn and refine their practice; increased MFA awareness
Disseminate project findings through conferences/journals	Number of presentations and publications	Increased MFA awareness among stakeholders
National dissemination of MFA facilitator institutes	Number of stakeholders enrolled in institutes	Continued expansion of MFA beyond this project

C.3. Addressing the Needs of the Target Population

The main target audiences for this project will be **elementary and middle school students with and without disabilities from high need schools**, their **teachers**, and the **teacher leaders** who support them. The program has been developed and refined through extensive pilot- and field-testing with over 1,000 teachers and 140 teacher leaders from more than 90 schools and districts, and has **demonstrated effectiveness in meeting the needs of these audiences**. It has been successfully implemented in urban, suburban, and rural schools across 10 different states. The efficacy of the strategies embedded in MFA for positively impacting mathematics learning outcomes for diverse populations of elementary and middle school students with and without mathematics learning difficulties and their teachers has been demonstrated through many studies, (see Fuchs et al., 2022) and our own research (Duncan et al., 2018; Duncan et al., 2022 a, b; Moeller et al., 2023). We have also been able to demonstrate the **promise of our scale-up strategies**, such as building capacity among local teacher leaders to serve as MFA facilitators (Moeller et al., 2023). In addition, collaborating with local service providers allows us to bring MFA to (and adapt it for) an ever-wider range of populations and settings, while maintaining FOI, and helps build capacity for sustaining and expanding MFA locally.

As the aftereffects of the COVID-19 pandemic have brought to the fore, **students have diverse academic and social-emotional needs** that impact their performance in mathematics. Teachers need support in such areas as ongoing formative assessment of students to enable them to identify students' strengths and learning gaps, re-engage students after prolonged absences, and plan and implement lessons that offer students grade-level content and also address any

learning gaps they may have (e.g., National Center for Learning Disabilities, 2021; Short & Hirsh, 2021). **MFA PL is well-poised to help teachers meet students' diverse needs and to address widespread learning gaps and the growing performance differences in mathematics** between student subgroups.

There is also a great need to build the capacity of school- and district-based teacher leaders who support teachers in these important efforts. About $18 billion is spent annually on teacher PL, and the vast majority of PL funds are used by school districts for internal PL efforts (The Boston Consulting Group, 2014). Yet, very little attention has been paid to who teaches the local teacher leaders who are directing this PL. MFA resources and PL for local facilitators **address the need for PL for teacher leaders,** particularly in helping them keep up with the latest research and learn about evidence-based strategies to support high-quality instruction.

Recognizing the needs of students, teachers, and teacher leaders, our school district partners eagerly signed on to this project and have **pledged significant in-kind contributions** to enhance the preparation of their teachers, teacher leaders, and school leaders to implement and support effective PL to help teachers improve mathematics instruction for diverse learners (see Appendix C for letters of support and Appendix H for cost-share commitments). Sites for the proposed project will be **80 high-need schools** (as defined on p. 1). Information about the **demographics and math performance levels of the pool of close to 800 schools we will draw from to recruit schools for participation** in this project is included in Appendix J.3.

D. Project Evaluation

D.1. Methods Designed to Meet WWC Standards Without Reservations

MFA uses multiple instructional practices supported by strong Tier 1 evidence. It is ready to be tested at a national scale to determine if its impacts can be sustained over time and to better understand the conditions under which it is most effective. We propose to study the impact of MFA under conditions aligned with our previous studies, while also (1) expanding into different settings, (2) including additional populations, and (3) testing a new scale-up strategy. If results from the proposed study are consistent with findings from prior trials, this work will offer

evidence of the generalizability of MFA impacts across new settings and populations; meanwhile, findings that diverge from prior results might identify conditions under which MFA is most effective and for whom (Coyne et al., 2016; Spybrook et al., 2020). New findings related to middle-grades implementation will also inform future iterations of PL materials and processes.

Westat, ICF, and EdResearcher will use a **Primary RCT** to study MFA impacts, followed by an exploratory **Scale-Up RCT** that will yield information about the level of support educators need in order to be fully prepared to lead MFA PL. Our overall design is guided by literature on replication research (e.g., Bonnet, 2012; Coyne et al., 2016) and the Standards for Excellence in Education Research. This study will address nine research questions, outlined in Exhibit 6.

Exhibit 6

Research Questions (RQs)[1]

RQ1. What is the impact of the MFA PL (treatment) on **teachers' self-efficacy**,[2] preparedness and comfort in teaching students with disabilities, and adopting a growth mindset?
RQ2. What is the impact of the MFA PL on **teachers' knowledge and use of instructional strategies** that support the development of students' mathematical language, memory, social-emotional and higher-order thinking functions, and use of representations?
RQ3. What is the impact of the MFA PL on **student achievement in mathematics** (with independent impact estimates for elementary-grades and middle-grades students)?[2]
RQ4. What is **the implementation fidelity** of MFA PL and teacher practices?
RQ5. How is the impact of the MFA PL on student achievement in mathematics **mediated** by teacher lesson planning and practices? How is the impact of MFA PL on student achievement and teacher lesson planning and practices mediated by (a) the fidelity of MFA implementation by local facilitators and (b) school leader participation in the PL?
RQ6. How is the impact of MFA PL on student achievement in mathematics **moderated** by school, teacher, and student characteristics (e.g., disability status, ELL status)?
RQ7. (a) What is the **cost-effectiveness** of MFA PL compared to the PL in which BAU teachers engage? (b) Do differences seen between study conditions in the Scale-Up RCT justify the additional cost associated with MFA-Enhanced?
RQ8. To what degree does teachers' participation in MFA influence **students' mathematics achievement in subsequent study years**? [exploratory]
RQ9. What are the successes and challenges of the **scaling strategies** (i.e., training local teacher leaders to become facilitators, standard vs. enhanced support for local teacher leaders,

PL for school leaders, expanding the MFA PL for middle school teachers)?

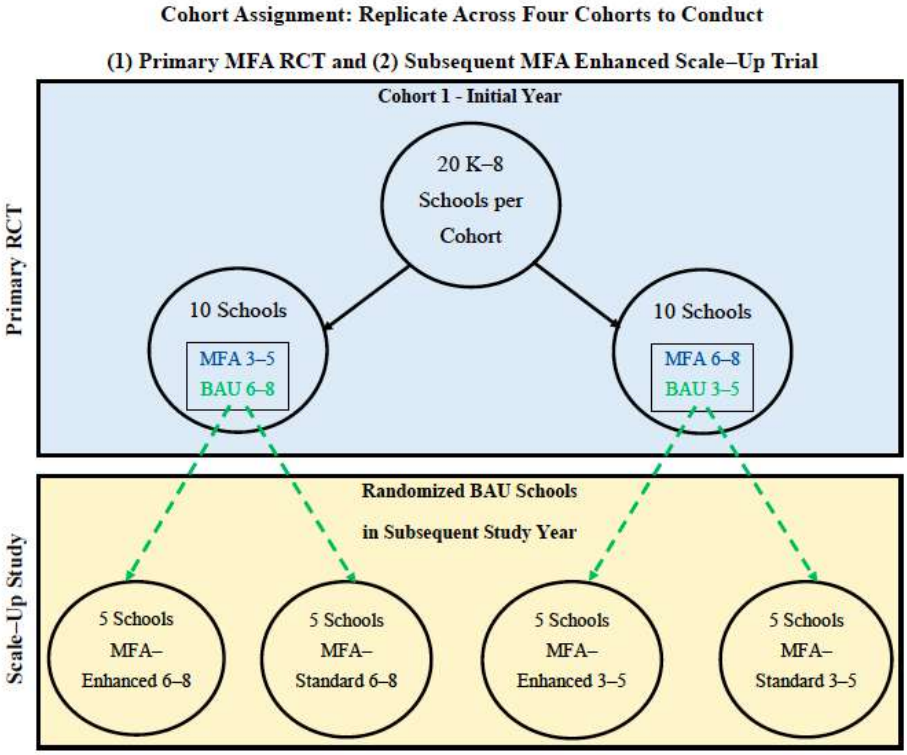
[1] The Scale-Up RCT addresses variants of these same questions but compares MFA-Standard and MFA-Enhanced. The key scale-up question is: What is the impact of different levels of facilitator support (standard vs. enhanced) on teacher and student outcomes?

[2] The self-efficacy measure (*Mathematics Teaching Efficacy Belief Instrument*, Cronbach alphas between 0.781 and 0.8860, see Appendix J.9) falls within the Teacher Well-Being outcome domain, which is eligible for review under the WWC's Study Review Protocol, Version 4.1 (or higher). Student mathematics achievement is also eligible for review under the mathematics achievement domain.

Study conditions and random assignment. We propose to conduct a set of sequenced school-level **RCT evaluations**. Schools will be the unit of assignment because MFA entails teacher collaboration under coordinated instructional leadership, as outlined in Exhibit 6. Random assignment in this RCT will determine whether a school implements MFA in grades 3–5 or 6–8. As depicted in Exhibit 7, schools that use MFA in the grades 3–5 band will offer BAU instruction in grades 6–8; likewise, schools assigned to use MFA in grades 6–8 will offer BAU instruction in grades 3–5. This yields an efficient design (cf. Roschelle et al., 2014) that allows all study schools to experience a version of MFA, removing the complexity of informing school leaders during sample recruitment that their school might not experience MFA. We have successfully used this design with a first cohort of schools in our Mid-Phase project. Furthermore, this five-year design will allow us to explore longer-term influences that MFA teachers have on students' math achievement over time (RQ8) because this RCT will be conducted across four cohorts of schools (one cohort per year over four years). Each cohort in the Primary RCT will include 20 K–8 schools (when necessary, we will use school pairings consisting of a single elementary school linked to a middle school). The Scale-Up RCT will assign schools that offered BAU with either no additional facilitator support (MFA-Standard) or continued coaching for facilitators (MFA-Enhanced) the year after the schools participate in the Primary RCT. The Scale-Up RCT will be conducted with minimal statistical power because it entails comparing two versions of MFA, rather than comparing MFA to BAU and because it will

Exhibit 7

Impact Study Design



have a sample size based on 3 cohorts (see Appendix J.7). We will explore impact analyses for the Scale-UP RCT but its purpose is to determine if local facilitators can adequately implement MFA on their own after one year of support as effectively as when developers provide ongoing coaching to local facilitators. The Scale-Up RCT will also allow us to assess the relative costs and benefits of MFA-Enhanced versus MFA-Standard (RQ7). To be eligible to participate in the overall study, schools will have to use common lesson planning time with school leader involvement and meet our definition of *high need* (see p. 1).

Contamination. MFA PL is not easily transmitted without the summer institute and ongoing teacher support so contamination is a minimal concern. The teacher PL literature has consistently found that PL without sufficient duration and collective participation is unlikely to have any impact on instructional practice (Garet et al., 2016; Yoon et al., 2007). We have not detected contamination concerns in prior MFA studies. Nevertheless, we will (1) instruct school staff not

to share MFA strategies across grade bands during the study, (2) have study staff monitor schools for any use of MFA strategies by teachers at the BAU grade levels, and (3) examine teacher surveys and logs for evidence of contamination (which the study team will then mitigate).

Sufficient statistical power. Each cohort in the Primary RCT will involve 20 schools, yielding 80 total schools for the grades 3–5 contrast and the grades 6–8 contrast. For our main teacher-level power analysis, we assumed that elementary schools will include an average of eight teachers (two general educators per grade [$n = 6$] and two special education teachers). Following standard power analysis assumptions around intra-class correlations (i.e., ICC = 0.15) and covariate values (i.e., a Level 1 R^2 of 0.49 and Level 2 R^2 of 0.36), this design would yield a minimum detectable effect size (MDES) of 0.246 when examining treatment impacts on teacher outcomes in a two-level model. We used similar assumptions for the 6–8 grade band but expect there will be an average of three general education teachers and one special education teacher ($n = 4$), yielding an MDES of 0.287. Power analyses and a detailed discussion of our assumptions are presented in Appendix J.7, along with presentation of what would happen with more conservative assumptions.

We highlight here that even highly conservative assumptions yield teacher-level MDES values below 0.5; effects this large are often found when working with teacher outcomes (e.g., Yoon et al., 2007), and we have seen larger effects in our prior MFA work (e.g., Duncan et al., 2018). A three-level impact model will be used to assess MFA impacts on student outcomes. For our primary grades 3–5 power analyses, we assume there will be 20 students per classroom. With eight teachers per school, an ICC of 0.11 at Levels 1 and 2, and R^2 values of 0.64, 0.36, and 0.15 at Levels 1–3, respectively, the student-level MDES will be 0.205. For the 6–8 grade band contrast, if we assume 100 students per grade and the same R^2 and ICC values as the elementary grade contrast, we can detect an MDES of 0.212. More conservative assumptions still yield MDES values of under 0.3 (see Appendix J.7, Table J.7.3 for both scenarios).

Strategies to guard against attrition. Low attrition rates (especially differential attrition between treatment and control groups) are important to ensure that our work meets WWC

standards without reservations. We will use five strategies to guard against attrition:

- During recruitment, we will be explicit in communicating expectations to get buy-in from at least 75% of teachers at each school (we will assess this with a recruitment survey).
- We will over-recruit schools by 10% (i.e., recruit ~ 22 schools to net 20 per cohort).
- Trusted MFA-trained teacher leaders within the schools will help retain teachers by emphasizing the importance of the study.
- The study design (i.e., grade-band assignment, delayed treatment for BAU) allows all schools in the study to receive the intervention, which will help with sample retention.
- We will employ the communication and data collection strategies we developed through our previous work, which led to very high response rates across study conditions.

Should the study experience higher levels of attrition than expected and previously experienced, we will use multiple imputation, while attending to the WWC's missing data standards, to perform sensitivity analyses.

Data analyses. Note that the analytic approaches for the Scale-Up RCT will mirror those used in the Primary RCT. Appendix J.8 specifies statistical models/details for RQs 1–6 and 8. Analyses of **impact on teacher outcomes** (RQs 1 and 2) will be based on a two-level intent-to-treat analysis (ITT) that includes all eligible teachers in randomly assigned schools, factoring in teacher- and school-level covariates and school-level random effects. Analyses of **impact on student outcomes** (RQ3) will be based on a three-level ITT analysis that factors in student-, teacher-, and school-level covariates and teacher- and school-level random effects. For each cohort of students, we will examine state end-of-year mathematics assessment scores, using standardized scores in impact analyses. RQs 5 and 6 focus on **mediators and moderators** of the impact of the MFA PL and will involve multilevel modeling with cross-level interactions.

Implementation fidelity (RQ4) will be examined using qualitative, descriptive, and multivariate analyses, ranging from correlations and cross tabulations to ordinary least squares regressions and multilevel analyses. **Cost-effectiveness analysis** (CEA) (RQ7), based on the ingredients method (Levin, 1983), will document the costs of MFA PL implementation (i.e., cost

per teacher, cost per student) and how costs vary across sites. CEA will be used to contextualize any observed treatment effects. We will also explore how resource requirements and costs of MFA might change at different levels of scale, including across different geographic areas and locale types. In addition, we will assess how total and marginal costs of MFA are likely to vary with scale, and where economies of scale might be achievable with or without changes to implementation tested in the Scale-Up RCT (see Appendix J.10 for details).

The research team will deploy a comprehensive set of interviews, surveys, and administrative data collection activities that will allow us to assess MFA PL perceptions across school leaders, teacher leaders, and teachers. Data collected from each cohort will allow us to examine critical implementation information, including MFA PL buy-in and implementer capacity. The team will search for evidence of implementation success, and alter approaches as needed following Coburn's (2003) four dimensions of scale. Collectively, these activities will gather the data necessary to answer RQ9: What are the **successes and challenges** of the scaling strategies? Answering this question will require a mixed-methods strategy that integrates findings from the RCTs and the qualitative dataset at the end of the study (see also Section D4).

D.2. Generation of Guidance About Effective Strategies Suitable for Replication

Our design facilitates documenting BAU conditions because we will work with all study schools as we implement MFA in one of two grade bands, allowing us to measure the essential elements of the treatment contrast (Hill et al., 2023), which in turn will inform implementation guidance. Furthermore, the impact study will work with regionally diverse schools that vary in size, community characteristics, and faculty and student populations (see Appendix J.3). Having a large and diverse evaluation sample representative of multiple states across elementary and middle school grades will generate information that can guide schools and districts in both whether and how to implement MFA. Our guidance will cover (1) specification of the core elements of MFA, (2) how MFA fits into different school contexts and what supports are necessary, (3) how MFA can be implemented with fidelity, (4) the impact of MFA in different settings and for different populations, and (5) the cost to implement MFA. Our moderator

analyses will help us describe any differential impacts of the PL across settings and populations (RQ6; student disability status is of particular interest). Other moderators of interest include student grade level, ELL status, teacher certification and experience working with students with disabilities, and school leader support. Quantitative and qualitative implementation data from an array of sources, including facilitator and teacher surveys, school leader and facilitator interviews, and teacher logs, will help assess the implementation of the MFA PL model and refine the training and the resources and materials used to support facilitators. CEA (RQ7) will help inform districts and schools about the cost of MFA to achieve certain effects for teachers and students and how this cost compares to the expense of BAU PL (see Appendix J.10 details about cost data collection and analysis.) In developing guidance about effective scale-up strategies, we will frame our findings and discussion according to Coburn's (2003) framework of scale. This will allow us to take a more nuanced and reform-focused perspective on what it takes to promote the depth, sustainability, spread, and local ownership of MFA implementation.

D.3. Components, Mediators, Outcomes, and Thresholds for Acceptable Implementation

Components, mediators, and outcomes. The MFA logic model (see Appendix G) informs the design of the impact evaluation. Key **components** of MFA include the use of a neurodevelopmental framework to help teachers better understand individual students' strengths and challenges and the demands of mathematics lessons; learning about instructional strategies that support students' neurodevelopmental functions; and collaboration between general and special education teachers to plan standards-based mathematics lessons that personalize instruction based on individual students' strengths and needs. Key teacher **outcomes** include enhanced self-efficacy, comfort, and preparedness to instruct students with disabilities; improved beliefs about students' capabilities in mathematics (a growth mindset); and improved knowledge and use of strategies to support students' use of language, models and representations, social-emotional functioning, and problem solving. Improved achievement in mathematics is the key student outcome. Key **mediating** variables for student outcomes are teachers' lesson planning and classroom practices. Appendix J.9 includes descriptions of the instruments we plan to

administer and information about their psychometric properties.

Teacher beliefs (RQ1) will be assessed by a self-report comprising Likert-scaled items from the teacher survey used in the Duncan et al. (2018) efficacy study (Cronbach alphas for these scales range from .788 to .950). **Teachers' pedagogical content knowledge** (RQ2) will be measured using a scale that assesses teachers' knowledge about and use of various classroom practices (Cronbach alphas for this scale ranges from .85 to .92). **Student achievement in mathematics** (RQ3) will be measured using state test scores in mathematics. Teachers' reports of lesson planning and classroom practices, captured within teacher logs, will be used in tests of **mediators** of the treatment effect on student math achievement (RQ5). School and student characteristics will be taken from administrative data, and teacher characteristics will be gathered from the pre-test teacher survey to examine **moderating effects** (RQ6). **Fidelity** (RQ4) is a multifaceted construct that includes adherence, dosage, quality of delivery, participant responsiveness, and program differentiation (Century et al., 2010); it will be assessed with a range of instruments, including workshop feedback forms, surveys, facilitator interviews, teacher logs, and review of agendas and PL materials. School leader interviews and teacher and facilitator surveys will yield **CEA** information (RQ7). Note that we will also conduct longitudinal exploratory analyses by modeling the change (i.e., growth) in student academic achievement outcomes (see Appendix J.8). School administrator and facilitator interviews will document the **successes and challenges of the scaling strategies** (RQ9).

Measurable thresholds for acceptable implementation. We must consider three levels of implementation: (1) implementation of MFA PL for facilitators and school leaders, (2) implementation of MFA PL for teachers, and (3) implementation of MFA practices by teachers. As demonstrated by the measures described in Appendix J.9, we will assess FOI and quality of implementation in multiple ways. **Minimum** acceptable implementation thresholds based on our prior MFA work are defined as follows: *We expect facilitators to participate in both days of the summer institute and to attend 80% of the planning and debriefing meetings. We expect school leaders to participate in one day of the summer institute and in at least eight hours (20%) of the*

PL sessions for teachers. The PL team will offer make-up sessions for facilitators who miss any workshops. Teachers participating in MFA PL must attend at least 32 of the 40 hours of PL (80%). Indicators of acceptable implementation of MFA practices by teachers will be reports of collaborative lesson planning and lesson adaptations in at least five of the eight teacher logs. These thresholds will ensure the presence of inputs as described in the MFA logic model.

D.4. Performance Feedback and Periodic Assessment of Progress Toward Outcomes

Collectively, **four sources of feedback** will inform the **continual improvement** of MFA resources, research design and methods, and project implementation: (1) ongoing formative and FOI data (e.g., session feedback surveys, teachers' lesson plans), (2) annual interviews with a sample of stakeholders (e.g., school leaders, facilitators), (3) input from an external advisory board and the assigned EIR evaluation TA consultant, and (4) data from multiple cohorts of participants. Results from **FOI and interview data** will be reviewed on an ongoing basis by the project's leadership team. At our monthly project meetings, we will discuss the implications of emergent findings for improving the project's materials, activities, and procedures. Results from each cohort of MFA participants will inform the refinement of the MFA PL resources and the research design and procedures—that is, our mixed analytic framework will allow for annual descriptive analyses of impact within each cohort, geographic location, and school type. These analyses will be coupled with qualitative information to allow for periodic assessment of progress toward achieving excellent FOI and effecting change in key outcome variables. To help steer this annual performance feedback process, our **advisory board** will review project activities and progress toward goals, suggest refinements to the MFA PL resources and research design and methods, review emerging findings, provide input on dissemination strategies, review reports and manuscripts prepared for publication, and suggest strategies for sustaining and scaling up our work. We will also work closely with the **EIR evaluation TA consultant** assigned to this project to review evaluation plans and methods, ongoing implementation, research activities, and plans for dissemination. We will use the consultant's feedback to refine program implementation, evaluation, and dissemination activities.