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Contributions of *Math for All* to building local facilitators' capacity for conducting professional learning to support accessible mathematics instruction

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We report findings that describe how a published mathematics professional learning (PL) program can contribute to building the capacity of school- and district-based mathematics teacher educators to scale up PL on making high-quality instruction accessible to all students. Twelve local facilitators were trained in the use of the program and implemented it over the course of two years. Drawing on survey and observation data, we report descriptive findings regarding facilitators' implementation of the program and its contributions to their learning. With support, local facilitators were able to implement the program with high fidelity, and program use contributed to their PL. Facilitators who varied in content specialization (mathematics vs. special education/English language learners) and role (staff developers vs. teacher leaders) benefitted differently from the PL they received. These findings have implications for preparing and supporting local facilitators and future research.

Keywords: Mathematics teacher educators, facilitation, professional learning, scale up, accessible mathematics instruction.

Introduction

Within school districts responsibility for providing professional learning (PL) and support to help teachers deepen their knowledge and skills about teaching mathematics often rests with local facilitators, such as curriculum coordinators, staff developers, coaches, or teacher leaders. Having school or district staff facilitate PL 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 facilitators often have established, ongoing relationships with teachers and schools and are familiar with school district priorities; this allows them to provide sustained and contextualized support. Yet, these leaders themselves are in need of PL and resources to keep up with evolving standards and research on teaching and learning. To address this need, a number of PL programs have been developed in the U.S. over the past two decades. These programs are well-specified (some are published), and include resources such as activities and materials for teachers, teacher outcome measures, and descriptions of facilitator roles that enable facilitators other than the developers to implement these programs (Borko, 2004). Examples of such programs include *Developing Mathematical Ideas* (Shifter et al., 2017), *Learning and Teaching Geometry* (Seago et al., 2017), and *Math for All* (Moeller et al., 2012). The designs of such PL programs tend to incorporate research-based practices for teacher PL and K–12 education. As such, they have promise for contributing to the PL of the facilitators themselves (e.g., van Es &

Sherin, 2017), and for guiding local facilitators in translating research into practice and scaling up evidence-based practices to teachers and their students. However, little is known to date how well-specified PL programs can contribute to institutional capacity building and scale up, because research accompanying the design of such programs has focused primarily on studying the PL as implemented by its developers rather than by the audiences (i.e., district- or school-based facilitators) for which they were developed (Borko, 2004). This paper reports findings from the first phase of an ongoing study that examines how an intensive, well-specified mathematics PL program, *Math for All* (Moeller et al., 2012), can be scaled up by building the capacity of local facilitators.

Overview of the *Math for All* program

Math for All supports teachers of grades K–5 in making high-quality mathematics accessible to all students, including those with disabilities. It is designed to equip teachers with skills in using a neurodevelopmental (ND) framework (e.g., Barringer et al., 2010) to (1) analyze mathematical tasks, (2) develop student learning profiles, and (3) adapt mathematics lessons in ways that make them accessible to all students while maintaining the original goals of the lesson. During the 40-hour program, teachers participate in five workshops in which they learn about different parts of the ND framework and use them to adapt and reflect on their own lessons. In each workshop, they view and discuss a video case study of a math lesson and evaluate the ND demands of the lesson task, consider the ND strengths and challenges of a focal child, and then observe the adaptations the teacher made in order to make the lesson more accessible to the focal child and others. Following the analysis of the video case study and using it as a guide, general education and special education teachers collaborate on planning adaptations for a lesson they will be teaching in their own classroom. *Math for All* is designed for both general and special education teachers, and an integral part of the PL is the collaboration between the two, as they plan adaptations for common lessons, implement them with students they share, and reflect on their work.

Math for All is a published PL program that includes a variety of resources to support facilitators in its implementation, including a facilitator guide, a website that provides access to video case materials, digital versions of handouts, presentation slide decks for each workshop session, and a participant book. While *Math for All* is well-specified, it leaves room for adaptation by facilitators. The lessons that teachers choose to adapt are selected by facilitators and teachers from the local K–5 mathematics curriculum based on their interests and needs. In addition, the facilitator guide includes suggestions for how PL leaders can customize elements and resources of the program based on local contexts, teachers’ needs, and their own preferences.

Math for All has been extensively piloted and field-tested with more than 500 teachers from urban, suburban, or rural school districts from eight different states (Moeller et al., 2016). A recent randomized controlled study demonstrated positive effects of *Math for All* on teacher classroom practices, their preparedness and comfort in teaching students with disabilities, and on students’ mathematics achievement (Duncan et al., 2018). However, in our prior research, the developers of the program facilitated the PL. Here we report on current research, which investigates the role that local facilitators can play in scaling up the program. We present initial findings addressing the

following research questions: (1) How do local facilitators implement *Math for All*? (2) In what ways does *Math for All* contribute to local facilitators' learning?

Conceptual framework

The current literature about PL implementation and the role of facilitators serves as our conceptual framework. Research suggests that facilitators play a key role for the success of well-specified PL programs (Borko, 2004; Fennel et al., 2017; Hjalmarson & Baker, 2020; LeFevre, 2004; Remillard & Geist, 2002). There is growing recognition that studying facilitators' use of innovative programs involves understanding facilitators' processes for constructing the enacted PL curriculum and the role that PL resources play in it (Hjalmarson & Baker, 2020; Remillard & Geist, 2002).

Implementing an innovative program is not simply a matter of picking it up and using it. Instead, it involves interpretation of new and unfamiliar ideas about teaching and learning. According to

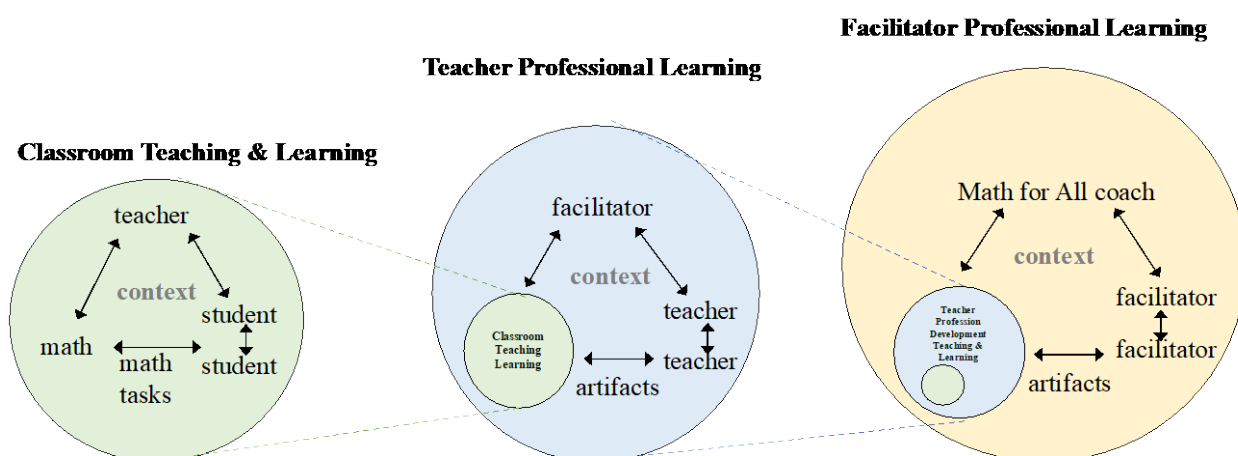


Figure 1: Nested nature of learning for facilitators of PL programs

Remillard and Geist (2002) and as illustrated in Figure 1, there are at least two layers of complexity in using an innovative PL program: (1) working with unfamiliar ideas about children's mathematical learning (e.g., ND framework, how to adapt math lessons based on individual students' learning profiles while maintaining the rigor of the mathematics), and (2) new approaches for supporting teacher learning (e.g., using video case studies, supporting collaborative lesson planning). Facilitators must assume an active role, rather than passively managing the program (Jacobs et al., 2017). They must understand the goals of the program and how to use the resources provided to achieve these goals (Seago, 2007). Further, they must use this knowledge to establish a community of learners and to structure learning experiences for that community (Borko et al., 2011). They also must be able to use the program flexibly to respond to participants' needs and local contexts (Remillard & Geist, 2002). The challenge is to do so with fidelity. Drawing on the implementation research literature (e.g., Gage et al., 2020), we defined fidelity in terms of adherence to the published program, dosage, quality of delivery, and participant responsiveness.

Methods

In this paper we report descriptive findings based on data collected from a first cohort of local *Math for All* facilitators. This research is part of a multi-cohort study, which is still in progress.

Sample

Twelve local facilitators from urban and rural school districts in a midwestern state in the U.S. participated for two years. The sample comprised ten women and two men, averaging 40 years of age, with representation across ethnicities/races (four Black, four Hispanic, and four White; one of the 12 facilitators also identified as Asian). Content area specializations were in the areas of math (n=7) and special education or English language learners (SPED/ELL n=5). The majority of local facilitators were staff developers whose primary job responsibility was providing PL to teachers (n=9); the others were teacher leaders, working teachers who supported other teachers on top of their regular classroom duties (n=3). Nine of the 12 local facilitators reported having led PL in math.

To prepare for the implementation of *Math for All*, all local facilitators participated in a week-long summer institute in which they experienced the program as a teacher would, and discussed key content, issues of leadership, and acceptable ways of adapting the program. The institute was led by the developers of the program, who served as coaches to the local facilitators. Over the course of the two-year implementation period, program developers provided ongoing support to facilitators by planning and debriefing workshop sessions with them. In addition, a second eight-hour facilitator institute was held between the first and second years.

Measures

A 40-item pre-survey designed to understand facilitator characteristics and some of their views around facilitating PL and teaching mathematics to diverse learners was administered prior to implementation. A 28-item post-survey was administered at the end of the two-year implementation period. The post-survey included additional questions about facilitators' experience with implementing *Math for All*, their plans for sustaining and scaling it up, and what they had learned from the experience of implementing the program. Items in the surveys were a mix of open-ended questions, frequency ratings, Likert-scaled attitudinal questions, and background questions.

Observations of workshop sessions led by teams of local facilitators were conducted multiple times by program developers. The program developers recorded their observations by responding to a structured observation form via SurveyMonkey. Drawing on the literature on fidelity of implementation (e.g., Gage et al., 2020) the observation form was designed to collect data about the implementation of key workshop elements, changes that the facilitators made and reasons for those changes, the dynamic between co-facilitators, individual facilitators' use of various moves associated with effective facilitation, and teachers' participation and teachers' engagement in the session. The observation form consisted of 61 items and included open-ended questions, Likert-scaled ratings of the quality and fidelity of implementation, checklists of changes made and reasons for those changes, and low-inference assessments of evidence for specific behaviors (e.g., encourages participation in discussion: Not evident, Somewhat evident, Fully evident).

Analytic methods

Quantitative data was analyzed using descriptive statistics (means, standard deviations, frequency counts). Responses to open-ended questions in the surveys and observation forms were coded thematically by a researcher who was blind to the identity and role of the facilitators.

Results

Program implementation by local facilitators (RQ 1)

To understand how local facilitators implemented *Math for All*, we examined the fidelity of their implementation and the adaptations they made in the implementation of the program.

Fidelity of program implementation. The fidelity of program implementation made by the local facilitators was high. For the most part, local facilitators followed the program guide books and slide decks closely. Except for one school, which ran into scheduling issues due to the COVID-19 pandemic, all sites were able to implement all five of the *Math for All* workshops over the course of two school years. The program developers rated the overall quality of the implementation of a sample of workshops for each facilitator team using a three-point scale, with 1=low, 2=medium, 3=high. The average rating across workshops and teams of facilitators was 2.86 (SD=.36), indicating that the program developers perceived the quality of implementation to be high. Average ratings for key dimensions of fidelity, including adherence (M=2.89, SD=.32), alignment of changes with the goals of *Math for All* (M=2.14, SD=.77), quality of delivery (M=2.46, SD=.56), and participant responsiveness (M=2.80, SD=.41) were consistently high.

Adaptations made by local facilitators. Most facilitators made some adaptations as they implemented *Math for All*. Program developers documented changes in 83% of the workshop sessions that were observed. However, many of the adaptations were minor and did not substantially alter the content and format of the PL. The most frequently reported changes were adapting the presentation slide decks (54% of the sessions observed) and shortening one or more activities (37%). Making changes to a handout, adding a new activity, substituting an activity, and cutting one activity altogether were each observed in 20% of the sessions. Other changes less frequently observed were: changing the discussion format (17%), adding examples (11%), greatly extending the time for one or more activities (9%), and other miscellaneous changes (11%). The least frequently reported changes were creating a new handout (6%) and changing the sequence of topics in a session (6%). Reasons cited for making these changes were the desire to make an activity more relevant to the teachers' school context, to make an activity more interactive, and time constraints (i.e., running out of time).

Contributions to facilitators' learning (RQ 2)

We asked facilitators what effect their participation in *Math for All* had on their learning about the content of the PL (how to use the ND framework for making high-quality mathematics accessible to all students), as well as on their learning about facilitating PL.

Learnings about making high-quality mathematics accessible to all students. In the post-survey, the facilitators were asked to describe two or three things that they learned about making high-quality mathematics instruction accessible to all students. The most frequently reported responses for the sample overall were (1) using the ND framework (42%), (2) planning adaptations for an outlier (42%), and (3) the power of observing focal students (33%). For instance, one facilitator noted, "When planning, the neurodevelopmental framework needs to be considered. Adapting lessons in a meaningful way provides access to all." Another facilitator said, "Plan adaptations for the outlier and it benefits all students. Consider students' strengths when planning lessons." We also observed

differences among subgroups of facilitators. For mathematics facilitators, the most frequently reported learnings were (1) planning adaptations for an outlier (57%), (2) using the ND framework (43%), and (3) the power of observing focal students (43%). For special education/ELL facilitators, the most frequently reported learnings were (1) the importance of collaboration between general and special education teachers (60%), and (2) using the ND framework (40%). As one special education facilitator put it: “Intentional planning with collaborative teachers is essential to supporting students. Engaging in the lesson from a student point of view is useful when planning instruction to identify the various demands of each lesson you are implementing.” For staff developers, the most frequently reported learnings were (1) using the ND framework (56%), and (2) planning adaptations for an outlier (44%). For teacher leaders, the most frequently reported learnings were (1) the power of observing a focal student (67%), and (2) the role of language in mathematics (67%).

Learnings about facilitating mathematics PL. In the post-survey, facilitators also were asked to describe what they learned about facilitating PL. Overall, the most frequent responses included learning about (1) the importance of creating a community and a safe space to work for PL participants (33%), (2) the importance of planning and reviewing content before presenting (25%), and (3) the value of collaboration with a co-facilitator (25%). For instance, one facilitator explained, “There is more ‘learning’ happening when adults are put in a low-risk environment; teacher learners are able to give honest feedback and are more resilient to the feedback they receive.” Another facilitator noted, “Providing a safe space to do math together, share out thinking, and discuss our thinking prior to implementing with students builds teacher confidence and capacity.” We again found differences among subgroups of facilitators. Mathematics facilitators most frequently reported learning about (1) the importance of creating a community and a safe space to work for PL participants (43%), (2) the importance of planning and reviewing content before presenting (29%), and (3) the importance of teachers seeing the impact of their lesson plans on students (29%). Special Education and ELL facilitators most frequently reported learning about (1) the value of collaboration with a co-facilitator (40%), and (2) the importance of making PL relevant to the audience (40%). Staff developers most frequently reported learning about the value of collaboration with a co-facilitator (33%), while teacher leaders most frequently reported learning about (1) the importance of creating a community and a safe space to work for PL participants (67%), and (2) the importance of planning and reviewing content before presenting (33%).

Discussion and significance

Our findings suggest that a well-specified PL program like *Math for All* can play an important role in building the capacity of local facilitators to implement evidence-based PL to support teachers’ efforts to make high-quality mathematics instruction accessible to learners with diverse strengths and challenges. With the support of published program materials and implementation support, local facilitators learned new content and practices about differentiating mathematics instruction for students in grades K–5, and about facilitating PL on this topic. We found that local facilitators were successful in providing teachers with intensive PL, and fidelity of implementation was high.

Our research also revealed interesting differences among subgroups of local facilitators in how they benefitted from the program materials and the PL they received. The differences we found were

associated with both content specialization and role. Facilitators with a mathematics background differed from facilitators with a SPED/ELL background in terms of learnings they reported about classroom teaching and learning and about facilitating PL. For facilitators with a mathematics background, the most salient learnings about classroom instruction were about how to focus on individual students, while for facilitators with a SPED/ELL background learning about the collaboration between general and special education teachers was most salient. In terms of facilitating PL, the most prominent learnings for math facilitators were around creating a safe and productive PL community, whereas for SPED/ELL facilitators the most salient learnings were around collaborating with a co-facilitator and the importance of making the PL relevant to their audience. Staff developers were more likely than teacher leaders to report a variety of learnings about facilitating PL, whereas teacher leaders were more likely than staff developers to report learning about classroom teaching and learning. These findings have implications for how we think about preparing and supporting local facilitators for the implementation of a well-specified PL program. Local facilitators who have different content specializations and who serve in different roles benefit from program materials and supports in various ways and will benefit from different types and levels of support.

The results reported here are descriptive and based on a small sample of facilitators working with only one particular PL program. Our findings should not be interpreted as representative of the population of potential facilitators (mathematics specialists, special education and ELL specialists, and teacher leaders) and may not apply to other types of well-specified PL programs. Nevertheless, the descriptive data provided by this cohort of 12 facilitators help us to suggest several important lines of continuing inquiry: (1) There is a need to understand better and more systematically what specific characteristics of PL facilitators in various roles and with different content specializations impact the implementation of well-specified PL programs. (2) We also see a need for longer-term research to better understand the roles of local facilitators in supporting the sustainability and scale-up of well-specified PL programs. Longitudinal research is required to better understand whether and how local facilitators continue to use a PL program, and how implementation may evolve over time.

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