

Math for All: Assessing the Efficacy of a Professional Development Program for Elementary School Teachers

Teacher and Administrator Interviews

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***Math for All* Teacher interviews: Overview**

These interviews were conducted as part of the research activities for *the Math for All: Assessing the Efficacy of a Professional Development Program for Elementary School Teachers*, an IES-funded grant. The purpose of this grant work is to test the efficacy of the *Math for All* (MFA) professional development (PD) program. Overall, the research activities will investigate the impact of the MFA PD on teachers' knowledge, skill, and classroom practice, and on student academic achievement in mathematics.

The first year of the grant was used to pilot the PD activities scheduled for subsequent years of the grant. The first year also included a pilot of the semi-structured interviews scheduled for use in subsequent years. The semi-structured telephone interviews with teachers are intended to better understand and refine the Theory of Change/logic model for the *Math For All* intervention (i.e. factors that mediate and moderate outcomes) in addition to documenting overall implementation fidelity at the end of Years 2 and 3.

The Stated Outcomes for Participating Teachers in the MFA PD Program

Teacher knowledge outcomes. (a) Being more knowledgeable about and skillful in the informal assessment of students' strengths and needs; (b) being more knowledgeable about instructional strategies and skillful in matching them to individual students' strengths and needs; and, (c) being more knowledgeable about mathematical content for teaching.

Teachers' classroom practices. (a) The ongoing assessment of individual students; (b) adapting mathematics lessons to build on students' strengths and weaknesses while maintaining the rigor of the mathematics content; (c) the use of instructional strategies, classroom structures, and materials that are responsive to individual students' strengths and needs; (d) supportive

teacher-student interactions; and, (e) ongoing collaborative lesson planning between general and special education teachers.

Improved student outcomes. (a) Improved student self-efficacy for mathematics; (b) student perception of the quality of mathematics instruction; (c) student achievement in mathematics; (d) explore differential student achievement in mathematics by student sub-groups (i.e. general versus special education students, high-and-low achieving students as determined by baseline measures).

Interview Questions

The open-ended questions probe for participant knowledge of MFA, facilitators of and barriers to implementation, perceptions of training, ways in which MFA altered their pedagogy, and the degree to which teachers think MFA has had an impact on their practice and student learning. These interviews serve as an interim check of implementation and yield a descriptive sense of how MFA altered participants' knowledge and practice, which corresponds with the MFA research questions 1, 2, and 3.

Methodology

Sample, Selection, and Size

Schools in the Chicago Public School District were approached to participate in the MFA grant activities. Four schools volunteered for participation in the pilot year. To qualify for participation a school had to have grade four and/or grade five general education teachers and special education teachers willing to participate in the PD. Twenty teachers (4th and 5th grade teachers, special education teachers, and mathematics content specialists) participated in the pilot year of the grant and received the MFA professional development. One teacher transferred to another school after the first session and another teacher dropped out after the third session citing

the workload. The eighteen remaining teachers were invited to participate in the interviews by the grant partners. Scheduling contact was made by the Center for Technology and School Change (CTSC) through phone and email. Two participants did not respond to the four invitations to schedule an interview. Thus, a total of 16 teachers participated in the phone interview.

Incentives

Teachers were given \$50.00 when they completed all of the research activities, which included activity logs and the phone interviews.

Interview Protocol Development

The interview protocol was developed by the Center for Technology and School Change (CTSC) and reviewed and refined by additional grant staff partners. Questions were developed with an emphasis on open-ended questions to solicit the range of experiences that teachers had while participating in the MFA program, particularly their knowledge of MFA, facilitators of and barriers to implementation, perceptions of training, ways in which MFA altered teachers' pedagogy, and the degree to which teachers thought MFA has had an impact on their practice and student learning. (See Appendix B for Interview Protocol)

Interview Procedures

Interviews were conducted by phone. Participants were called at a time they selected, in response to the email invitation. Some teachers scheduled the call for before or after school while others scheduled it for a free period during their school day. Teachers were called at the phone number they provided. Some used personal phones while others used school phones.

Occasionally, logistical issues required the phone calls to be rescheduled (e.g. when school day

plans were changed). The length of calls ranged from 15 minutes to 59 minutes with a mean of 30 minutes.

All but one interviewee agreed to have their phone call recorded. These interviews were transcribed verbatim at a later date from tapes of the interviews. One interview, based on participant preference, used a data transcriber who wrote notes as the phone call occurred.

Data Analysis

After the data was transcribed and the notes were written up, two researchers separately themed the transcripts by looking at individual question responses across participants. These themes were then compared and similar themes were combined. Transcripts were subsequently reviewed a second time to look for responses across questions to see how frequently those themes emerged throughout the totality of interviews. Summaries of the themes and counts of the frequency of the themes were produced. Appendix A lists counts for each theme across the totality of the interview transcripts.

The themes that emerged were in part a reflection of the questions provided to the teachers. The majority of the questions were open-ended. Had other specific questions been raised then it is possible that additional themes would have emerged. Furthermore the number count for each theme does not represent the total number of teachers who might have responded to a direct question on the particular theme but rather indicates what teachers brought up in response to questions. It is quite likely that the numbers would be higher were we to directly ask the teachers questions about each individual theme. However, the benefit of using open-ended questions is that researchers don't direct the response of participating teachers. Numbers are provided in the findings to indicate how many teachers noted that theme.

In only a few categories were teachers asked direct questions, e.g. who recruited them, how many minutes they teach mathematics daily and so forth.

Direct Question Findings

Six questions elicited specific answers that are summarized below: (1) Recruitment; (2) Discipline; (3) Teacher Evaluation; (4) Length of Math Class; (5) Initiatives; and (6) Teacher Decision-making.

Recruitment

An important aspect of project implementation is the recruitment of teachers to the program. In discussing recruitment to the program, teachers were asked specifically how they were recruited. In response to this direct-question teachers generally indicated that they were recruited by their school principal (n= 8) or by someone the school principal had asked to do the recruiting (n= 4). Five teachers indicated a mathematics coach had recruited them to participate. One teacher was recruited by more than one method.

Discussion among teachers supported teachers in deciding to participate. One teacher stated, *“Our principal asked our department. I wasn’t interested but my colleague convinced me to do it.”* A second teacher noted, *“All of our colleagues that I collaborate with signed up. It was definitely a group decision; we definitely talked about it.”* In addition to being motivated by colleagues who were participating, three teachers mentioned they signed up because of the support they believed it would provide them in teaching mathematics. *One teacher noted, “we started a new mathematics curriculum this year and the students were really struggling ... any extra help I could get would be well worth it.”*

Discipline

When asked directly, “How much do behavior/discipline problems impact your ability to implement what you learned in the MFA PD?” eleven of the teachers mentioned minimal or no discipline issues in their classrooms related to the implementation of the MFA program or impacting the implementation of the MFA program, with one teacher finding that the program improved student behavior. *“Well I have just found ... just for me personally ... these improved lessons improve the behavior because if the kid is interested in what they're doing, they're going to want to do it. Where before if you were just working on straight computation, you might get ... even if you have a good class in front of you, you have like 60-70% that are really participating and then you have the rest just sitting there, either spacing out or misbehaving. And if you have these better lessons where the kids can truly participate and get involved in them, they're behaved better. It just went hand in hand.”*

The other five teachers indicated a few behavioral concerns. One teacher noted she needed to deal with behavior issues prior to implementing the math lesson. A different teacher noticed that the use of the focal student approach could lead to student discipline issues: *“The only snag that I found when I was doing my close observations of one student, sometimes that was hard because, you know, there would be another student that was off task, or up against the wall, or another student that had a question. So sometimes that was a challenge.”* Another teacher noted that her students would *“get a little out of hand and rowdy”* when doing group work. Teachers noted that when student are disengaged or frustrated that more discipline issues arise. *“Definitely some behavior issues, in my school, in my classroom in particular. It didn't stop any implementation but I definitely had to pay attention to those behavior issues before I could move on and do a lesson each day.”*

Teacher Evaluation

Six teachers indicated they were not observed or evaluated on their mathematical instruction, with the majority being evaluated on their literacy instruction. Of those observed on their mathematical instruction, five teachers felt that their participation in MFA did positively impact their evaluation. Two teachers felt the skills they learned in *Math for All* were transferable to other content areas on which they were evaluated. One teacher noted that it improved her leadership skills.

Another teacher noted that she has improved in a specific area that the school has chosen to focus on: providing students time to fully think out problems. *“One of the things that we try as a group actually (to focus on) is the time factor, [that is] giving the students time to work out the math, rather than trying to rush through the lesson. I think that was something very important, and so during our teacher evaluation process one thing that my administrator mentioned was that even though the lesson went over the amount of time I was supposed to go, that the students had that opportunity to work it out without me telling them any answers, they had the opportunity to think and collaborate with each other and work things out. Yes, and that's what the program taught me. Let them have the time they need. I can't remember which one of the ladies said it. But one of them said you know, math is not, it's not real math if you are just doing 25 times 25. You have to get stuff away from that [just doing drill work] and I really did try and do that this year with the students.”*

Length of Math Class

Teachers were asked how long their mathematics instruction was per day. The four schools reported slightly different amounts of time provided in mathematics instruction. In one

school the general education teachers reported 90 minutes of math instruction a day. In that same school special education teachers indicated that math instruction varies from 60 to 80 minutes per day.

In a second school students have 90 minutes of mathematics instruction per day in the general education program, with special education teachers teaching mathematics for 60 minutes per day.

A third school has changed its math instruction time from 40 minutes (last year) to a minimum of one hour (this year). However general education teachers indicated that they are actually teaching mathematics for a slightly longer time, with an average of 70 minutes of instruction a day. The special education teachers in this schools who are in self-contained classrooms teach math for 75 to 80 minutes per day with one teacher offering an additional 75 minute period of math per week beyond that.

In a fourth school, general education math instruction ranges from 75 to 90 minutes per day and special education classes have mathematics instruction that ranges from 40 to 60 minutes per day.

Initiatives

Eleven teachers indicated there were no math initiatives happening in their district.

Initiatives mentioned by the other five teachers included:

- Math Talk: students put math into a sentence to make sense of it. (n=3)
- PAPPLE: mathematics questioning technique. (n=1)
- Mental math: a program for students to practice math calculations. (n=1)
- Guided Math: a workshop method of mathematical learning. (n=1)
- Three Reads Method: a process for students to understand word problems. (n=1)

- Descartes continuum: to choose learning objectives for a small group. (n=1)
- Common core was considered a new initiative in the district. (n=1)

Teacher Decision Making

In one school, teachers write their own units and are expected to share them across grade level. A teacher shared, *“Our school is like really into, as long as you know you're teaching them the essential things from the unit, hitting those essential things that students need to know for their grade level, then they are pretty open to how we teach it.”*

At a second school the teachers are provided with Engage NY curriculum and are allowed to make minimal adaptations. *“Systemically no, but teachers do. I was able to adapt a little bit.”*

At a third school, the general education teachers reported having autonomy over their own curriculum. *“Yes. Absolutely. Our math workshop is written by teachers and so I came in this year and had total freedom. They said, you know, this is kind of the sequence we have in mind....”* Another teacher noted, *“Yes, as far as what topics would be covered, [and] when [we], just [had] to make sure that the common core standards would be met, but from there it was completely my design. So we have some resources. We have a couple different textbook sets, and games and activities and things like that. But yes, the independence is definitely there.”* In contrast, the special education teacher has a bit more structure imposed because of the need to align with the general education classrooms. A special education teacher explained, *“There is an expectation that I'm using a similar structure to make sure that my students are getting the*

exposure to the general education curriculum similar to the general education peers even though they're receiving specialized special education services format in an alternate setting.”

At a fourth school, all of the teachers indicated they have autonomy to design and implement their mathematics curriculum. Teachers explained that they have no specific curriculum that is followed and materials are limited. Teachers are looking forward to spending time this summer working collaboratively to develop their curriculum. As one teacher said, “*We have no curriculum since the Common Core has been introduced. Our math materials are so ancient it's not even funny. We have zero money spent on math, so teachers are pulling things from everywhere that they can find. We're going to spend some time this summer tweaking some of those lessons that we start off in September [with. To be] ready to go with these improved lessons.*”

Open-ended Question Findings

The open-ended questions were themed and led to eight findings with multiple sub-findings in each category: (1) MFA Impact on teaching mathematics & student learning; (2) Changes in Lesson Planning; (3) Changes in Classroom Practice; (4) Impacts on Focal Students; (5) Changes in Relationships with other Teachers; (6) Barriers and Supports to Implementing MFA Practices; (7) Differences in the teachers who did not participate; (8) Differences in the MFA Professional Development.

MFA Impact on Teaching Mathematics & Student Learning

In looking at the impact of MFA on participating teachers' thinking about math, math teaching, and student learning four themes emerged: how students learn math, teachers' change in their attitude towards the discipline of math and confidence in teaching math, importance of

helping students really understand math, and their desire to provide mathematics that is more interesting to students.

How students learn math (n=8). Teachers grew in their belief that students should really understand math and display independent thinking. One teacher noted, *“You know, you kind of think of math as just numbers. But really the program taught me that it’s not numbers, it’s not really, you know multiplication, or you know the computational part, it’s [the] intricate thinking involved.”* Another teacher described that she felt that giving students more choices supported their thinking. *“As far as math thinking goes, I think giving them a variety of materials to choose from and let them pick what would help them ... was getting them to think for themselves, rather than me say, ‘Okay, take this and do that’ ... the more they can do on their own, the more confident they become, the more interested they are, and it just cycles and cycles, which is wonderful.”*

Previously hated math, now enjoying and have confidence (n=4). A number of teachers noted how their background and how their attitude towards mathematics and their skill in mathematics impacted their teaching of Mathematics.

A teacher explained that they didn’t see themselves as being mathematically oriented and that getting more excited about math impacted their students. *“Well, I don’t think I’m a math person, first of all, so when it comes to math, I’m not like, ‘Oh, I’m excited about it.’ [Now] I really enjoy teaching it [and] I kind of found that if I’m feeling excited about it, then students will be excited as well.”* A second teacher also noted that changing her perspective changed her practice and student reactions to mathematics. She said, *“It definitely created an awareness. First of all, it’s changed my outlook from being very negative and pessimistic. I remember them*

(MFA facilitators) saying that math was fun and you could play with numbers, and I've always thought math is not fun. But I've actually found different ways of playing with numbers, and I enjoy showing it to the kids, and I have to say that, when I will show them a different method, and all of a sudden I would get the blank stares, to (then) the kids all making that sound, like, 'Ahh.'"

A third teacher noted how much her perception of teaching math had changed. She talked about the transition she felt she had made as a result of participating in the MFA program. *"Well, prior to the program, I hated teaching math. [I was] very uncomfortable teaching math. I had been a middle school English, language arts, social science, and history teacher. [Then] I was changed into fourth and fifth grade math. Through this program, what I really got the most was not only feeling comfortable, but if I didn't know something or I didn't understand something, it was okay not to know it or understand it ... it's natural and its part of the process, and it built my level of confidence and it made me somewhat excited about teaching math, versus dreading it."*

Helping students really understand math (n=5). Five teachers noted that the MFA program helped them to come to new understandings of how students understand mathematics. One described this change as, *"I think it [MFA] really impacted my thinking on how students learn math and the sort of process that they have to go through to engage in learning and things that I might not think are difficult but are incredibly difficult for them for [a] variety of reasons and so I think just having the awareness of the reasons that it might be difficult for them and some work-around strategies for those different areas of, um, challenge, that would be an area that would benefit, um, my thinking around math or math instruction."*

Making math more interesting (n=3). Teachers also believe that supporting math instruction means making mathematics interesting as they approach the whole child. A teacher noted, *“I think it [MFA] just really did a good job of reminding me that you're teaching the whole student and you're not teaching skills in isolation. This is my eighth year of teaching and it's a low income area and it's a pretty high needs area and I teach bilingual ... and it's very easy to get caught up on teaching the skills and not understanding what they are not understanding.”* Another teacher further said, *“I think you just, you really have to, um make math interesting. Um, for your children, teach it in different ways because you're not going to reach everybody just teaching it in one way.”* Another teacher spoke of how her students reacted to her changed instruction saying, *“[My] students are getting more excited about math, and I would notice that because even times where, um, ‘Oh, today we have to shorten math because there's something else going on,’ they're like, ‘Oh, my god, you know, like how can we skip the other’ and say, ‘we want to do math.’”*

Changes in Lesson Planning

Teachers reported a number of changes in the way that they planned lessons with seven subthemes emerging: (1) Collaboration with others around lesson planning; (2) focus on focal student/struggling students; (3) awareness of student misconceptions; (4) analysis of neurodevelopmental demands of math activities; (5) focus on maintaining standards-based goals of the lessons and, (6) reflections on practice.

Collaboration with others around lesson planning. Teachers noted that one impact of the MFA program was a greater level of collaboration. Six teachers mentioned it in relation to

lesson planning in general and eight teachers mentioned how it increased their collaboration activities with special education or general education teachers.

A teacher noted that in participating in the MFA program she had become *“A lot more open to just like, really collaborating with all of my fourth grade teachers.”* Another teacher noted how her new collaborations increased her understanding of her students, *“One thing this program did was allowed me to collaborate a lot more with the special education coaches in our building and it just gave us more insight as to the diverse needs of those special education students.”* One teacher reported enthusiastically that she became aware of the special skills that special education teachers could bring to a collaboration, *“I mean I've been teaching in this school for over 20 years now and this is the first time I have really worked this closely with them.”*

Focus on focal student/struggling students. Eight of the teachers indicated that through participation in MFA they had put greater focus on and given support to their focal and struggling students. A teacher described how she did this with one of her students. *“One of my students has autism, and he's pretty reserved. I made sure that he had some questions written down for him, so that when he was part of the group discussion, he had a couple of things to choose from ... Which gave him enough confidence, just having the cards, to join the group. Even if he didn't need the extra written words ... just having them there as a fallback made him more confident.”*

Awareness of teacher misconception. Two teachers noted that they had found they had misconceptions about their students that they became aware of through using the MFA focal student observation process. One teacher spoke about how she learned to put aside her pre-

existing assumptions as she observed her focal student, *“Learning to look at a student and trying to set aside what you already know about them ... so, if you have a student that [you] don't usually follow ... you're going to have a set of assumptions about them based on what you've seen from them before. Um, and to really do a an accurate observation at a given time you need to put those aside as much as possible and just look at what exactly you are seeing them do.”* Another teacher noted that she became more aware of her own misconceptions of a student by deeply observing them. *“At first when I felt all those things about that student but then through my observations and through this class I discovered that there [are] actually other issues that play with him that I didn't see at first.”*

Analysis of neurodevelopmental demands of math activities. Nine of the teachers mentioned analyzing the neurodevelopmental demands of mathematics activities, both as they planned lessons and as they taught. One teacher noted how she added this to her lesson planning process *“I think I'm taking a little bit longer to look through what skills are necessary. Not only the focus skill of the day or the week, but what skills build up to the students being able to do that? What linguistically do they need to know? What fine motor skills do they need to have? And then know the students [who] have deficits and don't have some of those skills, how can I pull them up or how can I work around that to help them?”* Another teacher discussed how she changed her pacing to reflect her increased understanding of neurodevelopmental skills. *“I think sort of in my own, like, whole group instruction I tend to talk very quickly with a person and so having the knowledge that spoken language might be challenging for students, a solution to that might be just to slow down spoken language, that's the type of things that I started to think through as I was planning or as I was instructing my students.”*

Focus on maintaining standards-based goals of the lessons. Six teachers spoke of the importance of maintaining the standards-based goals of the lesson even if they needed to adapt aspects of the lesson. One teacher spoke of adapting the lesson for all students but in such a way that the students with IEPs were still *“Included in the setting because what often happens is because they're often at the lower level academically, [and] they end up getting just kind of modified work.”* She further noted, *“If the activity itself is accessible for everyone and they're joining in, or it's something that they can benefit [from] ... then they can benefit from [that lesson] as well. So I think that ... that was also something that I got from the PD.”*

Reflections on practice. Six teachers noted that they reflected more often on their practice as a result of the MFA program. One technique in particular that three teachers took away from the program was the importance of trying the activity themselves prior to teaching it. As one teacher said *“Well one of the things [that was beneficial from MFA], the first thing that kind of comes to my mind is that actually doing the lesson, not just thinking about the lesson, but actually doing the work of the lesson [is important]... because that was one of the things that the program really focused on, actually trying out the lesson and taking out the manipulatives, that you expect the kids to use. .And yeah, working with them and seeing, thinking about what might impede learning or what you can do to promote the learning and use of those materials.”*

Another teacher commented, *“I never even reenacted an activity until this program. Then when you do, [you can] kind of see what the students are going through it kind of gives you insight.”*

Changes in Classroom Practice

Teachers spoke of two areas of change in their classroom practices: ongoing formative assessment of individual students and the use of multiple instructional strategies.

Ongoing formative assessment of individual students. Three teachers mentioned ongoing formative assessment of individual students. One teacher described how she stepped back from direct instruction and provided the students more opportunities to try and fail in their learning process. *“So one of the things that I really learned was to step back, to be more of a facilitator versus direct instruction. And they do many lessons, but I’m going to be engaged more and walking and facilitating, and listening to what the children say, and sort of allowing them to make those errors, and then we can visit what they’ve done, versus me just jumping in and saying, no, no, no, this isn’t correct ... Sort of, we have to kind of step back, and that’s something I didn’t do before as a teacher.”*

The use of multiple instructional strategies. Fifteen teachers discussed use of a greater variety of instructional strategies that take into account student strengths and weaknesses. One teacher spoke of, *“giving students, you know, a variety of tools...like in teaching fractions having students, using fractions bars, using counters to create fractions and separating things into groups”*.

Impact of Focus on Focal Students

Six subthemes emerged when teachers discussed how the focus on focal students impacted their classrooms. Teachers noted: (1) Increased observation and reflection skills; (2) the importance of differentiated instruction; (3) changes in focal students; (4) benefits for the rest of the class; (5) their awareness of student learning styles, and (6) students becoming more excited and confident about math.

Increased observation and reflection skills. Participants were asked about how the MFA program impacted the focal students they observed as part of this professional

development. In response to this question, teachers most frequently described changes in themselves rather than the focal student. Four teachers noted that they increased their awareness of student learning styles. *“Actually it made me a lot more aware; it allowed me to be cognizant of individual learning styles, it really did. I mean, we’ve always talked about it ...”* while another teacher noted, *“Just being able to really observe [was important]. The power of observation to me is just huge and just to be able to step back and observe him and then to take my observations and rewrite a lesson or add something to a lesson.”*

The importance of differentiated instruction. Through the process of focusing on focal students, eleven teachers said they became more aware of the importance of differentiated instruction. A teacher noted how she had changed, saying, *“I feel like it changed my way of thinking. I wanted to teach it one way, and I was able to see and learn that there are many [more] multiple ways to teach them things than I was thinking of.”* Another teacher commented on her own change saying, *“I think that I made lessons, you know, more accessible to them and to probably other students too because I was thinking particularly about what their needs were.”*

Changes in focal students. Six teachers spoke of specific changes in their focal student. Two noticed that students increased their standardized test scores. One teacher remarked, *“He went up about 15% on his standardized tests. He started about a fourth grade level and ended about a seventh grade level. I think observing him more closely allowed me ... he was very unmotivated and it allowed me to spend a little bit more time paying attention to what were his motivations and what were his, you know, deficiencies and I think it helped us build a better bond. By the end of the year I felt like I could reason better with him when he wasn’t on task, because I knew a little bit more of what did motivate him.”*

Another teacher noted that while her focal student had improved standardized test scores he did not grow as much as expected. Other teachers mentioned focal students increased their mathematical ability, interest in math and how much they liked math. One stated, *“I saw that his math ability really soar[ed]. And while, you know, he ended the year not perfect in math, he certainly made huge strides in his, not only his academic ability but also his thinking, because he originally started out not even liking math. And now he has much more confidence.”* Other teachers also mentioned the growth in confidence of their focal student.

Benefits for rest of the class. The majority of participating teachers (15 of 16 participants) reported that adapting curriculum to recognize different student learning strengths ultimately benefited their whole class. One teacher noted, *“I think they also benefited, I mean whatever adaptations I tried to make for my focal student I also implemented with groups of students, especially the lower ability students.”* Another teacher said, *“[I] think it was definitely positive because some of the things they implemented were whole-group activities. So they weren't, um, I didn't modify lessons always just for a couple students. And so I think, you know, Math For All really helps me to come up with some creative ways of presenting the material.”*

A third teacher concurred, suggesting it benefited her whole class. *“Well, again they enjoyed it too ... it's like ... what we're seeing is, these lessons were more interesting ... and the kids just enjoy them more. I keep going back to the geometry one with the area and perimeter. The kids who didn't need to work around the perimeter, they wanted to do it and they wanted to be the helpers, because we had a large special education population in the classroom with them. These kids then wanted to be the teacher to help these kids and to demonstrate, look at how I'm doing this. And of course, through them demonstrating and teaching the lesson, they learned the material better.”*

One teacher noted that she saw achievement across her entire class suggesting that the MFA program contributed. *“I think looking at them on more of a social-emotional level, which was one of the focuses, definitely attributed to that. We did have a lot of success as a class. Each student has a goal, a personal goal that they need to make ... And 87% of my students made their goal this year. Overall my class started out at a second grade level and we left right on track at a fourth grade level. Just above actually. Reading growth was not nearly as great, so I think I can definitely say a lot of what I learned in the math I need to start to apply to the reading block as well.”*

Growing awareness of student learning style. Nine teachers noted that through the focal student process they became more aware of student learning styles in general.

Students became more excited and confident about math. Six teachers reported that through use of the focal student approach they impacted the class in ways that led to many more students becoming more excited and confident about mathematics.

Changes in Relationships with other Teachers

Teachers found that their relationships with other teachers in their school changed as a result of participating in the MFA program. Teachers noted changes in their relationships with special education, general education, bilingual, other subject area, different grade teachers, and mathematics coaches.

Out of the 16 teachers responding, fifteen teachers mentioned changes in their relationships with other teaching professionals. Teachers noted that their relationships grew personally as they were able to bond with other teachers from their school. One spoke of her growing relationships with teachers in her school. *“One of the best parts of it was that we car-*

pooled together. In my opinion, just that social interaction that we don't get at school [was important]. It's nice that we got to know each other on a more personal level, but also, 'hey did you try this, don't forget to do that', and having a sounding board ... When somebody else has a good idea. But I really enjoyed getting to know my colleagues on a more personal level ... Which was interesting." Two other teachers noted, *"It was a good bonding experience for us."* And *"I felt more connected with the other teachers."*

Teachers mentioned that the MFA program allowed for collaboration with people who normally did not collaborate together. Said one teacher, *"[The collaboration led to] just a much closer relationship with the special education team. The special education teachers were somebody, you know, I always welcomed them into my room, I just never worked closely with them."* Another teacher noted that they came to value other teachers more as a result of the MFA collaborations. *"It definitely opened my eyes. She's been teaching here for quite some time, so, maybe it's something that is old hat for her, but this is my first year, so, collaborating with her has definitely helped me make all of my students better."*

By having the MFA space, teachers were able to collaborate with others in different grade levels allowing teachers to identify gaps in learning trajectories. One teacher described her experience as, *"There ended up being three of us that participated and one teacher was a special education teacher and one teacher was a fifth grade teacher and then I teach fourth grade. It definitely allowed for some vertical planning. The fifth grade students were really struggling with implementing the new curriculum ... Because they [the 5th grade teachers] felt like there were so many gaps from our previous learning. Just being able to sit together and plan together, I was able to show them what we were doing in fourth grade and how I built background based*

on what they should have learned in K3. I was able to give them that information to kind of build upon what they were learning in their class and fill in the gaps. I think it was really helpful.”

Working with special education teachers allowed general education teachers to become more aware of the needs of special education students. A teacher described the change saying: *“You know, it really kind of fine-tuned, I think, our collaborations, where we were able to really dig deep, not, 'Well this is what I do and this is what I do,' but, 'Here's what we both tried to do.' And, what worked better and what worked differently and, so that really helped.”*

Teachers mentioned they respected their colleagues' ideas and thus enjoyed engaging in conversations about lesson planning. Said one teacher, *“There are so many talented people and so many great ideas. And if you stick just to your classroom and don't really go out there and branch out, you miss out on that.”* Another teacher commented, *“You really don't have time to collaborate like that [as we did in MFA]. So, hearing other teacher's views, like on our fifth grade team, has really helped to further our own understanding and communicate other ideas. Which I thought was very beneficial because four heads are better than two. Because you get more ideas, you get their experience. You hear other things that worked for them. And then you could see [that] you could actually visualize it if they talk about it, too.”*

Barriers and Supports to Implementing MFA Practices

Teachers were asked about the barriers and supports that they believe existed for implementing the MFA practices they learned. Six areas emerged: The time to collaborate, plan and prepare, resources, school administration support, mathematics coaches, school curriculum, and the need for additional professional development.

Time to collaborate, plan, and prepare. Teachers most consistently mentioned the issue of time constraints. Fifteen teachers specifically mentioned their concern about having sufficient time to prepare and plan these types of lessons. One teacher said, *“Because if you want to make a really good lesson and meet all those needs it just takes hours and hours you know ... creating manipulatives, creating graphic organizers.”* Another teacher noted, *“It's a really thorough process and it's a really meticulous process that we were sort of asked to engage in, so I think just knowing how the school year goes and the amount of time that I have with students and all of the things that I need to get done with them, time is really a prohibiting factor in terms of having all of the time to individualize all of the lessons and modify everything so it's just perfect at their level.”*

Teachers focused on the importance of shared planning time: seven of them specifically mentioning the need for greater collaboration, within the grade, across grades and with special education teachers. Looking ahead to sharing this work with other colleagues, two teachers mentioned concerns about other colleagues being willing to participate. *“A lot of our colleagues may find it to be too demanding time-wise.”*

Resources. Five teachers were concerned about a lack of resources such as money for substitutes to provide teacher release time for planning time, and for classroom materials. Two teachers mentioned large numbers of students in the classrooms and the need for manipulatives as a barrier. One teacher noted that a barrier for her was the large size of the school.

School administration support. Three teachers wanted greater support from the school administration. One teacher suggested, *“I don't think they kind of knew anything about the program and what it entailed.”* Another teacher suggesting that administrative support could come from giving the experienced teachers greater autonomy in decision-making.

Mathematics coaches. Teachers also discussed the value of the mathematics coaches, with three specifically mentioning the importance of the mathematics coach in their school and one teacher mentioning the desire for a mathematics coach in her school.

School curriculum and focus. Teachers also mentioned the focus of the school, such as when the school did not focus enough on math or focused too much on testing, as a barrier to implementing the MFA program. One teacher expressed concern that the school “... *focus(ed) on test scores and trying to teach more content, as opposed to having more depth.*” Two teachers expressed concern about the strength of the math curriculum that their school used.

Need for additional professional development. One teacher expressed the need for further professional development to learn how to manage identifying multiple student needs. “*I think that would be the biggest issue because, like I said before, it was great to be able to observe one student, like really in-depth. But, to be able to do that with many, what would be the next step be for that?*” In contrast to this teacher, another teacher felt that she had learned what they needed to learn, “*I don't think that I really need any more support. I printed out the checklist of the different things that we sat and wrote down each session, but after you do it a couple times it really becomes ingrained in how you look at your lessons ... And I think that that is all you really need.*”

Differences in the Teachers who didn't Participate.

How is your practice different from teachers who did not attend? In general teachers responded to this question by talking about themselves and what they gained, rather than discussing what other teachers were lacking. The most frequent theme that emerged was

teachers' sense of intentionality although teachers also spoke about their focus on student understanding of mathematical concepts.

Speaking of the intentionality she had gained one teacher said, *"I think one thing that's different between myself after the program and my colleagues that have not gone through the program is that, um ... Just the intentionality with which I plan.... So, you know, if we're solving multiplication problems, or, on a quiz they might just kind of pick two numbers because you can multiply any two numbers, and yes that's true, but the Math for All has helped me to see that not all numbers are created equally. And I can sit down and be really strategic about the numbers that I'm choosing or the types of problems that I'm choosing in order to be more ... Just to be more purposeful for my students."*

In considering how they thought about children's understanding of mathematics, one teacher noted, *"Just understanding math on a deeper level, not just solving word problems or performing the operations, but I think it was a little bit more focused on understanding mathematics. [Looking at] patterns and relationships among numbers and understanding, having a deeper understanding of the concepts behind math and being able to explain [them was valuable]."* And in considering this understanding a teacher noted it was rather more than rote memorization or test score results, *"My attitude [is] yes, test scores are important, but I'm more concerned with children understanding mathematical concepts. That's going to take them further than being able to pass a test, and learn something [from] rote memorization."*

Differences in the *Math for All* Professional Development

The level of professional development in mathematics instruction offered through the school district varied. In one school, all the teachers (n=3) mentioned that they had not had any

mathematics professional development opportunities prior to the MFA program noting, “*We haven’t had any [hands-on] professional development opportunities. It [the professional development] was [just] Common Core. ‘Here it is. If you have any questions, come ask me.’*” In contrast, in two of the schools none of the teachers (n=9) brought up the issue of not having professional development in mathematics. In the fourth school, the one teacher noted she chose not to attend the mathematics professional development that was offered.

Teachers were asked how the MFA program differed from mathematics or other professional development. Teachers noted that what distinguished MFA professional development was its depth, the level at which they were engaged, the focus on a particular student, and the fact that they were learning a process as opposed to a specific set of strategies, and the quality of the experience. Additionally five teachers mentioned the neurocognitive approach to gaining deeper understanding to student learning.

Depth of professional development. Teachers described the MFA professional development as being different from other professional development that they have attended. “*[In the other professional development] they throw something at you for two hours and hope that you do it and they never really revisit it. So talking about something very specific each week all connected to the greater plan of breaking down each lesson was very helpful.*” Two teachers noted the emphasis on deep student understanding, explaining, “*Well, naturally it’s much more intensive than any other professional development I’ve done.*” Echoing those comments a third teacher stated, “*I think the big thing that jumps out at me is how in-depth it was. Typically in the past when I’ve done other professional development you kind of walk away with, ‘That was a waste of my time.’ You know, ‘How much am I going to really apply this?’ Or it just scratched*

the surface of an idea without really, you know, getting into it. I think this program, the duration of it, while it might be a barrier for some people to put the time into it; I think that the time is important because it allows you to go into the concept and all of this neurodevelopment that goes on with children. You can't do that in just 3 hours. You have to really put the time into it."

Engaging Activities. Teachers felt engaged in that they were required to try this professional development approach both in the sessions and back in their schools. A teacher spoke of that aspect saying, *"What was nice about [this] is that you are learning about it, given what you need, and then going ahead and trying to implement it at the same time. So, it's almost kind of like, you're doing trial and error right within the workshop. So, you're going through the whole process during each session and then being able to come back and share with other colleagues and find similar commonalities between your students and their students."*

A second teacher also spoke of how this professional development felt different to her because of the engaging activities, *"Well, we were actually doing things. A lot of the PD's, you just sit and take notes. Or sit, and other people play on their phones or answer e-mails, but here we were engaged in the lessons, and when you do things, you remember them longer. So I liked that part of the PD."* Similar sentiments were expressed by a third teacher who noted, *"I have been to other math PDs where they just tell you what to do and then you're off on your way ... there's so many different components of the program and there you go. But that wasn't the case for Math For All. I think that getting the opportunity to talk to other teachers even from different schools was very beneficial. The fact that we worked on a different skill every single time we met, was also very important because then you're just focusing on one thing and kind of really, you*

know, talking about it and how it's going to impact your classroom. I think there was just a lot of support, among the Math For All community. And that definitely made a difference for me."

A teacher noted that the professional developers were clear in showing their expectations during these activities. *"They really got us [to do] hands-on activities [and] they expected a lot from us. If we weren't working to the level that they expected, they let us know, and I think that's something that is important, to hold people accountable, and, you know, to remind them that none of us, or at least nobody from my school [really] had to be there."*

Collaboration. Teachers noted that the focus on collaboration was another distinction of the MFA professional development. One teacher stated, *"I think what was distinct was that it offered some coaching and co-planning, which was really helpful."* Another teacher commented, *"I always found it is so valuable talking to other teachers. We are ... each one of us are our own best resources. If we could just find the time to sit down and really share these ideas and then again like I said, the special education team, they have such specialized skills ... we really don't have that enough."*

Use of process versus strategy. Teachers also noted that the MFA program focused more on a process of working with their students rather than a single strategy approach. A teacher described the difference as, *"Compared to the PD that I've been at that, that was more just teaching you different strategies, this one was more like, open. They didn't tell you specifically what to use, but then they were just like, what do you think, collaborate with your colleagues and talk about it you know. How could you adapt to fit the needs of the student, the other students that you work with, instead of being 'oh here is a strategy you should use this.' I thought they would just be like, 'Oh here's a strategy that you can use' and then we would use*

that strategy for our students and then reflect back on it when we came, but it was more like, thinking about how to do it yourself and changing it and collaborating you know [with] fellow colleagues and stuff.”

One teacher noted that they felt the school districts often offer professional development that is focused on one strategy whereas the MFA professional development they described as “*I think it's sort of more along the shaping of perspective, um, teacher perspective and planning practices.... the program seemed more about, developing a way of looking at students and a way of thinking about them rather than a set of tools ...*”

Another teacher noted that a lot of professional development is focused on differentiating based on content, and in contrast, the MFA professional development “*Has been more about differentiating based on process ... this, it's a little bit more focused on trying to teach the same content to, you know, to multiple learners.*”

Focal student. Teachers also mentioned that the focus on a specific student was different from other professional development programs they had participated in. One teacher noted, “*How is it similar or different? Let's see, I think it's because it had [a] focus on a specific student and then, think of how we might adapt to that specific lesson or unit for that student. Like really getting to know your focal student.*” Another teacher commented, “*It's different because it seeks to adapt that on an individual basis and I think in a lot of other professional developments we're looking at whole groups or we're looking at a small group of students. We're not necessarily looking at individuals and so I think this program's a little bit different because it does ask you to go target and zoom in on just one student and their strengths and challenges.*”

Quality of the experience. Two teachers mentioned that the facilitators did not talk at the participants but were active listeners to teachers' comments, responses and concerns about their practice. As one teacher stated, *"A lot of time professional development are kind of, you sit back and people talk at you and that's that."* Another teacher commented that the experience of the facilitators was something that they appreciated. *"We could see that they were people who actually had experience in the classroom. And I really loved the fact that you were being taught, too, and the fact that they gave us guidance. They were collaborating, they listened, and they had suggestions, 'Oh, what do you think about this way?' You know? Like, [they] challenge you to think differently, which really did help, too. I really did like that."*

Teachers felt that the professional development was well done, *"I really feel well prepared after having all of the PD. The women did a great job of breaking everything down and allowing us to learn on our own pace and to influence each other and learn. And have really good discourse about it."* Additionally teachers mentioned that they felt they were listened to, as professionals. As one teacher recalled, *"And then they would listen. One of the things I noticed [is that] they do a lot of, the presenters I'm talking about, active listening, and paraphrasing what you said. So, that seemed to help a lot, too. I know that's good teaching practices and I'm just thinking like things that they did when we were there."*

Two teachers expressed concern about aspects of the professional development with one suggesting that the sessions should occur over shorter sessions and the other teacher questioning the necessity of the reading assignments.

MFA Principal/Administrator interviews: Overview

The first year of the grant was dedicated to piloting the larger PD implementation scheduled for grant years 2 and beyond. There was no control group during the pilot year. The first year included a pilot of the semi-structured interviews that will be used in subsequent years. The semi-structured telephone interviews with administrators are intended to document organizational support for the MFA program in the participating schools.

School administrators are key partners in any educational implementation because decisions about implementations are typically made by district leaders (mathematics, special education coordinators, and superintendents), in collaboration with school principals. Principals are interviewed to collect data to better understand and refine the Theory of Change/logic model for the *Math For All* intervention (i.e. factors that mediate and moderate outcomes) in addition to documenting what organizational supports (such as common planning time, collaboration opportunities among teachers, availability of learning materials and curriculum) were available to teachers to implement the MFA program.

Methodology

Sample, Selection, and Size.

Schools in the Chicago Public School District were approached to participate in the MFA grant activities. Four schools volunteered for participation in the pilot year. To qualify for participation a school had to send teams of fourth and/or fifth grade general education and special education teachers willing to participate in the PD. The grant partners notified principals about the interviews and scheduling contact was made by the Center for Technology and School Change (CTSC) through phone and email. The principals of these four schools were contacted

to participate in the pilot interviews. Two of the four principals did not respond to the four invitations to schedule an interview. In the case of one of the two schools that responded, the assistant principal was actually interviewed.

Incentives

There were no incentives for administrators to participate in the research activities, because they were conducted during the school day and CPS RRB regulations did not allow us to pay principals for research activities conducted during their normal work hours.

Interview protocol development

The interview protocol was developed by the Center for Technology and School Change (CTSC) and reviewed and refined by additional grant staff partners. Questions were developed with an emphasis on the school structure and support for the MFA program implementation (See Appendix D for Interview Protocol)

Interview Procedures

Due to the low response rate of principals the evaluators offered to conduct interviews in person rather than just by phone. One of the principals participated in an interview in Chicago and the other was interviewed over the phone.

Data Analysis

Based on the feedback from two principals who were interviewed, and the two principals who never responded to the invitation to be interviewed, it appears that the principals had a limited degree of connection with the program. Summaries of the principal interviews (n=2) follow and are summarized individually as the responses were unique to each school.

Principal Findings

School One

The vice-principal stated that Math had been a priority for their school for 2014-2015 and together with the Math coach they were determined to focus on designing differentiated curriculum for all students. The vice-principal explained that the teachers were very excited to have participated in the MFA professional development. Since the MFA professional development had been implemented, he noticed that teachers were spending more time designing lesson plans and were targeting more diverse learners. He expected the teachers to come away with more content knowledge geared towards assessment standards and was surprised by the positive effects of the sharing and collaborating that the teachers did with one another at MFA. He pointed out that a strategic priority for the following school year was having teachers collaborate more - especially the general education and special education teachers. This school administration seems to be involved in the instruction of teachers - by observing lessons of teachers, assigning days for professional development sessions, and hiring substitutes to allow time for teachers to engage in vertical planning. He stressed the importance and value of a math coach to facilitate, coordinate and continue the type of work learned at MFA. It was evident that the Math coach was also responsible for most of the recruitment of the teachers for the program initially. In this school it appeared that having an individual (the mathematics coach) lead the charge for generating teacher enthusiasm about joining the program and sustaining this work after the professional development was over was key to the belief that this work would be continued.

School Two

The principal shared the information about the MFA professional development with teachers and they voluntarily decided to participate. From his informal conversations the teachers did not complain about the professional development and so he concluded that it must have been a valuable experience. The principal was unable to speak specifically of the changes brought about by the MFA professional development. The school is structured in content areas from third grade on, so teachers can focus on specific disciplines. The structure also allows teachers to engage in vertical planning. This school has a number of professional development opportunities available for teachers including the Model workshop and a problem-solving cycle. Teachers are evaluated using the Danielson Framework. There is a large focus on data analysis at this school.

Conclusion

The MFA pilot teacher interviews provided insight into how the participating teachers perceive the MFA program and what elements have made a significant impact on them. Overall, the interview results suggest that this program provided a unique professional development experience for the teachers and focused on a process that enabled the teachers to more specifically understand and meet the mathematical needs of their students.

In reviewing the data collected the CTSC researchers suggest some minor modifications to the interview protocol for implementation with the first treatment cohort (see Appendix C). These revisions address two key areas for further exploration: (a) Questions that should be removed because they proved to be duplicative or elicited non-useful responses; and, (b) ways to support teachers in the interview process itself.

Appendix B
Theme Counts from Teacher Interviews

Theme	Count
MFA impact on thinking about teaching mathematics	
How students learn math	8
Previously hated math, now enjoying and confidence	4
Helping Students really understand math	5
Making math more interesting	3
Changes in lesson planning	
Increased collaboration with others around lesson planning	6
Increased collaborating with a special education or general education teacher	8
Focus on focal student/ struggling student/ student not reaching	10
Awareness of teacher misconceptions	0
Analyze the neurodevelopmental demands of math activities	9
Maintain standards-based goals of the lessons	6
Reflections on practice	6
Changes in classroom practice	
Ongoing formative assessment of individual students	3
Use of multiple instructional strategies	15
Impact of focus on focal student	
Increased observation and reflection skills	9
Importance of differentiated instruction	11
Changes in focal student overall	6
Benefits to rest of class	15
Awareness in student learning styles	9
Students more excited about math and gained confidence	6
Changes in relationships with other teachers	
Increased relationships with special education teachers	7
general education teachers	10
Increased relationships with Bilingual	1
Increased relationships with Mathematics coaches	2
Increased relationships with other subject teachers e.g. Science	1
Increased relationships with teachers in different grades	2
Barriers or supports to implementing MFA program	
Time to collaborate, plan or prep	15
Resources including money for subs, materials, manipulatives	5
School administration support needed	3
Math coach listed as supportive or would be supportive	4
School curriculum not strong enough	3
Need for additional professional development	1

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