MAKING PRE-K COUNT

Improving Math Instruction in New York City

Executive Summary

Pamela A. Morris
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Overview

In the context of a persistent achievement lag among low-income children despite substantial investments in early education, policymakers and practitioners continue to seek ways to improve the quality of children's preschool experiences. The Making Pre-K Count study addresses whether strengthening prekindergarten (pre-K) instruction in math, hypothesized to be a "linchpin" skill in children's development, can improve children's short- and longer-term learning. Specifically, the study rigorously evaluated the effect of an evidence-based math curriculum called Building Blocks along with ongoing training and in-classroom coaching, relative to the typical pre-K experience. Making Pre-K Count took place in 69 pre-K sites and over 170 classrooms across New York City. Thirty-five of the pre-K sites were assigned to receive the math curriculum, training, and coaching over two years (the "BB-MPC" group), while the other 34 were assigned to continue their typical programming (as the "pre-K-as-usual" group). Outcomes for children were assessed in the second year of the study, after teachers were familiar with the program. Over the course of the study, the typical pre-K experience in New York City was changing rapidly, with a new focus on the Common Core math standards and a major expansion into universal pre-K.

This initial report provides early results on teachers and children at the end of pre-K during the second year of Making Pre-K Count implementation.

Key Findings

- Implementation of the professional development and curriculum model generally went well. Training and coaching were well attended and delivered with high quality. Teachers were able to implement three out of four main curricular components (Whole Group, Hands On Math Centers, and Small Group) successfully at levels prespecified by the research team. Implementation of the Computer Activities component fell slightly below those levels.

- Teachers in BB-MPC classrooms spent more time on math — an additional 12 minutes of math instruction and an average of nearly two more math activities in a three-hour period — despite the surprisingly large amount of math instruction already taking place in New York City pre-K programs. BB-MPC led to slightly higher-quality instruction in math, but there was no impact on teachers' general use of strategies that promote higher-order thinking (such as asking "why" and "how" questions).

- BB-MPC had no impact on direct assessments of children's math competencies, language ability, or executive function (a set of skills underlying self-regulation). Children with stronger language skills at pre-K entry may have benefited from BB-MPC, but there was no evidence of gains for other subgroups of children.

These pre-K findings stand in contrast to previously published studies of Building Blocks, which found positive effects on both math instruction and outcomes for children. Many open questions remain about how the New York City context, including the substantial amount of math already in place and the unique sample of children, may have contributed to these initial findings. Future reports will address these questions, as well as the longer-term effect of BB-MPC on children's outcomes as they move into kindergarten.

Preface

Six years ago, concerned that investments in preschool programming were not making as big and lasting a difference as hoped, the Robin Hood Foundation, in partnership with the Overdeck Family Foundation, the Heising-Simons Foundation, and others, began working with MDRC to determine whether an increased focus on the amount and quality of math instruction could have long-term effects on students' school performance. Coupling a developmentally appropriate math curriculum named Building Blocks with an intensive training and instructional coaching program for teachers, Making Pre-K Count is an ambitious effort in New York City to build evidence about early math's role as a "linchpin" in improving children's skills. The study was designed to learn whether skills improved not just in math but also in language and literacy, self-regulation, and executive function; assess whether gains can be generated on a large scale; and gauge whether gains are sustained as children move into kindergarten and elementary school.

During the years of this study, the New York City prekindergarten system began implementing a new set of pre-K Common Core learning standards specifically focused on increasing the amount and quality of math and literacy instruction. And in 2014, the city launched a major preschool expansion effort aimed at creating a universal pre-K model to reach an additional 32,000 children. These changes mirror efforts to expand and strengthen early childhood education across the nation — and constitute big changes in "business as usual."

While recent studies of universal preschool programs in such locales as Tennessee and Boston tackle the question of whether preschool works at all, Making Pre-K Count asks a different question: How can we improve the quality of preschool instruction — both what is taught and how it is taught — *above and beyond* the business-as-usual classroom? And can this be done in a large, diverse array of pre-K programs, both in schools and in community-based centers?

The implementation story summarized in this interim report is a positive one. Teachers successfully delivered the Building Blocks curriculum, and the amount and quality of instruction rose relative to the business-as-usual setting. But even in the control group, the amount of math instruction students received increased dramatically. Possibly as a result, when students in both groups were tested at the end of the year, the two groups performed comparably. These preliminary findings stand in contrast to those found in other studies of the Building Blocks curriculum. While there are reasons to believe that some differences may emerge by kindergarten, what might explain the results so far? Besides the surprisingly high level of typical math instruction, contributing factors may include the distinct sample characteristics and an emphasis in the skills test on counting but not on geometry, which was an important part of the curriculum. These and other questions will be explored more fully as children progress through the kindergarten year. We will also have an opportunity to learn more about how well children sustain math skills gained in pre-K and about the effects of a math "booster" being tested in kindergarten.

Gordon L. Berlin
President, MDRC

Acknowledgments

Making Pre-K Count (MPC) reflects the efforts and contributions of many people. We are extremely grateful to the teachers and site administrators without whom the study would not have been possible. Thank you to the teachers for attending numerous trainings, for implementing the program, for allowing us to visit your classrooms, and for sharing your insights. Thank you to the administrators and other staff in each of the schools and centers that were part of the MPC study who generously gave their time, commitment, and cooperation throughout the project.

We extend our appreciation to current and former leadership at the New York City Department of Education's Division of Early Childhood Education and the Administration for Children's Services' Division of Child Care and Head Start, who provided valuable support and guidance for implementing the study in schools and centers throughout the city.

Running and supporting an intervention at this scale requires a true collaboration with many contributing partners. We are particularly thankful for the dedicated consultation and deep engagement of the developers of the Building Blocks curriculum, Drs. Doug Clements and Julie Sarama, who helped the team conceptualize the Building Blocks intervention, led trainings for our teachers, and provided thoughtful comments on this report, as well as for the hard work of the Building Blocks trainers, Linda Bialek, Melissa Comerchero, Meg Gailey, Dorothy Jordan, Amy McCampbell, Shelley McLaughlin, Doug Van Dine, Beth Walker, and Jessica Walker-Beaumont, who trained teachers and conducted site visits. Thank you also to Mary Louise Hemmeter and Lindsay Giroux for providing training and support around classroom management. Bank Street College of Education was also an invaluable partner. The Bank Street team provided valuable input on the professional development model and technical assistance throughout the project, and their commitment to coaching the teachers on this project was vital. We could not have proceeded without the contributions of Sabrina Silverstein (Project Director Pilot Year and Year 1), Katherine Baldwin (Coach Pilot Year and Year 1, Project Director Year 2) and all the coaches from Years 1 and 2 whose commitment and enthusiasm were instrumental in driving implementation and supporting teachers. Thank you to the current and former leadership at Bank Street College, including Josh Thomases and Jon Snyder, for their guidance, thoughtful partnership, and review of the report.

The design, planning, and execution of the research and data collection benefited from the thoughtful input of the Making Pre-K Count steering committee. Thank you also to our academic partners, including Sandra Barrueco of Catholic University; Karen Bierman of Pennsylvania State University; Greg Duncan of the University of California, Irvine; Dale Farran of Vanderbilt University; Linda Platas of San Francisco State University; Katherine Magnuson

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Most important, we thank the children, families, and teachers who participated in our study and generously gave their time, commitment, and cooperation throughout the project. Our research would not have been possible without them.

The Authors

Executive Summary

Preschool has been championed as a poverty-fighting strategy that can — under certain circumstances — improve outcomes throughout childhood and even into adulthood. Yet the "fade-out" of preschool effects, particularly as preschool programs expand to a larger scale, has emerged as one of the central challenges in the field. With evidence suggesting that early mathematics skills may be important to children's later academic outcomes and the understanding that math instruction has tended to be underemphasized in preschool, Making Pre-K Count focused on math as a potential pathway to improve preschool instruction and to bolster children's competencies in preschool and in the long term.

The study was designed as part of the Robin Hood Early Childhood Research Initiative, which was established to identify and rigorously test promising early childhood interventions. The initiative is a partnership between Robin Hood, one of New York City's leading anti-poverty organizations, and MDRC, a nonprofit, nonpartisan education and social policy research organization. Making Pre-K Count, conducted in collaboration with Bank Street College of Education and RTI International, is also supported with lead funding from the Heising-Simons Foundation, the Overdeck Family Foundation, and the Richard W. Goldman Family Foundation.

As the initiative's first study, Making Pre-K Count tested whether an evidence-based math curriculum (Building Blocks), along with teacher training and in-classroom coaching, would improve children's short- and long-term learning compared with prekindergarten (pre-K) as usual in New York City. The study took place at 69 sites serving predominantly low-income children of color in New York City. The pre-K experience in New York City was in flux during the study period, with greater attention to children's learning in math and language and literacy and an expansive move to universal pre-K for 4-year-olds. As a result, Making Pre-K Count compares an innovative approach to teaching pre-K math with an evolving "business as usual" pre-K program model. This report presents initial findings about implementation, teacher practices, and child outcomes. Future reports will focus on the longer-term impact of this math curriculum and professional development on children's outcomes in elementary school.

Why Math?

The impetus behind Making Pre-K Count derived from nonexperimental research demonstrating that math may be a "linchpin" skill that can improve a broad set of outcomes for children, including language and a set of cognitive skills known as executive function that support

children's self-regulation.[1] In fact, preschoolers with strong early math skills have higher achievement in both math and reading in elementary school than their peers with lower math skills, adjusting for other differences between these children.[2] Likewise, children with strong math skills throughout elementary school have higher rates of high school graduation and college attendance, which are critical milestones on the path out of poverty.[3] Yet despite these links between early math and later learning, young children historically have received little math instruction in preschools, suggesting a math intervention as a promising way to substantially change children's preschool experience. Emerging evidence from smaller tests by designers of play-based math curricula, appropriate for preschoolers' developmental level, demonstrate that it is possible to increase the quantity of math instruction in preschools, leading to moderate to large effects on children's math skills.[4] The combination of these factors — children's limited exposure to formal math instruction in preschool, the availability of promising curricula to fill that instructional gap, and the prospect that preschool math skills may promote a host of other outcomes for children in the longer term — make math a compelling target.

Making Pre-K Count Study Design

Making Pre-K Count tested the Building Blocks preschool math curriculum, combined with ongoing training and in-classroom coaching to support teachers' delivery of it. Building Blocks, developed by Douglas H. Clements and Julie Sarama, was chosen for a number of reasons: (a) It has a detailed and scripted manual to support widespread dissemination across many classrooms; (b) it has a well-developed training component; (c) it addresses a broad set of math content areas; (d) it is uniquely based on a developmental progression that should support learning for children at all skill levels; and (e) it shows strong evidence of effects for children

[1]Executive function, also known as cognitive regulation, in early childhood is made up of working memory (or the ability to keep a number of pieces of information in the mind at once), cognitive flexibility (or the ability to flexibly shift between pieces of information), and inhibition (or the ability to stop or repress an immediate response).

[2]Greg J. Duncan, Chantelle J. Dowsett, Amy Claessens, Katherine Magnuson, Aletha C. Huston, Pamela Klebanov, Linda S. Pagani, Leon Feinstein, Mimi Engel, and Jeanne Brooks-Gunn, "School Readiness and Later Achievement," *Developmental Psychology* 43, 6 (2007): 1428-1446.

[3]Greg J. Duncan and Katherine J. Magnuson, "The Nature and Impact of Early Skills, Attention, and Behavior" (paper presented at the Russell Sage Foundation Social Inequality and Educational Outcomes Conference, New York City, 2009).

[4]Examples of curricula are Douglas H. Clements and Julie Sarama's Building Blocks, Herbert Ginsburg's Big Math for Little Kids, and Prentice Starkey and Alice Klein's Pre-K Math.

Box ES.1

Brief Illustration of a Building Blocks Whole Group Activity

Ms. Rosario has both hands behind her back as she sits down on the rug with the children and asks, "Boys and girls, do you know who's visiting today? It's Mr. Mixup!" She pulls out a plush hand-puppet moose, and the children cheer. Ms. Rosario tells the class that Mr. Mixup has been confusing the names and parts of shapes, so they have to correct him and explain why. Mr. Mixup comes to life, saying "Hello-o-o, boys and girls!" They wave at him. "I'm so excited to teach you everything I know about shapes because I know a WHOLE lot." Some children giggle.

Mr. Mixup gestures with one hoof to an easel displaying a drawing of a rectangle and says: "This is a square." Voices call out, "No-o-o!" Mr. Mixup harrumphs loudly, asking what they mean. Several children raise their hands and Ms. Rosario calls on Jenni: "It's a rectangle!" Mr. Mixup responds, "But a square has four sides, and this has four sides so this is a square." Jenni corrects him: "It doesn't have four *equal* sides. A square has four equal sides." Mr. Mixup says, "I get it! A square has four equal sides! A square is not a rectangle."

Ms. Rosario asks the class, "Is a square a rectangle? What did we learn about squares?" Cristiano recites, "A square is a special kind of rectangle." Mr. Mixup interrupts, "Are you kidding me?!" The children burst into laughter. "A square is a special rectangle? I don't get it." Cristiano explains that a rectangle has opposite sides that are the same length and a square also has opposite sides that are the same length — they just are *all* the same length. Mr. Mixup claps and says, "Very good. So you said a square is a special kind of rectangle. It's special because it has four *equal* sides. I got it!"

across a number of preschool samples and sites.[5] The curriculum includes 30 weekly lesson plans consisting of four main activities: (1) *Whole Group*; (2) *Small Group* instruction led by a teacher with three to four children in the class; (3) *Hands On Math Centers*; and (4) *Computer* activities. Box ES.1 provides a brief, illustrative description of a Building Blocks Whole Group activity.

Sixty-nine pre-K sites housed in public schools and community-based organizations were selected throughout Brooklyn, the Bronx, Manhattan, and Queens to participate in Making

[5]Karen Anthony, Dale C. Farran, and Kerry G. Hofer, "Improving Young Children's Math Learning Through Technology," unpublished paper (2013); Douglas H. Clements, Julie Sarama, Mary Elaine Spitler, Alissa A. Lange, and Christopher B. Wolfe, "Mathematics Learned by Young Children in an Intervention Based on Learning Trajectories: A Large-Scale Cluster Randomized Trial," *Journal for Research in Mathematics Education* 42, 2 (2011): 127-166; Kerry G. Hofer, Mark W. Lipsey, Nianbo Dong, and Dale C. Farran, "Results of the Early Math Project — Scale-Up Cross-Site Results," working paper (Nashville: Peabody Research Institute, Vanderbilt University, 2013).

Pre-K Count (MPC). Of these, 35 were randomly assigned to receive two years of Building Blocks (BB) and extensive professional development (the "BB-MPC" or program group), while the remaining 34 were assigned to continue their typical pre-K programming (the "pre-K-as-usual" or control group). Professional development provided to lead and assistant teachers in the BB-MPC group consisted of 11 days of training led by Building Blocks program developers and ongoing, in-classroom coaching delivered by Bank Street College of Education over two years (2013-2014 and 2014-2015) to support teachers' implementation of the curriculum. Impacts were assessed with the cohort of children who *entered pre-K in Year 2*, when most teachers would have already taught a full year of the curriculum. This report presents initial findings about implementation, teacher practices, and child outcomes from the second year of implementation. Future reports will focus on the longer-term impact of this math curriculum and professional development on children's outcomes in kindergarten.

The New York City Pre-K Environment

Making Pre-K Count provides a test of an enhanced pre-K experience (BB-MPC) compared with the typical pre-K experience in New York City, which may have been different from the typical preschool experience in other Building Blocks trials. During the second year of Making Pre-K Count, the city's recently elected mayor, Bill de Blasio, expanded full-day pre-K services to all 4-year-olds, leading to the sudden opening of tens of thousands of new pre-K slots and programs. Along with this major expansion, an emphasis on New York State Prekindergarten Foundation for the Common Core standards for math and literacy led to a heightened focus on formal instruction in pre-K classrooms. These initiatives meant more scrutiny of pre-K programs and a large (and possibly growing) amount of math instruction being delivered in New York City pre-K classrooms during the time of the study.

Another difference from prior Building Blocks studies was the New York City-based sample of children, which was more heavily Hispanic (56 percent of children) and Spanish-language dominant (20 percent) than the child sample in previously published Building Blocks studies, where Hispanic children made up less than 22 percent of the samples.[6] Children in the study sample also entered pre-K with slightly higher scores on executive function measures than low-income children in some other studies.[7] Thus, Making Pre-K Count provides a test of

[6]Clements et al. (2011).

[7]Emily Moiduddin, Nikki Aikens, Louisa Tarullo, Jerry West, and Yange Xue, *Child Outcomes and Classroom Quality in FACES 2009* (Washington, DC: Administration for Children and Families, 2012); Ellen S. Peisner-Feinberg, Jennifer M. Schaaf, Lisa M. Hildebrandt, and Yi Pan, *Children's Outcomes and Program Quality in the North Carolina Pre-Kindergarten Program: 2012-2013 Statewide Evaluation* (Chapel Hill: Frank Porter Graham Child Development Institute, University of North Carolina, 2014).

Building Blocks with a more diverse sample of children in an environment where more math was occurring.

Making Pre-K Count Findings to Date

Teacher training and coaching were delivered with high quality and as intended. Training sessions were well attended and covered 95 percent of the training content. The amount of coaching was high, with teachers receiving around 149 minutes (out of a planned 180) of coaching weekly in Year 1 and 99 minutes (out of an expected 120) of coaching twice a month in Year 2.

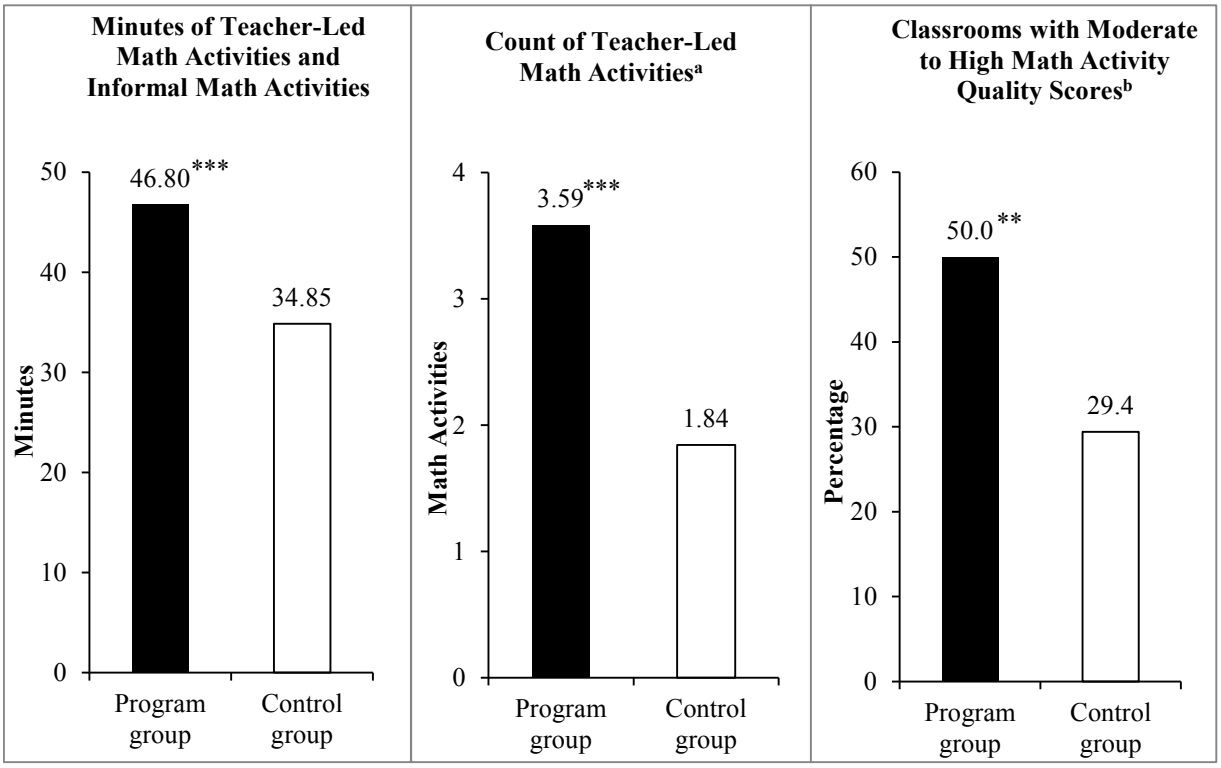
Teachers were able to implement three out of the four main curricular components successfully at levels prespecified by the research team. Most of the components of Building Blocks were implemented as intended across both years, with implementation of Computer Activities slightly lower than the other three components. Teachers were able to conduct Whole Group and Hands On Math Centers on over 90 percent of the days that children were in attendance. Small Group implementation was not as strong, but still good. The Computer component was implemented with less consistency than intended, perhaps due to difficulties with technology and the challenge of supporting every child's computer use.

Teachers in BB-MPC classrooms spent more time on math — an additional 12 minutes of math instruction, offering an average of nearly two more math activities in a three-hour observation period. In the spring of the pre-K year, trained observers, blind to whether they were in a program group or control group classroom, recorded every observed formal or informal math activity. In comparison with control group teachers, BB-MPC teachers led nearly two more math activities per observation across a range of math content, which translated into nearly 12 more minutes of teacher-led math during this three-hour period (see Figure ES.1). These impacts were on top of what were unexpectedly high levels of math teaching in pre-K-as-usual control group classrooms, where teachers taught nearly 35 minutes of math.

The impacts of the curriculum and professional development on instructional quality were mixed. BB-MPC led to slightly higher-quality math instruction but did not affect the quality of other instruction. Observers also rated the quality of each math activity, based on the extent to which teachers extended children's math learning or explained the math concept underlying an activity. As shown in Figure ES.1, BB-MPC teachers were 21 percentage points more likely to deliver moderate-to-high quality math than control group teachers. However, the overall quality of math instruction across both groups was low — below a rating of 2 (on a scale of 1 to 5), meaning that teachers were inconsistent in using instructional

Figure ES.1

Impacts on Classroom Outcomes in the Spring of the Pre-K Year



SOURCE: MDRC calculations based on three-hour observational assessments conducted in spring 2015 using a version of the Classroom Observation of Early Mathematics—Environment and Teaching (COEMET; Sarama and Clements, 2009), modified for the Making Pre-K Count study, that records every math activity lasting for 30 seconds or longer.

NOTES: Statistical significance levels are indicated as follows: *** = 1 percent; ** = 5 percent; * = 10 percent.

[a]A math activity is defined as one that meets the following criteria: (1) persists for at least 30 seconds; (2) develops mathematics knowledge; (3) has a discernible topic, goal, and task; and (4) involves several interactions (e.g., two or more conversation turns) with a teacher and one or more children.

[b]Category is in contrast to classrooms with a low quality score or no math activity observed. The proportion of classrooms where at least one teacher-led math activity was observed differed across program and control groups (96 percent versus 81 percent), precluding direct comparison of math activity quality scores. For each teacher-led math activity observed, quality was calculated by averaging across six items rated on a scale of 1 (low) to 5 (high). The scale assesses the extent to which the teacher explains the math concept underlying an activity, asks open-ended questions, and builds on children's answers, ideas, and strategies to extend their mathematical thinking. Scores at or above 2 were classified as having moderate to high quality.

practices aimed at extending children's mathematical thinking. Thus, BB-MPC did not lead to higher quality instruction more generally (that is, teachers extending children's thinking by asking more open-ended questions) across all activities (math and nonmath).[8]

Contrary to expectations, the observed impacts on teachers' math instruction did not lead to stronger math, language, or executive function competencies for children at the end of the pre-K year. There were no effects of BB-MPC on either of the two measures assessing children's pre-K math competencies (the ECLS-B and Woodcock-Johnson Applied Problems subscale, both validated measures largely assessing numeracy skills), one of which is shown in Figure ES.2. Children in BB-MPC classrooms did score higher on a math assessment in the late fall than children in pre-K-as-usual classrooms, possibly because children were quickly exposed to the program as teachers in BB-MPC classrooms got off to a fast start in teaching math.[9] However, these early impacts observed at the start of the school year faded by the spring as both groups learned more math, closing the gap between the two groups. There was also no evidence of consistent positive impacts on children's skills in other areas. Children in BB-MPC classrooms did score higher on one measure of executive function (Pencil Tap), but the effect was small and was not found in the two other measures of executive function or on the measure of children's language skills.

Some evidence suggests that children with stronger language skills at pre-K entry benefited from BB-MPC, but there was no evidence of gains for other subgroups of children. BB-MPC led to small, positive impacts on two measures of children's math skills for children entering pre-K with higher receptive language skills — that is, the ability to understand words — but not for children entering with lower levels of such language skills.[10]

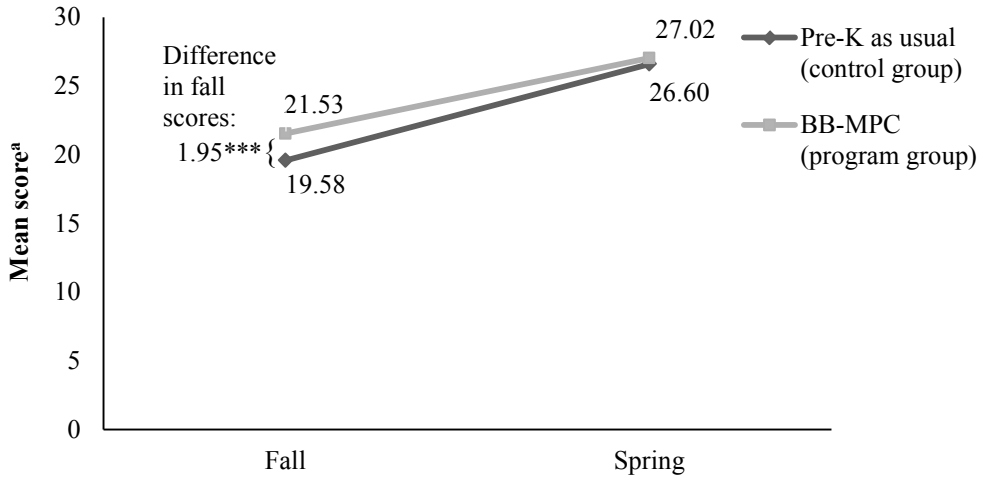
[8]Instructional quality was rated using the Classroom Assessment Scoring System (CLASS), a widely known observational instrument.

[9]Early gains for children were plausible (rather than an unlucky draw in the randomization process resulting in unequal groups) for two reasons: Teachers were trained the previous year and could start using the Building Blocks curriculum from the first day of school, and the fall testing process extended from September into early November. Extensive analyses conducted and described in this report's appendixes lead to the conclusion that these early differences are in fact impacts of the program. At the time of randomization, the pre-K-as-usual and BB-MPC classrooms were similar on all measured teacher math practices and classroom climate. There are no differences in test scores between the BB-MPC and pre-K-as-usual children assessed early in the fall, but there are statistically significant differences between the two groups for children assessed slightly later in the fall. Thus, the impacts on children's fall test scores emerged and grew larger as the number of days from the start of the school year increased.

[10]Effect sizes for the subgroup with stronger language skills ranged from 0.16 to 0.19. Effect size is expressed in terms of standard deviations and calculated as the difference between the mean values for the program group and the control group, divided by the standard deviation of the control group.

Figure ES.2

Mean ECLS-B Math Scores in the Fall and Spring of the Pre-K Year



SOURCE: MDRC calculations based on direct assessment of children in fall 2014 and spring 2015 using the Early Childhood Longitudinal Study-Birth Cohort math assessment (ECLS-B).

NOTES: Statistical significance levels are indicated as follows: *** = 1 percent; ** = 5 percent; * = 10 percent.

[a]The potential score range on the ECLS-B math assessment is from 0 to 44.

Discussion and Open Questions

Making Pre-K Count tested whether a math curriculum supported by intensive professional development could strengthen children's pre-K experience and subsequent outcomes on a large scale in New York City, by increasing the amount of math instruction and improving its content and quality. Relatively strong implementation of BB-MPC in three of the four main curricular components led to teachers delivering more math instruction across more math content areas, despite a large amount of math already being taught in pre-K-as-usual classrooms. BB-MPC also improved the quality of teachers' math instruction — which was low in both the BB-MPC and control groups — but not the quality of instruction more generally. However, these observed impacts on math instruction did not translate into gains for children at the end of pre-K.

The lack of overall impacts on children's outcomes in the short term does not align with findings from prior published studies of Building Blocks, in which the curriculum has generally

led to moderate to large impacts on children's math skills.[11] There is one important exception: Making Pre-K Count findings in the fall and spring of pre-K mirror the pattern of effects from a recent, as yet unpublished Building Blocks study, which also had substantially more math instruction in the pre-K-as-usual context and a larger sample of Hispanic children than prior trials.[12] Interestingly, in that study, impacts on children's math skills did emerge one year later, by the spring of the *kindergarten* year. That said, given their inconsistency with much of the prior research, the findings so far from this New York City-based trial raise a number of questions, some of which are highlighted below.

Did the high level of math already in place in New York City pre-K programs limit how much value Building Blocks could add for children's math learning? Making Pre-K Count's impact on the amount of math instruction — nearly 12 additional minutes — was two to three times larger than the impacts reported in other Building Blocks studies (2 to 5 additional minutes).[13] However, perhaps due to the rollout of universal pre-K and emphasis on alignment with Common Core standards, control group classrooms in New York City were already conducting an average of 35 minutes of math in a three-hour block, much higher than the 12 to 27 minutes taught by control group teachers in previous Building Blocks studies.[14]

Was Making Pre-K Count able to strengthen the teacher practices that might help produce gains in children's learning? While BB-MPC teachers implemented most curricular components and provided more math instruction, BB-MPC did not substantially change their use of higher-quality instructional practices like open-ended questioning or tailoring instruction for each child's skill level, either during math activities or more generally. Although BB-MPC teachers were more likely to deliver slightly better quality math instruction than their pre-K-as-usual counterparts, math instructional quality was still low. Perhaps relatedly, the curricular components that are most suited to such high-quality instructional practices proved somewhat more difficult for teachers to implement than other components of the program.

[11]Based on a variety of developer-created and normed instruments, effect sizes for children ranged from 0.72 to 1.47. Douglas H. Clements and Julie Sarama, "Effects of a Preschool Mathematics Curriculum: Summative Research on the Building Blocks Project," *Journal for Research in Mathematics Education* 38, 2 (2007): 136-163; Douglas H. Clements and Julie Sarama, "Experimental Evaluation of the Effects of a Research-Based Preschool Mathematics Curriculum," *American Educational Research Journal* 45, 2 (2008): 443-494; Clements et al. (2011).

[12]Douglas H. Clements, Julie Sarama, Carolyn Layzer, Fatih Unlu, Carrie Germeroth, and Lily Fesler, "Effects on Mathematics and Executive Function Learning of an Early Mathematics Curriculum Synthesized with Scaffolded Play Designed to Promote Self-Regulation Versus the Mathematics Curriculum Alone," unpublished paper (2016).

[13]Clements and Sarama (2007); Clements et al. (2011).

[14]Clements and Sarama (2007); Clements et al. (2011).

How might the particular nature of the pre-K population in New York City have influenced these findings? Making Pre-K Count tested the effects of Building Blocks on a diverse sample of children that may have differed from samples in previous Building Blocks studies. The study included more children of Hispanic origin (56 percent) and more children who entered pre-K speaking mostly Spanish (20 percent) than prior published studies of Building Blocks. Children in the Making Pre-K Count study also appeared, on average, to have entered pre-K with higher executive function scores than low-income children in some other studies.[15] It is unclear what role these sample characteristics played in the observed pattern of findings.

Does this study fully assess, with the math measures collected in pre-K, children's deep math learning? Building Blocks targets children's math learning across a number of content areas, from numeracy and operations to geometry and spatial skills. The math measures used in Making Pre-K Count (the ECLS-B and Woodcock-Johnson Applied Problems) are validated measures focused mostly on children's numeracy; a measure assessing more geometry may have captured differences in math learning between BB-MPC and pre-K-as-usual children. Additionally, the Building Blocks curriculum is designed to change the ways children think about and understand math, which may help children navigate more complex math tasks in kindergarten with facility (consistent with the data discussed above from a more recent Building Blocks trial).[16] Making Pre-K Count data from the kindergarten year, including a more comprehensive assessment of children's math competencies, will help inform this question about the longer-term impact of Building Blocks.

What's Next

Future reports will detail further analyses designed to address these open questions and present findings on the impact of Building Blocks on children's math, language, and executive function skills in kindergarten, as well as the impact of an add-on math initiative called High 5s, which randomly assigned children in the Making Pre-K Count program group to receive small-group math club instruction in kindergarten. While a number of questions remain from these initial pre-K findings, Making Pre-K Count provides important information to the field on the current preschool environment and how to scale up programs while retaining a high level of quality. Additional analysis and follow-up in kindergarten will provide further evidence on how preschool can best deliver on its promise of making a difference for low-income children's school readiness and possibly beyond.

[15]Moiduddin et al. (2012); Peisner-Feinberg, Schaaf, Hildebrandt, and Pan (2014).
[16]Clements et al. (2016).

About MDRC

MDRC is a nonprofit, nonpartisan social and education policy research organization dedicated to learning what works to improve the well-being of low-income people. Through its research and the active communication of its findings, MDRC seeks to enhance the effectiveness of social and education policies and programs.

Founded in 1974 and located in New York City and Oakland, California, MDRC is best known for mounting rigorous, large-scale, real-world tests of new and existing policies and programs. Its projects are a mix of demonstrations (field tests of promising new program approaches) and evaluations of ongoing government and community initiatives. MDRC's staff bring an unusual combination of research and organizational experience to their work, providing expertise on the latest in qualitative and quantitative methods and on program design, development, implementation, and management. MDRC seeks to learn not just whether a program is effective but also how and why the program's effects occur. In addition, it tries to place each project's findings in the broader context of related research — in order to build knowledge about what works across the social and education policy fields. MDRC's findings, lessons, and best practices are proactively shared with a broad audience in the policy and practitioner community as well as with the general public and the media.

Over the years, MDRC has brought its unique approach to an ever-growing range of policy areas and target populations. Once known primarily for evaluations of state welfare-to-work programs, today MDRC is also studying public school reforms, employment programs for ex-offenders and people with disabilities, and programs to help low-income students succeed in college. MDRC's projects are organized into five areas:

- Promoting Family Well-Being and Children's Development
- Improving Public Education
- Raising Academic Achievement and Persistence in College
- Supporting Low-Wage Workers and Communities
- Overcoming Barriers to Employment

Working in almost every state, all of the nation's largest cities, and Canada and the United Kingdom, MDRC conducts its projects in partnership with national, state, and local governments, public school systems, community organizations, and numerous private philanthropies.