AMBITIOUS LEADERSHIP:
A CASE STUDY OF ALIGNING MATH CURRICULUM TO COLLEGE-AND-CAREER-READY STANDARDS

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CREATING A COMMON CORE–ALIGNED CURRICULUM

The alignment of the math curriculum to the Common Core State Standards has been a multiyear, iterative process at DC Bilingual Elementary Charter School in Washington, D.C., which educates all students in English and Spanish. Wanda Perez, DC Bilingual's former principal, began the process of aligning the curriculum to the Common Core before the PARCC tests were introduced in 2015. Under her leadership, student proficiency on the DC Comprehensive Assessment System grew by 30 points in reading and more than 60 points in math. When Daniela Anello took the reins as principal in 2014, she continued the work of aligning the curriculum to the Common Core, and the school has further advanced student performance. In 2015, the first year of the Common Core–aligned PARCC exams, 65 percent of DC Bilingual students scored at least a 3 (approaching college-readiness standards) on the English language arts test, and 64 percent did so on the math test, compared with averages of 44 percent and 56 percent respectively for the city at large. In fact, DC Bilingual — where 81 percent of students qualify for free lunch and 51 percent are English language learners — had the fourth highest percentage of third graders scoring a 3 or above in math of any D.C. school.

Practices Supporting Curriculum Alignment at DC Bilingual

- **Leveraging pedagogical expertise and distributing leadership:** The principal hired a lead math coach who had deep knowledge of teaching practices and the Common Core to lead the curriculum development process, and she appointed teachers with strong math knowledge to the math curriculum team. She provided professional development opportunities to help team members deepen their knowledge of the Common Core standards, pedagogy, and coaching.
- **Backward-mapping from the standards:** Instructional leaders created the curriculum by using the Common Core standards as a guide, reorganizing the standards as necessary to meet the needs of the school's community of students.
- **Articulating changes in instructional practice necessary to deliver the curriculum, and building teachers' capacity to enact and refine these changes:** Instructional leaders articulated necessary changes in lesson models and instructional practices, and supported teachers in mastering and continually refining them.
- **Regularly testing, observing, and revising curriculum:** Instructional leaders regularly observe classroom instruction and solicit feedback from teachers on lessons and unit plans, using that information to revise the curriculum.

Perez and Anello, as well as the school's instructional coaches, say that their laser-like focus on adopting, adapting, and adjusting a rigorous, standards-aligned curriculum has been key to the school's success. They note that their work developing the math curriculum, particularly their repeated deep-dives into the standards, has been vital to growing

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their capacity to support students in meeting the higher expectations. Said one math specialist, "It really allowed me to better understand the content at each grade level, the primary goals of each grade, and what the rollout should be, particularly for the grade levels I have not taught. Unpacking the standards will continue to be a part of our work with our teachers."

The curriculum development work at DC Bilingual is distinguished by several core practices, as described in the inset on the previous page.

CURRICULUM DEVELOPMENT PHASE 1: LEVERAGING EXPERTISE AND DISTRIBUTING LEADERSHIP

The school's math department has been working on its math curriculum — including a vertical math map, scope and sequences, and unit and lesson plans — since the release of the Common Core State Standards in 2010, when Perez was still the principal of the school. At the time, DC Bilingual's math curriculum looked like that of most schools, focused exclusively on teaching standard algorithms rather than developing conceptual knowledge. "Students memorized a procedure but did not know why they were doing it, and by the end of the year they might not remember how to do it," a third-grade teacher said.

To help lead the school in the shift to the Common Core, Perez hired an expert in the standards and in conceptual math instruction — a former instructional coach in Prince George's County Public Schools — to serve as the school's lead math coach. The coach took over the work of developing the math scope and sequence and wrote one term of lesson plans for each teacher, pulling from several different sources, including the TERC Investigations curriculum and Math Solutions resources, both of which had concept-based lessons that incorporated time for students to reason and think critically.

The initial implementation of the curriculum appeared to have a positive impact on student learning. In the coach's first year, the proportion of DC Bilingual students scoring proficient on the DC Comprehensive Assessment System rose by 15 percentage points. However, given the scope of the coach's responsibilities — the school had hired several new teachers who would need intensive support the following year — Perez and the coach decided to discontinue developing a math curriculum from scratch and instead to adopt the TERC Investigations curriculum, while retaining some unit plans and lessons that had worked well the prior year.

When Anello became principal in 2014, she was aware that despite the gains in student achievement, there was still resistance among teachers to the shift to standards-aligned math. "Teachers have their own fears about math," she said, and their own opinions about best practices. To help the coach address these challenges, Anello expanded the math team, creating math specialist positions for two teachers with strong backgrounds in math. Both specialists had taught at DC Bilingual for at least five years and had received significant coaching from the math coach on designing and implementing effective standards-aligned math instruction. One specialist noted that, as a second-grade teacher, she had worked with the math coach after school almost every day to review and refine her lesson plans and instructional materials.

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CURRICULUM DEVELOPMENT PHASE 2: BACKWARD-MAPPING FROM THE STANDARDS

Members of the expanded team examined the evidence they had gathered on the newly adopted TERC curriculum[1] and quickly decided it was still not sufficiently aligned with the Common Core standards. Once again, they embarked on building their own curriculum. To get them started, Anello found money in the budget to bring in Math Solutions trainers for a two-day training session on curriculum development. After that training, the math curriculum-writing team — which included the math team as well as a kindergarten teacher who attended the Math Solutions training — met every Monday for two hours after school, as well as on the occasional Saturday, to brainstorm and debate the most effective materials and instructional approaches for teaching to the standards.

They launched the process by cutting up printouts of the standards for each grade, organizing them into themes and units that seemed logical based on what they knew about their students, and breaking them down into skills, concepts, and generalizations. They analyzed the standards, moved things around, and discussed how teachers could revisit standards in different contexts. They also addressed issues that had come up with the curriculum over the last few years. For example, they had noticed that teachers were not spending enough time on combinations of 10 and often had to return to that topic later in the year, so the team built more time for that focus area into the new curriculum.

As the team began working on units for each grade, they invited the teachers from that grade to participate. In most cases, at least one grade-level teacher joined them for planning. Once the units were laid out, the math team held meetings with each grade's teachers to get feedback. These meetings, in which grade-level teacher teams reviewed the units and the thinking behind them, built their knowledge of the standards, and their ability to assess the alignment of lesson and unit plans.

The math team also vertically aligned each unit, listing within each unit plan the focus standard for that unit, the foundation standard on which the unit was built, and the standard it built toward. In this process, they relied heavily on the progressions documents for the Common Core math standards published by the University of Arizona (http://math.arizona.edu/~ime/progressions/). They created a pre-assessment for each unit based on the progressions documents so that teachers — and students — knew what was expected from them in each unit and how it built on previous learning. The vertical alignment process involved not just content but also instructional strategies. "We thought about what math practices were going to be consistent from year to year and how to develop habits of mind from year to year," the lead math coach said.

The team wanted teachers to understand from the scope and sequence how their year would unfold, so each unit plan included the relevant Common Core standards, describing the expertise students were expected to develop; major goals (e.g., understanding unit fractions as the basic building block of fractions, or recognizing equivalent fractions as different ways to name the same quantity); the essential questions students should be able to answer at the end of each unit (e.g., what is a fraction?); planning strategies, such as specific readings; and pacing guides.

As school leader, Anello encouraged and trusted the team. She co-observed math lessons with them and gave them feedback, holding them accountable for the lessons they produced and their implementation in classrooms. At the same time, she supported the team by providing the time and resources they needed to carry out the work.

1 This was an earlier edition of the TERC elementary school math curriculum. A revised, Common Core–aligned edition was released in the summer of 2016. See https://investigations.terc.edu/

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The teachers liked the clear connections drawn between the lessons and the standards. Said one teacher: "The standards are not just thrown at you. They're broken down so you know what you are teaching. When we are grading, it's not just, 'Oh, you got it completely, so this is how you got a good grade.' We have different levels at which the student is mastering a concept."

At the end of each unit, coaches met with teachers to find out which lessons should be kept and what was missing from the unit plan. "We make sure that as the teachers are teaching it, that we are constantly reflecting on what changes we should make," the coach said. Anello created a complicated schedule of grade-level meetings, vertical team meetings, data-and-planning days, and one-on-one coaching to support this work.

"I always want teachers to be focused on, 'What's the math behind this activity, and how does it fit into the developmental milestones of the kids?'" the lead coach said. "I want them to be thinking about not just, 'What am I doing tomorrow?' but thinking about a piece of data, and where students are developmentally, and whether you have a tool that is going to lay that out for them simply."

ARTICULATING RELATED SHIFTS IN INSTRUCTIONAL PRACTICE

As the math team members developed the new curriculum, they also had to attend to changes in instructional practice that the curriculum required. For this reason, the pacing guide they developed broke out in detail a new way to approach lessons, which followed a "launch, explore, summarize" model.

In the launch phase for each investigation-based lesson, the teacher would make a connection between what students were going to do that day and something they had already done, or lead students in brainstorming about how they might get started on the problem. "The launch sets them up to do the heavy lifting with partners or independently," one math specialist said.

During the exploration phase, students would tackle the problem on their own or in groups. During this time, the teacher would monitor and coach students, and ask probing questions. "It allows teachers to have a small group during that time," another math specialist said. "It allows for a lot of flexibility to give targeted support within the classroom."

In the summary portion of the lesson, students might complete an exit ticket if they had reached the end of a concept or skill, or the whole class might come together to participate in a discussion about the problem. "A lot of big ideas or strategies can come out of that conversation," one math specialist said. The teacher would record the discussion on an anchor chart to make clear what the class learned that day and what students would need to work on the following day.

Lesson plans for each day included the estimated time to spend on each phase of the lesson, the standards addressed, objectives, routines, and a suggested menu of activities. The level of detail written into lesson plans varied: Some were laid out step-by-step; others were teacher point-of-view narratives taken from Math Solutions. Some lessons plans also provided more support in helping teachers figure out what the launch would be, where the explore phase should take place, and how to make connections to student objectives ("I can" statements). Lesson designs varied by day and grade level: Some included 45 minutes of problem exploration, and some included a mini-lesson that gave students time for independent work, fluency practice, or extensions of another problem.

As teachers taught the newly designed lessons, the curriculum designers looked for ways to revise and refine them. "We ask for a lot of feedback from teachers: 'Did you feel comfortable teaching that lesson?'" one math specialist said. Because the curriculum writers were math coaches, they were in the classroom

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every day to see first-hand how the lessons they designed were being taught. They also worked with small groups of students as interventionists, so they could see what students were struggling with, and they used that information to revise instruction and the curriculum.

DEVELOPING ASSESSMENTS ALIGNED TO THE COMMON CORE

As the team wrote the curriculum, it was also necessary to design aligned interim assessments. To do this, they pulled from external resources, including Math Solutions, Illustrative Mathematics, Inside Mathematics, and PARCC. School leaders emphasized that they did not want teachers doing test prep with the PARCC exam, but they did want them to deeply understand what the test was looking for so that they could help students develop the conceptual knowledge necessary to tackle any question. The school used data from these assessments, as well as from classroom observations, to inform three- to four-week coaching cycles focused on areas for instructional growth, and to adjust and refine the curriculum.

CURRICULUM DEVELOPMENT PHASE 3: REGULARLY TESTING AND REVISING THE CURRICULUM

Even with such comprehensive efforts, some teachers pushed back on some of the curriculum changes. Because Anello regularly gathered feedback from teachers, she and her math team came to understand the root causes of the resistance. In surveys and conversations, teachers complained that the inconsistent structure of the curriculum — which drew lessons from varied sources — made lesson planning difficult. For example, some lesson guides included questions for teachers to ask their students, while other lessons required teachers to write their own questions.

Anello also realized — after hearing teacher feedback, observing coaching meetings, and reviewing teacher and student performance — that one coach on the math team was not a good fit for the role, and decided to let her go. With one less member, the math team had to rethink its work moving forward. Team members felt they had built a solid foundation of content knowledge among the grade-level teams over the last year through the unit studies, but they determined that they could not continue to write and revise units at the same level of intensity and still maintain their coaching and intervention work.

Happily, TERC had just released a new Common Core–aligned math curriculum. Teachers liked TERC's clear and consistent structure, and the math team liked that its lesson model of "launch, explore, summarize" was consistent with how many of their math lessons were already designed. To decide whether to adopt the TERC curriculum, the math team went through the DC Bilingual math curriculum for each grade level, examining what percentage of lessons were from TERC. The team also reviewed which lessons had been most successful in terms of student performance and teacher feedback. Following this review, and after conferring with the Anello and the school's academic lead, the team decided to adopt the new TERC curriculum.

The team set a goal of having 80 percent of each teacher's math lessons come from TERC, which left room for teachers to pull from non-TERC lessons, should the math and grade-level teams identify gaps in the TERC curriculum. The math team already knew, for example, that they would supplement TERC's third-grade curriculum with lessons from their prior curriculum that used manipulatives to teach fractions. "We are critical consumers," one of the math specialists said.

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CURRICULUM REFINEMENT IN ACTION

Two math coaches led a first-grade math team meeting focused on laying the groundwork for computation fluency in the early elementary grades. After reviewing the meeting agenda with the team, the lead coach distributed a map of the school's K-2 math fluency progression. The progression started with knowing the number names, then moved to counting out objects, parts of 5, combinations of 10, and finally 10 + *n*. To the side of the map, the coach had inserted the Common Core standard the progression comes from: *Add and subtract within 20, demonstrating fluency for addition and subtraction within 10, as well as some of the strategies associated with that standard.*

"Think about the progression and where your kids might fall as you are teaching computational fluency," the coach said. "What's that big hurdle we want to get over?"

The teachers discussed the trouble some of their students had been having with counting on. The lead coach noted, "Counting on is largely developmental. You need to give them that meaningful practice."

As is typical in these meetings, the lead coach then distributed student-level data from the most recent first-grade assessments. "Think about what you are already doing to support the kids," she said. "How can this data be on your radar every day to design those number talks?" One teacher later noted a common mantra from the coaches: Do not wait too long to assess, but assess frequently so that you are in touch with where the student is, where the student needs to be by the end of the term, and what you are going to do to get them there.

One first-grade teacher said she had been struggling because her students were in such different places: Some students could add groupings of, for example, three and seven dots, while others had to count them out one by one.

Pulling from strategies outlined in the math curriculum, the coach suggested the teacher use a 10-frame to help the student. "We want kids to be relating to the 'ten-ness,'" she said. "Be really strategic about the model you use in the number talk that day."

The math specialist then introduced the teachers to a math activity she wanted them to try with their students, one that was not a part of the curriculum but that one of the teachers had used successfully in small intervention groups. The coaches devoted the next 15 minutes of the meeting to having the teachers try out and analyze the activity. First, a coach demonstrated how the activity was done; then the coaches divided the teachers into pairs to try it out themselves. The coaches observed each pair as one teacher played the student, the other the teacher.

The lead coach told the teacher who was playing the teacher role, "Ask, 'Can you pick up five?'" The teacher asked the question to her partner.

To the teacher playing the student, the coach said, "Say, 'I can. I can pick up the red four and the blue one.'"

"Is there another way?"

"There is another way. The orange three and the yellow two."

The math coach had the two teachers continue to practice the activity.

In thinking about how the teachers would talk about the activity with their students, the coach advised, "One sort of meta thing to be aware of in your instruction is, 'How often do we ask kids to count off?' Maybe we should ask kids how they 'found out' rather than asking them to 'count off.'"

The coach asked the teachers to spend the last few minutes of the meeting thinking about where in the lesson they would insert the activity, and asked them to let her know their plan. Finally, she gave them an article to read on mastering fact fluency.

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When the math specialists shared the planned curriculum change with teachers in a session toward the end of the school year, teachers were enthusiastic and, said one specialist, felt "that their input on the curriculum had been valued." During the session, the math team gave teachers the scope and sequence for the following year, which was broken down into lesson names, standards, and brief descriptions. The math specialists also led teachers through a gallery walk of lesson- and unit-plan templates to get feedback so they could revise the templates to better suit their planning needs for the following year.

This planning session was only the first step in implementation. Starting in August, the coaches would meet with teachers to review each unit, identify lessons to include and omit, and address content concerns two weeks before each unit rolled out. Teachers would be expected to read the "About the Unit" summary before these planning meetings and would receive professional development.

To continue the curriculum refinement process, the coaches created a simple rubric that teachers could use to rate the effectiveness of each lesson. Teachers would base the rating — from 1 to 4 — on their perception of the effectiveness of the tasks in the lesson and on student data. Additionally, because teachers taught each math lesson two times a day, the math specialists planned to track any increases in ratings between the two lessons, and ask teachers to explain any tweaks they made that led to the higher ratings.

QUESTIONS FOR REFLECTION

Discuss what this case implies about (a) the role of the principal in developing high-quality curriculum, (b) how responsibility and leadership for curriculum can be distributed, and (c) how professional learning communities and/or teacher teams can contribute to ongoing program improvement.

Who were the key stakeholders, and what role did they play in implementing a new math curriculum at DC Bilingual?

What implications does this case study have for your own classroom, your content-team work, and your grade-level work?

Many critical choices were made throughout this case study. Identify the three most important choices you think the school made. Who made the decision? Why do you think that decision was made? What was the impact?

Adapting a vendor-created curriculum was a key part of the curriculum development at DC Bilingual. What insight or guidance does this case study give you about adopting and adapting a curriculum and related instructional practices at your school?

If your school does not have dedicated personnel to oversee or develop curriculum, how might teachers and other staff approach the key practices described in this case study?

What questions does this case study raise for you?

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