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MATH in common®

Many Pathways to Student Success in Mathematics

Middle and High School Math Course Sequences and Placement Decisions in the Math in Common Districts

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WestEd's Evaluation of the Math in Common Initiative

Math in Common® is a five-year initiative funded by the S.D. Bechtel, Jr. Foundation that supports a formal network of 10 California school districts as they are implementing the Common Core State Standards in mathematics (CCSS-M) across grades K–8. Math in Common grants have been awarded to the school districts of Dinuba, Elk Grove, Garden Grove, Long Beach, Oakland, Oceanside, Sacramento City, San Francisco, Sanger, and Santa Ana.

WestEd is providing developmental evaluation services over the course of the initiative. The evaluation plan is designed principally to provide relevant and timely information to help each of the Math in Common districts meet their implementation objectives. The overall evaluation centers around four central themes, which attempt to capture the major areas of work and focus in the districts as well as the primary indicators of change and growth. These themes are

- Shifts in teachers' instructional approaches related to CCSS-M in grades K–8.
- Changes in students' proficiency in mathematics, measured against the CCSS-M.
- Change management processes at the school district level, including district leadership, organizational design, and management systems that specifically support and/or maintain investments in CCSS-M implementation.
- The development and sustainability of the Math in Common Community of Practice.

Together, the Math in Common districts are part of a community of practice in which they share their progress and successes, as well as their challenges and lessons learned about supports needed for CCSS-M implementation. Learning for district representatives is supported by WestEd team members who provide technical assistance related to goal-setting and gathering evidence of implementation progress (e.g., by advising on data collection instruments, conducting independent data analyses, participating in team meetings to support leadership reflection). An additional organizational partner, California Education Partners, works with the community of practice by offering time, tools, and expertise for education leaders to work together to advance student success in mathematics. California Education Partners organizes Leadership Convenings three times per year, summer Principal Institutes, "opt-in" conferences on high-interest topics (e.g., formative assessment), and cross-district visitation opportunities.

Executive Summary

The shift to Common Core State Standards (CCSS) presents a different way of thinking about the relationship between mathematics and course content and structure, requiring districts to reconsider the familiar mathematics course pathways students follow from middle school to high school. As a result, many California school districts are facing dramatic restructuring of middle and high school math course content — with little guidance on which approaches will work best.

Implementing these standards, which focus on preparing students for college and career readiness, demands more than simply enacting the guidelines for what students should know at grade level. Through interviews with the 10 California school districts participating in the Math in Common (MiC) initiative, we learned that these implementation efforts encompass rich and weighty discussions on curriculum choices, instructional vision, the needs of students, and parent voice. And, specifically in mathematics, districts have made a series of interconnected high-stakes decisions about their math programs, including rethinking their math pathways, curriculum, course sequencing, and placement criteria. These decisions are all made while trying to balance complex local and historical factors against state policy goals and existing research, and at the same time keeping in mind the real and immediate consequences for students and teachers.

The 10 districts within the MiC initiative — much like those across the state — have approached their mathematics decisions with a range of beliefs, perspectives, and pressures. The wide variety of decisions and experiences of these districts highlights the complexities of implementing Common Core pathways across vastly different localities. In fact, variation is the main theme that emerged from our interviews: we see tremendous variation in the ways districts have implemented CCSS pathways, and we anticipate districts' needs to monitor student outcomes closely in the coming months and years to learn about the effectiveness of their decisions associated with CCSS implementation.

However, some common focal points emerged from these interviews as well. The following highlights some key areas in which districts are thinking about and making important decisions as they continue implementing the CCSS-Mathematics across middle and high school:

» **Traditional and integrated pathways:** MiC districts were split evenly in their adoption of the two pathways.

Some districts that chose the traditional pathway (in which the standards of Algebra I, Geometry, and Algebra II are taught in separate years) felt that their parents and community were happy with the pathway the district already had and would not support a switch. Administrators in other districts that kept the traditional pathway expressed understandable concern that moving to an integrated pathway would require too much investment in teacher professional development. Districts that instead chose the integrated pathway (which blends standards from two or more domains across Math I, Math II, and Math III) mentioned that they had seen research showing that other countries using the integrated approach had higher math achievement than the United States. Some said they believed that integrating many different topics and bridging connections across courses would give students better access to the CCSS-Mathematics standards. Questions to consider: Is one particular pathway better for all students — or for some students or some districts — or do both pathways equally support strong student mathematics achievement as assured by the CCSS?

» **Curriculum materials:** We found in the 10 MiC districts that there are five different chosen curriculum materials in use at the middle school level, nine different chosen curriculum materials in high school, and all

districts using purchased curriculum materials are also using supplemental materials due to perceived gaps.

Alongside the decision to adopt either the traditional or integrated math pathway, districts also had to choose the curriculum materials that were going to be used for instruction for all of their mathematics courses. This represented another high-stakes decision made in a less-than-ideal climate because there was a lack of CCSS-aligned curriculum materials available for districts to draw on to support standards implementation. Question to consider: Which CCSS-aligned materials that districts selected or developed will provide strong support for student achievement in the MiC districts?

» **Placement policies:** MiC districts reported using many different measures in making math course placement decisions, and also using varying criteria for these measures to make decisions about placing students.

Several district administrators indicated that some of their placement policies continue to evolve as CCSS implementation continues and new course offerings are rolled out. Overall, while the placement criteria are often developed at the district level, most of the districts consider the placement criteria to be general guidelines that individual school sites are encouraged to follow. In other words, placement decisions may be ultimately made at the school sites. Question to consider: As districts monitor student outcomes and tweak placement criteria, especially in light of the California Mathematics Placement Act, which measures for student placement will prove most reliable?

» **Support and challenge opportunities for students:** MiC districts use different programs to support lower-achieving students, and offer these supports beginning at different grade levels. In some districts, the support options vary across sites due to scheduling pressures and other factors.

Equitable access to mathematical content for all students is a priority under the CCSS. Question to consider: With so many course sequence options in place across districts, and sometimes across sites within districts, what best practices will emerge to support lower-achieving students and those students ready for greater challenges in mathematics?

District leaders were very generous and forthcoming with their responses to our questions for this report, offering **advice** to other districts and readers. Many emphasized the value of collaboration to get **buy-in from stakeholders**, stressing the value of being inclusive and transparent. Specific mention was made by some interviewees about the importance of providing **site administrators, even as early as at the elementary level, with time and guidance** to fully understand what course sequencing looks like all the way through grade 12, because principals will be the front line of communication with parents and can advocate for the course sequence that will best serve each student over their K–12 experience.

With a wide range of variation and very little consistency across the 10 MiC districts, these districts are primed to collaborate in a fruitful discussion about their different approaches to math course sequences and pathways, and what actions or policies may be most beneficial to students in the Common Core era.[1] Even with understandable variation across the districts, including differences in student populations, district history, and current policies, we heard a consistent message throughout our interviews: the districts all want to offer a comprehensive mathematics program that prepares their students to succeed through and beyond high school.

But without more specific guidance from the state, districts are left to their own decison making. We encourage districts across the state to look to each other for guidance, community support, and insight. The variation across the districts also presents a window of opportunity, whether within the MiC initiative or beyond, to work together to identify best practices, share information on lessons learned, use data to inform course corrections, monitor and refine resources, and ultimately collaborate to improve student outcomes in math.

1 As described in the Common Core State Standards Initiative (NGACBP & CCSSO, 2010), "With the Common Core State Standards Initiative comes an unprecedented ability for schools, districts, and states to collaborate.... The Model Course Pathways in Mathematics are intended to launch the conversation, and give encouragement to all educators to collaborate for the benefit of our states' children" (p. 5).

Introduction

As school districts across the state continue implementing and adjusting to the Common Core State Standards (CCSS), they are reflecting on steps that may better prepare their students for college and career. Specifically in mathematics, districts are rethinking, with regards to these standards, how they should approach course sequencing and ongoing alignment efforts across K–12 and higher education.

The shift to the CCSS-M presents a different way of thinking about course content. With much of the traditional Algebra I content now included in the eighth-grade content standards, an unforeseen challenge in course sequencing is now evident (Daro, 2014). Prior to implementation of the CCSS-M, most eighth-grade students in California could skip Math 8 and complete Algebra I in middle school because Math 8 standards were configured to narrow and repeat Math 7 content and standards. But now that the Common Core specifies clear content progressions across grade levels, skipping a course can result in gaps in knowledge that could hamper success in later grades.

The Common Core State Standards provide suggestions about how to design course sequences that move students through middle and high school mathematics, including options for how to help students reach college-level math classes by grade 12. Yet, because CCSS-M implementation is recent, so far no proven information about which pathways work best is available. Districts looking for a roadmap to clear and effective course sequencing for all students — including those who struggle and those who move through the math content at a faster pace — find themselves having to choose among the different pathways offered by the CCSS-M: the traditional (Algebra I, Geometry, and Algebra II) or integrated (Math I, Math II, and Math III), or pathways that primarily follow either of these two but also compact some courses so that no content is omitted (National Governors Association Center for Best Practices & Council of Chief State School Officers [NGACBP & CCSSO], 2010).

The decision to follow any of these pathways is consequential but is only the first of many decisions a district will need to make to support the future success of students. Once sequencing is considered, placement criteria need to be identified and curricula adopted, which both in turn have impacts on sequencing decisions.

The Common Core State Standards seem to encourage variation and experimentation, stating,

> The pathways and courses are models, not mandates. They illustrate possible approaches to organizing the content of the CCSS into coherent and rigorous courses that lead to college and career readiness. States and districts are not expected to adopt these courses as is; rather, they are encouraged to use these pathways and courses as a starting point for developing their own. (NGACBP & CCSSO, 2010, p. 2)

After many states adopted the Common Core State Standards beginning in 2010, they worked on enacting policies to implement the standards within a specified timeframe and on recommendations about the broad approaches to organizing math content across the 6–12 grade span. But because the standards were so new, absent were detailed recommendations on how to implement these possible pathways and data on the student outcomes or impacts on college and career readiness of each.

While there *were* some emerging relevant data that reflected on pre-CCSS implementation and students' success in mathematics, the timing did not align with the new standards to inform district decision-making. This includes data indicating that:

» More than one-third of students nationally who graduate from high school and enter four-year

colleges are not considered mathematically proficient and require remedial work prior to their first year of college; the percentage doubles for students entering two-year colleges (Hodara, 2013).

- Grade 11 GPA is one of the strongest predictors of student achievement and persistence in math in college (Adelman, 1999).
- The innumerable ways in which students can progress from grade 6 to grade 12 in mathematics could create inequities in student access to and opportunity for math learning (Finkelstein et al., 2012).

In what amounted to an information vacuum about the advantages and disadvantages of pursuing each pathway to organizing CCSS-M content, districts had to balance complex local and historical factors against the state policy goals and the existing research and make a series of high-stakes decisions with real and immediate consequences for students and teachers. At the heart of the decision-making process was the debate about the meaning of "college and career readiness." Was the district preparing the majority of its students for career? For college? For functioning in a global society? What differences in course content did this imply for their students? For which students?

The decisions touched on just about everything a district stands for, or wants to stand for, with external and internal pressures at every turn: questions of ideology, values, and politics; beliefs about the capabilities of teachers and students; pressures from parents and community; conceptions of equity; and allocation of resources. The decisions were overlapping and cumulative as well — once each decision about CCSS-M implementation was settled, another high-stakes decision would immediately follow: determine a pathway and then choose a curriculum and necessary supplements to that curriculum; construct a set of course sequences and then determine course placement criteria and ways to support students who fall behind; and, in all phases of activity, determine and provide the professional development for teachers and administrators that supports the high expectation that all students can and should achieve mastery of the new standards.

The 10 districts within the Math in Common (MiC) initiative — much like those across the state (Harlow, 2015) — have approached their mathematics sequencing from a variety of perspectives, and this variety highlights the complexities districts have wrestled with to establish their preferences and policies. With the CCSS-M being implemented only within the past few years, little has been documented thus far about the decisions that districts are making to support their students' preparation for college and career, particularly with respect to course offerings, course content, and placement criteria. Because of the magnitude and complexity of the changes related to CCSS-M implementation, MiC districts are experiencing a number of bumps and snags along the way.

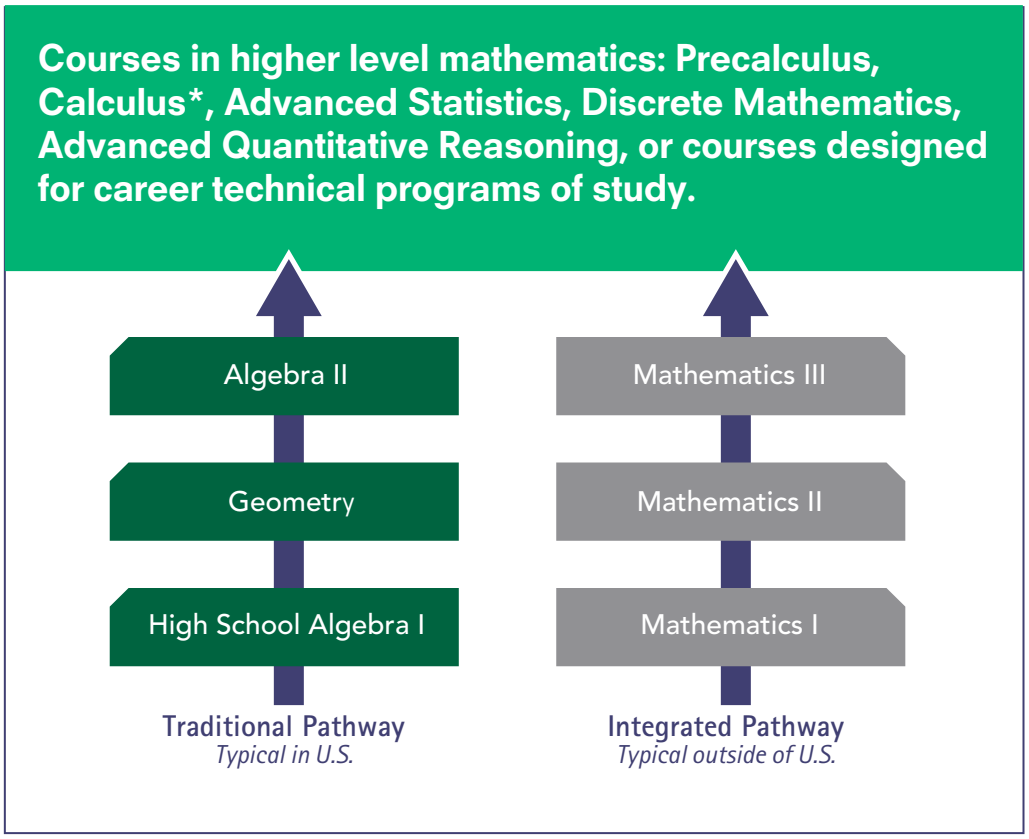
We intend for this report to identify the thinking that went into districts' decisions about pathways, as well as some of the challenges faced by the MiC districts to date and ways in which the districts are moving or could move forward. By sharing this knowledge among the MiC districts, and with other California school districts facing similar challenges, we hope to create opportunities for broader discussion and learning about these commonalities and differences.

Traditional and Integrated Math: Two Pathways Diverge

California's traditional high school math pathway teaches the standards of Algebra I, Geometry, and Algebra II in separate years (traditionally offered in grades 9, 10, and 11, respectively). In contrast, the new integrated math pathway modeled on pathways more frequently used in other countries — those often found to have higher student achievement in mathematics — blends standards from two or more domains across Math I, Math II, and Math III (grades 9, 10, and 11, respectively), emphasizing the mathematical connections among the topics. Appendix A of the CCSS-M (NGACBP & CCSSO, 2010) characterizes these two very different pathways as leading to the same destination, which is exposure to all of the math standards by grade 12. As described there, "The Pathways have been designed to be modular in nature, where the modules or critical areas (units) are identical in nearly every manner between the two pathways, but are arranged in different orders to accommodate different organizational offerings" (p. 4). In other words, both pathways aim to create greater access for all students to important mathematical content, in contrast to the significant differences in opportunity for learning math that have previously been documented for middle and high school students (see Finkelstein et al., 2012).[2]

But with differences in content organization and theory, the choice of pathway may have some implications for overall student success in mathematics in a given district. In this initial decision, district administrators found themselves having to make a choice between two very different paths, with little guidance other than assurance that either would be fine.

Figure 1. Equivalent Course Content Covered in the Traditional and Integrated Math Pathways



Source: National Governors Association Center for Best Practices & Council of Chief State School Officers. (2010).

2 Finkelstein and his co-authors examined the course-taking patterns for students in grades 7–12 using a dataset of 24,279 students in 24 unified (i.e., K–12) California school districts. The authors found that the most common course-taking sequence in the dataset, the option for students to take Algebra I in eighth grade, represented only 3.3% of the analytic sample. Furthermore, the authors noted that the 20 most common math course-taking patterns in the dataset represented only 31.24% of the analytic sample. Therefore, prior to the implementation of the CCSS-M, 68.76% of students in these districts were enrolled in other course sequences, thus receiving very different support for college and career.

> **"The district and the math office looked at pros and cons to both approaches, and because of the limited research, we didn't see favorable data to point us in one direction or the other."**
>
> *— District I*

Among the ten MiC districts, we found that they were split evenly in their decision to follow the traditional or integrated pathway: five are following the integrated pathway and five are following the traditional pathway. On the surface, we could identify no apparent common demographic thread among districts following one path or the other, but districts reported that concerns about their stance on standards and teacher capacity, some uncertainty related to the unknown outcomes of choosing the integrated pathway, and pressures from parents and the community were some of the factors that influenced their decisions to change or maintain their pathway.

Because of the complexity and weight of the choice to maintain or change pathways, districts took a year or longer to deliberate, soliciting input from scores of different stakeholders. Most MiC districts reported a decision-making group comprising some combination of district administrators, math specialists, and site staff. District G[3] included its union leadership and an outside expert, while District A and District H delegated the final decision to a committee of high school math teachers and a committee of high school principals, respectively. Within each MiC district there were, as a District I administrator said, "a lot of hands in the pot."

Regardless of which pathway they selected for CCSS-M implementation, administrators from several districts highlighted the importance of involving teachers and school staff in their decision-making processes. Many felt they had achieved crucial buy-in and support from teachers and parents through some combination of transparency of the process, open communication, and inclusion of many stakeholders in the deliberations. For example, administrators in District J tried out a new consensus process, which they adapted from the CCSESA Math Materials Evaluation Toolkit, and they enthusiastically recommend this method to others facing similarly complicated, high-stakes decisions. A district administrator noted:

> We've been through adoption processes with a vote where there are winners and losers at the end, but this time we used a consensus process. Everyone loved it, it went really well, and at the end everyone felt good and not like they got out-voted or their side lost. People told me it was the best group decision-making process they'd ever been through. We got the consensus process from the California County Superintendents Educational Services Association.

Figuratively, through these decision-making processes, administrators in the 10 MiC districts read the same CCSS policy tea leaves and made different

Points of variation: Introduction

In every MiC district, a range of varied mathematics experiences is available to students that result from the choices a district has made about its pathways. By using sidebars scattered throughout the report, we hope to draw attention to several areas where district administrators reported common points of variation within and across their district. Our intention in highlighting these cases is to encourage districts to seek to understand these points of variation and analyze whether and how the options they are presenting to their students lead to different outcomes.

3 We use pseudonyms to reflect the fact that information for the report draws most heavily on interviews with curriculum and instruction staff, math coordinators, principals, and math coaches in each of the MiC districts and therefore may reflect the individuals' subjective interpretation of district policy and actions rather than confirmed facts.

interpretations. Below, we describe some of the reasoning that went into the course pathway decisions.

WHY SOME DISTRICTS FOLLOW THE TRADITIONAL PATHWAY

The traditional pathway is well established in California districts, along with the teaching practices and content specialization that go with it. In the era of CCSS-M implementation, with so many other changes at play, the pathway's familiarity was an important selling point for some MiC districts. The familiarity of the course content in the traditional pathway was especially preferable for districts that worried about the hurdle of improving teacher content knowledge to the degree that might be necessary to successfully teach the course content in an integrated pathway.

> **"[Changing pathways would have been] too many new things all at once. We already have too many new things all at once."**
>
> *– District B*

Since teachers were already being asked by the CCSS-M to make deep instructional shifts, some districts decided supporting these shifts should be their main focus, not developing new content knowledge for the integrated pathway. "We were worried," said one district administrator, "that with the integrated pathway, the teacher knowledge would need to be much deeper in order to intermix geometry and algebra. So we focused on getting at the CCSS through the lens of our traditional pathway."

Another district reported that after seriously considering the integrated pathway, it decided that "the work to change instructional practice was ultimately more important than switching pathways."

Some districts liked the traditional pathway's long history and known track record. Administrators from a district that opted to remain with the traditional pathway said that their students and teachers were "successful" with the traditional pathway (the district showed comparatively high math scores within the state for an urban district of its size), and that the district's "conservative" approach to change dictated that they should continue with what was working. In a similar vein, administrators from another district worried that it would be difficult to get parents to understand that the integrated pathway was equivalent to the familiar sequence of Algebra, Geometry, and Algebra II, courses that have so much history and clout. They also noted that other nearby districts, and in particular those with higher socioeconomic status, were staying on the traditional pathway, and worried about the potential fallout from making an unpopular choice.

In summary, districts that chose the traditional pathway felt that the parents and community were happy with the current pathway and would not support a switch; some also expressed concern about the professional development investment that would be necessary to get teachers up to speed in new math content areas. With regard to course sequencing, Daro (2014) suggests that "The devil you know is better than the devil you don't: To make change attractive, the status quo has to be unattractive." In some respects, the districts that kept the traditional pathway were able to maintain course continuity and stability while at the same time shift the spirit of their math implementation to support the CCSS-M.

WHY SOME DISTRICTS FOLLOW THE INTEGRATED PATHWAY

Districts that chose the integrated pathway also gave a few reasons in common for doing so. Some noted that they had seen research showing that other countries using the integrated approach had higher math achievement than the United States; some said they believed that integrating many different topics and bridging

connections across courses was important and valuable in student learning; and some had observed nearby districts and districts across the state adopting the integrated pathway and, consequently, believed that the integrated pathway could serve their students well.

Several district administrators also said the integrated pathway offered their students and staff a clearer path to mastery of the standards. For example, one district administrator commented that the integrated pathway made more sense as far as its level of cognitive demand was concerned; it made little sense, he said, for students to move from higher-level cognitive demand activities in algebra to lower-level cognitive demand activities in geometry the following year.

Another district reviewed the available state-approved curricula, piloted two integrated and two traditional curricula for six to eight weeks each, then used a consensus process to make the final decision, which was to go with the integrated pathway. A district administrator said the teachers and steering committee members making the decision were motivated by "their philosophy and belief in how the new standards were laid out" as well as a sense that this pathway made math more accessible in the early years, and that other countries using this approach have better student outcomes.

Both pathways represented a step into the unknown in some way; even the "traditional" courses with their familiar names may look different under CCSS-M. Most MiC districts were motivated by their beliefs about how to best access the standards, and interestingly this common compass led districts in opposite directions. Rollout of the math pathways since implementation of the CCSS-M has meant different course sequences for different students across different years. As such, in order to weigh the impact of their math pathway decision, districts will need to closely monitor the impact of students' course-taking patterns on their overall math achievement.

Points of variation: Transitioning to an integrated course pathway

As districts are transitioning to an integrated course pathway, some are rolling out their pathway over the course of several years, leading to both new and old pathways coexisting in a school — a situation that could continue until 2020. This type of rollout can introduce wide variation in mathematical experiences for students. For example, one MiC district is currently in its first year of implementing Math I of the integrated pathway and will introduce Math II and III next year. (This district is one of several phasing in the new pathway in this manner.) A district administrator noted that students who started traditional math in seventh or eighth grade the previous year are "grandfathered into the traditional pathway and will continue through high school. Students from eighth grade accelerated and regular ninth grade math are the first to try the new integrated class."

Determining the Most Effective Course Sequences

After choosing between integrated and traditional, districts next had to decide their students' course sequences *through* the pathway. The MiC districts faced a complex array of questions and decisions about how to support a student to achieve mastery of the Common Core State Standards for Mathematics (CCSS-M) and meet important district-level high school graduation requirements, all within the framework of the particular pathway the district had chosen. For example, what were the middle school and high school courses that students should be enrolled in? How many years of math is "enough" to enable students to meet the standards, and which course is the end goal? What is the best course compression[4] strategy in order to offer a college math course in grade 12? Should this compression happen in middle school when many parents expect it, or in high school where the current research is more favorable? Who is eligible for the accelerated courses? Like the choice between integrated and traditional pathways, these choices touch on districts' core beliefs about their students and community as well as many other concerns. If the intent is to make sure that all students have access to and mastery of all the CCSS-M by the end of grade 12, which course sequencing approaches make the most sense for students?

Consider the course content. The content shifts required by the CCSS-M in middle and high school will challenge the status quo regardless of which pathway is chosen. For instance, the traditional geometry class addresses 46 geometry standards. In the integrated math courses, 13, 26, and 8 geometry standards are covered in Math I, Math II, and Math III, respectively (NGACBP & CCSSO, 2010). Figure 2 recreates a graphic one district uses on its website to describe how the "old" and the "new" mathematics content would fit into courses.

HIGH SCHOOL COURSE SEQUENCES

We found that while most of the MiC districts encourage students to take 3 math courses in high school for 30 credits, there are some differences: District I requires 4 high school math courses while District H requires 2, and District J requires 30–40 credits. While we did not gather data on the percentage of students who meet or exceed the district requirements (e.g., the percentage of District H students earning credits for more than two high school math courses), we can start to see that this variation across and within districts may provide both more or fewer opportunities for student engagement in high-quality mathematics learning. Moreover, we can also see how much student placement decisions along the way, the structures that are put in place within the district to enable student persistence in math, and the option of enrolling in a senior year math class all play a role in the level of mathematics that students ultimately achieve.

The topic of grade 12 mathematics is also hotly debated both at the K–12 and college levels. While taking mathematics in grade 12 is generally believed to "be good for you" (Rodriguez, Meguizao, & Willett, 2015), 40% of California students do not take mathematics as seniors. Additionally, grade 12 information about student performance in math is typically not used for purposes of college math placement because the data are not available in a timely manner. As a result, emphasis on mathematics in high school ends for most students in grade 11, even though greater intensity in mathematics has been found to lead to greater college preparation. Some California school districts, notably Fresno Unified,

4 For example, studying three years of content in two academic years or two years of content in one academic year.

Figure 2. The Traditional Mathematics Pathway: The Old and the New Algebra Class

How do the CCSS Math 8 and CCSS Algebra 1 courses compare to the old Algebra 1 course?

The standards that defined an Algebra 1 course under the old California standards are now divided between the CCSS Math 8 course and the CCSS Algebra 1 course, as shown below. CCSS Math 8 and CCSS Algebra 1 courses also include content from more advanced high school courses and concepts not previously taught in high school math, especially statistics.

Old CA Algebra 1

- >> Proportional Relationships
- >> Linear Equations, Inequalities
- >> Systems of Equations
- >> Roots and Exponents
- >> Expressions and Polynomials
- >> Quadratic Equations and Functions

Content from old CA Algebra 1 course

Content from old CA Geometry and Algebra 2 courses (high school)

Content not previously included in the regular high school math sequence

CCSS Math 8

- >> Proportional Relationships
- >> Linear Equations, Inequalities
- >> Systems of Equations
- >> Roots and Exponents
- >> Introduction to Functions

- >> Transformations and Congruence
- >> Angles and Parallel Lines
- >> Pythagorean Theorem

- >> Analyzing Graphs
- >> Bivariate Data

(including projects and applications)

CCSS Algebra 1

- >> Linear Equations, Inequalities
- >> Expressions and Polynomials
- >> Quadratic Equations and Functions

- >> Modeling with Functions
- >> Interpreting and Building Functions
- >> Linear, Quadratic, and Exponential Models

- >> Categorical and Quantitative Data

(including projects and applications)

Source: Adapted from a graphic shared by an MiC district.

Sample district math requirements for graduation

- **District A:** 3 courses required; 4 recommended. Students who have successfully completed Algebra in grade 8 with a C or better will still need to complete a minimum of 2 years of math in high school.
- **District E:** 3 years including Algebra, Geometry, and Advanced Algebra or Intermediate Algebra.
- **District F:** 3 courses (30 credits) in math to include 10 credits of Geometry/Integrated Math 2 with Algebra I/Integrated Math 1 as a prerequisite.
- **District G:** 3 years of math including Algebra I and Geometry with concurrent enrollment in an additional math support class/program if student's math performance is below satisfactory (less than a grade of C). Algebra I and Geometry completed in middle school may be used to satisfy this requirement. Student must complete a minimum of Algebra II at the high school level to meet graduation requirements.
- **District J:** 4 years of math (including algebra) and 2 years of science, or 3 years of math (including algebra) and 3 years of science (math must be taken senior year).

are pre-scheduling students for a fourth year of mathematics in high school, requiring that students opt out of a fourth year of math rather than opt in. Another question, then, is whether the MiC districts are offering students four years of math, and which students are availing themselves of the opportunity to take mathematics in their senior year, or whether students are missing opportunities to further their mathematics knowledge and ease their transition to college.

DEVELOPING COURSE SEQUENCES THAT SUPPORT ALL STUDENTS

To help students find their best path through the math sequence, districts must consider how to support those who exceed, or fail to meet, grade-level standards, either through providing additional support for lower-achieving students or enabling students to accelerate through course content by taking a compacted course sequence. Districts have had to make decisions about the design and implementation of additional support or compacted courses (when they are offered and by which faculty) as well as how to decide which students participate in such courses.

Supporting lower-achieving students

MiC districts are all putting in place different support systems for lower-achieving students. While some of these strategies include the implementation of the support class options suggested in Appendix A[5] of the CCSS (e.g., bridge classes, after-school tutoring, block-scheduling of math, summer options), districts are also employing other supports that focus on the changes in mindset needed to understand student progress (e.g., increasingly using formative assessment on task-based mathematics curricula to understand students' mathematical progress). This can include counseling for students or professional development for teachers to change expectations about what students are capable of, as well as to help teachers gain greater skill with differentiating instruction or considering social-emotional learning factors such as "growth mindset" (Dweck, 2006). Though the significance of these options can't be denied, in this report, we limit the scope of our support discussion to primarily focus on the support class options.

Not all MiC districts agree on when supports for lower-achieving students should initially be put in place. Some district administrators described the need to reach

5 Appendix A of the CCSS-M can be accessed here: http://www.corestandards.org/assets/CCSSI_Mathematics_Appendix_A.pdf

students even earlier than middle school to build a strong math foundation: "We believe early intervention is more efficient and effective, so we need eventually to think about what we are doing in grades 4, 5, and 6." District E begins its interventions before middle school, saying that in those years, "we need to be thinking about the support structures necessary for the Tier 1 and the Tier 2[6] kind of interventions to make sure we have a floor, not just a really high ceiling. We need an unambiguous floor at grade level." The emphasis here is on having all students progress through the course sequence at the same pace, with the necessary supports.

Several districts opted to provide targeted support in middle school. To boost academic growth in their middle school students, District G is piloting a math support program called Agile Minds; the course combines math content with support for a growth mindset for both students and teachers.

In looking for support class options, District D reached out to other MiC districts and researched available options. District administrators were unable to find a satisfactory program, so they have developed their own middle school math intervention and are piloting it this year. Scheduled as a companion class taken concurrently with Math 7 and Math 8, it parallels the applicable core class and also combines math content and ideas about growth mindset.

Although support options for lower-achieving students are available across the MiC districts, the supports are frequently not standardized within a district or even within a school. One district noted that supports available to lower-achieving students vary widely across school sites. One administrator explained, "so [School A] might have a tutoring program, [School B] might have a six-week intervention before school, [School C] might have several things on top of a semester-long or a year-long math success class as outlined in the Board policy." Support options can also vary by student. District C told us its goal for all students to complete two courses of math by their second year of high school would be obtained "by whatever means necessary." Options for students include support courses, summer school, and doubling up math classes, although they hope that their career academies will help more students persist to four years of math.

As the dust from early CCSS-M implementation settles, we recommend districts consider sharing with each other which of their support class options have been most successful and how they have determined this, so that the best practices may be implemented at all sites. Districts could consider, for example, how students from different ethnic backgrounds perform when placed in support classes or regular classes. What added value does each option contribute? How many students progressed to the next level with different support options, and how many continue to need support classes? The answers to these questions can help guide school sites as they consider what support to continue offering across the district.

Supporting higher-achieving students

Just as some districts have had to implement new supports for lower-achieving learners, some have also reconsidered their offerings for advanced students. In order for students to complete a college-level or AP math course in grade 12, districts' pathways must compress a year of math somewhere between grades 6 and 11, within either the traditional or integrated pathway. Students cannot jump straight from Algebra II (traditionally a grade 11 course) to Calculus; there needs to be additional content (or a course) in between. We present examples of possible compaction strategies in short case studies later in this report (see Case Studies: Challenges of Integrated and Traditional Pathways).

Guidance from the CCSS-M (NGACBP & CCSSO, 2010) suggests five ways that students can get on an accelerated pathway: taking two courses simultaneously; completing two courses in a year with one in the fall semester and the second in the spring (ideal for block

6 The tier levels referenced here denote academic and behavioral interventions to provide early, systematic, and appropriately intensive assistance to children who are at risk for or already underperforming as compared to appropriate grade- or age-level standards (notably "response to intervention"). Tier 1 is focused specifically within the core curriculum, with instruction and interventions targeting all students. Students who consistently do not perform within the expected level of performance through Tier 1 instruction are then provided with additional supplementary interventions at Tier 2, which typically involves small group instruction.

schedules); taking summer courses that provide the equivalent experience of a year-long course; compacting course content across years (for example, compacting three years of content into two); and enrolling in a hybrid course like Algebra II–Precalculus.

Interviewees from districts that offer compacted courses only in high school were motivated by a belief that students should have a strong math foundation in middle school before having an opportunity to enroll in compacted math courses, and, indeed, some math educators argue that is the recommended approach (Daro, 2014). In contrast, the districts that offer compacted courses only in middle school believe that students should have the opportunity to accelerate in middle school if there is sufficient evidence that these students are ready at that time. And finally, the districts that offered compacted courses in both middle and high school cited their belief in the importance of allowing students multiple options with respect to accelerating.

Math in Common districts went through many processes to make these decisions, and with varying amounts of community support and resistance. District G's long and complex process was typical of many districts, as it worked to determine acceleration points and to align these points with their beliefs and goals for math implementation in the district:

> The decision came out of a one-year process with all department chairs, plus teacher leaders, the union, and MiC paid for David Foster [Silicon Valley Mathematics Initiative] to consult and support. There were five meetings with teachers throughout the year. . . . The decision was based on competency-based education. The district wants to be sure the students have all the instruction that they need, that they won't miss eighth-grade content and then have difficulty later. If students are capable of accelerating, we want them to do it. We want them to pass algebra the first time they take algebra. We started with looking toward getting kids to calculus in 12th grade. Initially we were only looking at accelerated paths in high school, but we saw that there are kids who need acceleration in intermediate grades, so now kids can accelerate at either point. . . . There were a lot of misconceptions; teachers and parents worried that you couldn't get to calculus if you didn't accelerate in middle school. It was a year-and-a-half process to get the decision made.

It will be important for districts to closely monitor student outcomes from the pathways that students are

Points of variation: The middle school master schedule

One district described a domino-like effect it encountered when introducing the accelerated pathway under the CCSS-M: variation in middle school schedules (e.g., some of the middle schools have double math blocks) leading to a disparity in the minutes available for math instruction. Because of this disparity, students at different middle school sites receive different amounts of time to learn material, making it difficult for teachers to maintain common pacing of the curriculum. This disparity introduces a concern that students who come from different middle schools may not be able to start high school at the same place in their understanding of mathematics as their peers.

Additionally, in most districts, placing students in accelerated classes is typically based on a number of pre-specified criteria (grades, scores, teacher recommendations, etc.). But filling classes is also a consideration, given that middle schools typically do not have an excess of mathematics teachers. One district described the hypothetical example of having 15 students who met the criteria for placement into a compacted math course; but since 15 students would not completely fill a class, there is a good chance that the school or district may examine data for other students and then enroll the next highest-performing 10 or so students.

experiencing. As an administrator from a district that switched to an accelerated middle school pathway notes, "the district is following the framework and Appendix A, and the framework cautions against acceleration at the intermediate level because students can get the procedural — and appear to be doing fine — but not the conceptual parts of the class. Then this comes back to bite you in higher classes." With this warning in mind, the administrator mentioned that the district is using many data points (GPA, benchmark assessments, CAASPP) to confirm if students have been placed correctly.

For both districts that compact in middle school and those who don't, the decision often represented a political stance about the best way to serve all learners. In District I, which has always had an honors track, the stance was, "We've always offered the two different pathways [regular and honors], and we weren't going to take that away. Our superintendent had one of each of his kids go through each pathway, and he's very big on this as an equity issue. Every student in [the district]. . . should have access to these pathways."

One district compacted Math 8 and Algebra I into one year, followed by a compacted year of Algebra II and Math Analysis. This timing had a specific intention for the district, which was based on its beliefs about student identity and agency.

> Lots of people are saying we should be compacting grades 7, 8, and 9 — so three years into two, but we opted instead for doing two years in one. It's a much more intensive approach to the compacting. Our concern was [compacting in early middle school] would be an artificial sorting too early, based on whether you think you're a hotshot.

Importantly, administrators we spoke with framed district decisions about advanced students in the context of the rest of the student body. An administrator from District E commented that the main question should be:

> How can we get large numbers of kids successful in middle school math content? That's their job in middle school — it is not first to accelerate students further, it's to get every student successful with middle school content. And there are plenty of reasons to believe that when you take a quarter of the higher-performing kids [out of the class], it's not just that it sets up a "tracking feel," but that as a system we are spending disproportionate time talking about how [math] is working for that 25%.

Other district administrators echoed similar concerns. In a second district that chose not to offer compacted classes at all in middle school, an administrator said,

> It's been in the math education community for a very long time that faster isn't smarter, so [we're] trying to un-build this notion that the way of being smart in math is doing more problems, faster, younger. That is not a definition of mathematical proficiency that we believe in or that a lot of math educators believe in. . . . Mindset is another big idea for us. If we are sorting kids, we are reinforcing fixed mindsets about who is good at math and who is not. There is so much data that shows expectations matter, and that who is sorted out of the high track is African American and Hispanic students and English learners.

For this district, the decision about compaction was very much ideological. "It's a very strong social justice stance," the administrator said. "When our superintendent talks about it, he frames it as a civil rights or social justice issue."

The broader point about the supports for lower-achieving students or the opportunities for compaction for higher-achieving students is that students within a school and school district, as well as across the MiC districts, may experience significant variation in the mathematical content to which they have access. It will be critical for districts to carefully monitor the impact of the experiences students have on their later achievement in math. Appendix C provides some guidance on considerations for such monitoring.

Criteria and Considerations for Student Course Placement

The criteria by which students are placed into math courses as early as middle school are extremely important because they can determine the highest math course that students will take in high school and their subsequent performance and degree completion in college (Adelman, 1999). Given the high stakes and lasting impact of these decisions, it is unfortunate that little guidance has been offered to districts regarding the best practices around placement criteria. Adding to the pressure, decisions can be influenced by parent opinions; as one MiC district administrator said, "*principals face pressure from parents to promote students ahead in math, so there's a fear that if our administrators don't offer that, students will go somewhere else that will.*"

MEASURES TO DETERMINE PLACEMENT CRITERIA AND DECISIONS

Another factor that may begin to influence the placement criteria that MiC districts are currently using is the California Mathematics Placement Act (2015), which was recently enacted in California to require local education agencies to adopt "fair, objective, and transparent math placement policies." The act will require districts to only consider objective academic measures of pupil performance when making placement decisions. "Objective academic measures" refers to measures such as statewide math assessments including interim and summative assessments, placement tests, course grades, and report cards. Any subjectivity that currently exists in placement decisions would need to be omitted under the new law.

MiC districts reported using many different measures in making placement decisions, and for these measures the districts use varying cut-points to make decisions about placing students. (Appendix B includes a table showing criteria used by the MiC districts for placing students on an accelerated math track.) In addition, several district administrators indicated that some of their placement policies continue to evolve as the CCSS-M implementation continues and new course offerings are rolled out. In some instances districts described a holistic review of student progress, with decision-making about placement based on the inclusion of a number of measures, instead of using specific cut-points that students needed to meet for each measure. In other instances, the process might be more sequential in nature, where students who meet a certain criteria would then take an assessment and be additionally judged on other academic measures and a teacher recommendation.

In District I, the same team that made the decision about the district's pathway worked on determining the placement criteria as well. Their experience was similar to other MiC districts — not enough data points, not much guidance, high level of site variation:

> We looked to other school districts to see other models, and to make the best decision we can. We knew it would be difficult in the absence of a standardized test score, because we used the CST in the past. Grades were the only measure we had for all students. This is the recommendation from our office to our sites, but how they use it depends. There're different challenges at different sites in terms of the master schedule, so the document doesn't work at every site.

In the absence of California Standards Test (CST) scores, many districts are using or planning to use the California Assessment of Student Performance and

Progress (CAASPP) results in the future.[7] Districts that rely on data for placement also reported using the following measures: course grades (usually at least an "A" or a "B" to get into the accelerated track), district assessments, teacher recommendations, counselor recommendations, and family/student preference. The district assessments included diagnostic assessments such as the Mathematics Diagnostic Testing Project (MDTP), district-created placement exams, and interim assessments. However, one district administrator reported that while the MDTP test is an excellent tool for placement, the challenge of using this test is that it does not appear to assess conceptual understanding and the ability to employ the Standards for Mathematical Practice. Combining a diagnostic test like MDTP with a performance task for each domain of a curriculum might provide a more accurate picture of a student's ability to excel in mathematics.

PLACEMENT CRITERIA AS GENERAL GUIDELINES AT THE SCHOOL LEVEL

While the placement criteria are often developed at the district level, most of the districts consider the criteria to be general guidelines that individual school sites are encouraged to follow. In other words, the decision is ultimately made at the school sites.[8] As indicated earlier, such site-level decisions may carry important implications for student access to mathematics content. One district has evolved an interesting procedure that allows two-way communication between the sites and the district office. First, the district makes recommendations for each student and then sends these recommendations to the school sites. Sometimes a student may be considered a borderline candidate for acceleration, and so the school would then be instructed to look closely at the student's more current data such as grades and scores from the spring. Because decisions are not mandated from the top, there is room for dialogue; if the recommendation is not implemented, the district solicits feedback from the sites for discussion so that a final solution can be arrived at that is the most effective for the individual student. The district leadership feels that this collaborative process is successful.

In District H, schools have recently asked for district assistance on placement decisions for the seventh-grade accelerated course that used to be made at the sites. Now the locus of the decision is shared among the site, the academic office, and the district research office, and the criteria combine data and teacher recommendation. Their data points include grades and two placement tests: first, the MDTP algebra assessment and, second, if a student achieves a mastery level on the MDTP, an assessment composed of open-ended response items that align with different domains in the sixth-grade standards. If the student meets mastery level on the second assessment, the district looks at more data points (grades, test scores, CAASPP, benchmark scores) as well as teacher and parent recommendations.

COURSE PLACEMENT DECISION-MAKERS

Even among districts where the decision is entirely site-based, there is variation across districts about who or what assumes the "leading role" of the placement decision: teachers, counselors, data, or the student. In one district, there is no formal placement policy nor common rules for decision-making; the district relies entirely on teacher discretion. Interviewees said, "depending on how the student did in the grade 8 year on final assessments and academic performance throughout the school year. . . . teacher judgment is used to determine placement." In another district, sites use district guidelines with site-based school counselors "leading the charge" while

7 For the placement of students in the current year, CAASPP scores were often not completely available early enough in the decision-making process. In addition, because this was the first year that schools received student scores, districts and schools did not want to place too much emphasis on them. However, it was generally noted that these scores will be much more important in the future.

8 In many districts, district-level policies are complicated by site-level variations in terms of factors such as block scheduling, grade spans, enrollment size, or course offerings.

making use of teacher recommendations: This policy is "as aligned, school by school, as we can make it."

One district has phased out teacher recommendation completely in favor of student data. District G relies on five data points, which continue to evolve. This year it is using a math assessment test, the benchmark extended response from last fall, students' grades in the fall, last year's spring extended response, and students' spring grades. The system is weighted toward the math assessment, which is worth 4 points out of 10. Next year the district will add social-emotional measures, such as persistence, to the criteria. The district considers its recommendation system a work in progress, informed by advances in the field: "The criteria are always evolving based on new learning. In the spirit of CCSS, we are now trying to add social-emotional components based on what we're learning." The district is also looking ahead to seeing how well its system works: "As we start seeing data trends from placement, we'll be able to see if we've made accurate recommendations."

Another district introduced caps on enrollment in the accelerated courses. It had been placing 35% of students into advanced courses but learned that the average is 20% in other districts. The district adjusted its cut scores accordingly to put 25% of students in advanced classes. "However," interviewees say, "we see that we're back up at 35%, so sites are going above what we recommended." They mentioned parent requests ("which can be controversial") as a factor in this upward creep.

Across the districts, with their varying criteria for course placement, one positive trend we see in at least a few

Points of variation: Switching course sequences

As districts try out new placement criteria, or look across sites with varied placement policies, they may encounter students who have ended up in the wrong course. A decision based on clear data, however, should offer districts the opportunity to tweak or reassess their placement criteria. Like the original placement decision, the decision for students to change their course sequence is currently typically made at the site level in most districts. But because of course compacting, where two years of standards are covered in one year, or three years in two, it's not always easy to move students into or out of an accelerated course. They may be out of step with the content of the new class. District I experiences this problem, saying, "because of the compacted content, it's really a challenge for students to move from one pathway to another." This district offers a bridge class for students who've done well in traditional Math 6 and want to move to Accelerated Math 7 (which covers half of the Math 7 standards and all of Math 8); another district offers a "boot camp" for students completing Math 7 who want to skip Math 8:

A MiC district leader says, "Math departments at the site level have strategies for how they'll identify and move students to a better course if needed. After the first year of CCSS-M and Accelerated 7, some sites offer a summer boot camp for students in regular seventh-grade math who want to get into Math 1 and skip Math 8. It's not encouraged because students will have gaps from missing Math 8, but some parents want their students to do this. At the end of the boot camp, they were given an assessment to determine if they would be ready for it. We have a formal process to challenge course placement where a student takes a "challenge test" for that class and has to pass it with an 80% or better. Out of 39 students who came through the boot camp, then took the Math 8 challenge test, about 10% passed it."

In District F, where about a third of students are in the honors class, the emphasis is on quickly identifying and reassigning students who are struggling unsuccessfully, moving students to regular math between six weeks and the first trimester.

of the MiC districts is increasing emphasis on helping parents understand the implications for math placement decisions throughout the students' course-taking experience. Districts that do not currently follow the practice of mapping backward from grade 12 to help students and their families understand decision points and implications for course achievement and graduation may begin to see advantages to doing so, especially for students who struggle to meet grade-level expectations.

Adopting Curricula to Support Course Sequences

Alongside the decision to adopt either the traditional or integrated math pathway, districts also had to choose the curriculum materials that were going to be used for instruction for all of their mathematics courses. This represented another high-stakes decision made in a less-than-ideal climate — a lack of CCSS-aligned curriculum materials were available for districts to draw on to support standards implementation (Freedberg & Harrington, 2015). To support instruction in the first full year of CCSS-M implementation, two districts sidestepped the problem by creating their own curricula, and all other districts chose various other curriculum materials. Some districts supported teachers to supplement the available textbooks with additional resources more closely aligned with the CCSS-M. Looking across the experience of the MiC network, it is clear that California districts were initially not well served by most available curriculum options; districts were picking and choosing from various materials in order to best meet their students' needs. In the intervening years, districts have continued to adjust some of the curriculum materials they are using by, for example, adopting new textbooks, revising district-developed curricula, or identifying additional supplemental materials to support teachers' instruction.

Regardless of the curriculum chosen, many districts said in their view of CCSS-M implementation, the textbook is secondary to the standards. As District H said, "we teach the standards, and the curriculum is a resource for that." For some districts, this may represent an instructional and procedural shift, from having teachers closely follow the curriculum's lead to allowing the standards to lead and shape course pacing.

Table 1 shows the curriculum materials being used in each district at the time of our interviews. As shown in the table, a wide variety of curricula are in use across the 10 districts at the secondary level, identifying another point of variation in the mathematics opportunities that may be provided for students. At the middle school level five different curricula were being used at the time of our interviews, while at the high school level nine different curricula were being used; note that a district-developed curriculum is counted as a separate curriculum.

As shown in Table 1, among the 10 MiC districts, two are developing their own curriculum (with continuous improvement through feedback from the teachers). District G has not yet officially adopted a new math curriculum because the district staff believes that there is no high-quality option yet available that is aligned with the CCSS-M. Instead, District G is using Go Math textbooks combined with units of study written in-house by trained curriculum specialists and teacher leaders. Its curriculum specialists have scoured online resources to make curriculum maps to offer teachers more high-quality options, drawing from Engage NY and the Georgia State Department of Education. The district staff has also worked with David Foster of the Silicon Valley Mathematics Initiative to examine different curricula. They note that the curriculum maps are meant to be resources, not strict guides, as the district "believes in responsive teaching, allowing teachers to select the right curriculum to get there with their students. The same teacher might use different materials with different students to support students' deep math learning." With so many possible curricular inputs for students, District G is carefully monitoring student data to reassess its decisions.

Table 1. Math Pathway and Curriculum for Middle and High School Courses, by District

DISTRICT	MATH PATHWAY	CURRICULUM AND SUPPLEMENTAL RESOURCE MATERIAL
District A	Integrated	Engage NY (grades 7 and 8) with supplemental material from Utah Middle School Math Project Math Vision Project (Math I, Math II, Math III)
District B	Traditional	The district's own core curriculum
District C	Integrated	Carnegie Learning
District D	Traditional	Go Math (grades 7 and 8) Glencoe (Algebra I, Geometry, Algebra II) Supplemental resources from Irvine Math Project
District E	Traditional	Locally developed district core curriculum; not yet Board approved Math Instructional Toolkit Supplemental Curriculum Guide (for Special Educators)
District F	Integrated	Houghton Mifflin Harcourt
District G	Traditional	No adopted curriculum yet. Using Go Math textbook. In addition, units of study have been written in-house by trained curriculum specialists and teacher leaders.
District H	Integrated	Big Ideas Math (grades 7 and 8) Walch (Math I, Math II, Math III)
District I	Traditional	Big Ideas Math (Math 6 – Algebra II)
District J	Integrated	Houghton Mifflin Harcourt

Of the remaining seven school districts, two adopted Houghton Mifflin Harcourt, two adopted Big Ideas Math, and the remaining each adopted a different curriculum.

The wide variety of curricula adopted across the MiC districts is also not in any way surprising, as the Mathematics Framework for California Public Schools (California Department of Education, 2015) states, "LEAs have the authority and the responsibility to conduct their own evaluation of instructional materials and to adopt the materials that best meet the needs of their students." However, an additional important point about curriculum is whether the curriculum is used across multiple district course sequences to provide equitable opportunities for students to learn mathematics regardless of which courses they are enrolled in. For example, in District A, the same curriculum is in use in the regular and accelerated pathways, but "accelerated courses have more leeway to modify the curriculum" and are more likely to supplement the curriculum with material from the Utah Middle School Math Project; the same issue about additional supplemental materials being used to support accelerated courses is true in District I. In District H, where the mindset is shifting toward curriculum being a resource for teaching the standards, administrators report that particularly at the middle school level, there are teachers who use the curriculum rigidly, others who hardly use it at all, and others who are somewhere in between. The district supports teachers in making professional decisions that will best enable high-quality teaching and learning decisions.

In District F, the new math curriculum is mainly used as a resource for teachers; instead of rigidly adhering to the scope and sequence of the textbooks, grade-level teams created instructional units based on the standards. The district is very open to pulling together whatever resources it needs, saying "we don't believe that just one

curriculum is the best for all students, so the district uses things from many different places." This selective mindset applies to the standards as well; the district said, "The district is not teaching all of the standards, but is instead focusing on the essential/priority standards."

Each of these points of variation in curriculum adoption and use — across district, across course sequence, across higher- or lower-priority standards — may put student opportunity to learn the essential mathematics in question. As CCSS-M implementation continues, it will be incumbent upon each of the districts to understand how well the curriculum resources are being implemented and how well the materials are serving all students to achieve readiness for college and career, as measured on the common summative CAASPP assessments. The MiC Community of Practice creates a strategic opportunity for districts to have cross-district discussions about their decisions and resulting impacts for students.

Points of variation: Addressing CCSS-M course content

Because of the significant changes in content and instructional focus, some districts reported that over time they are gaining a better understanding of the pace that should be taken throughout the year to address the material. In the first few years of implementation, getting through all of the course material has been challenging in both regular and compacted math courses. District staff reported that some of the teachers were able to get through all of the material, while pacing other classrooms is still a "work in progress."

Interviewees in one district reported that teachers of regular math classes struggled to cover the material in part because it was the first time they had taught the course and in part because they were spending time reviewing prior grades' standards for lower-performing students. In the upcoming years, as teachers are more familiar with the courses and as students in earlier grades have access to the CCSS-M material, they may be able to hold off on reviewing topics at the beginning of the year and instead integrate review materials as they are needed when they come up during the school year.

District I reflected on difficulties some teachers are having especially with the material for the compacted courses: "Because it's a year and a half of content standards in a year, it requires some savviness on our teachers' part to stay true to the curriculum guide and supplementing any skills their students are missing."

Case Studies: Challenges of Integrated and Traditional Pathways

In this section, we provide case studies of two MiC districts as they shift toward implementing the CCSS-M in middle and high school math, each having chosen a different pathway.

DISTRICT H CASE STUDY (INTEGRATED PATHWAY)

In District H, the pathway for students who are at grade level is relatively straightforward under its integrated pathway: Math 6–8 in middle school, Math 1 through Math 3 in grades 9–11, and typically Precalculus in grade 12 (see Figure 3). But as a district administrator noted, they also must consider course sequencing for students who are below grade level and for those who might be above grade level and could be accelerated.

Options for students achieving at grade level

Last year for students at grade level, the district piloted a grade 12 math class in three schools for students who were deemed "conditionally ready" for college, based on the grade 11 standardized test (formally CST but now CAASPP). The district is now expanding the class to more high schools to get students ready for college.

Additionally, agreements are also being discussed with the local community college and California State University campuses about enabling students who pass this course in high school to opt out of remedial math at the college level. One district administrator reported, however, that in his opinion the course added no additional content beyond what students have received previously, but it did emphasize teacher pedagogy that aligns closely with the goals of the CCSS-M (e.g., increasing opportunities for students to discuss and explain their thinking). He noted that as the students have more exposure to the Standards for Mathematical Practice in earlier grades, this course may offer less added value in grade 12 because of the lack of new math content.

Options for students achieving below grade level

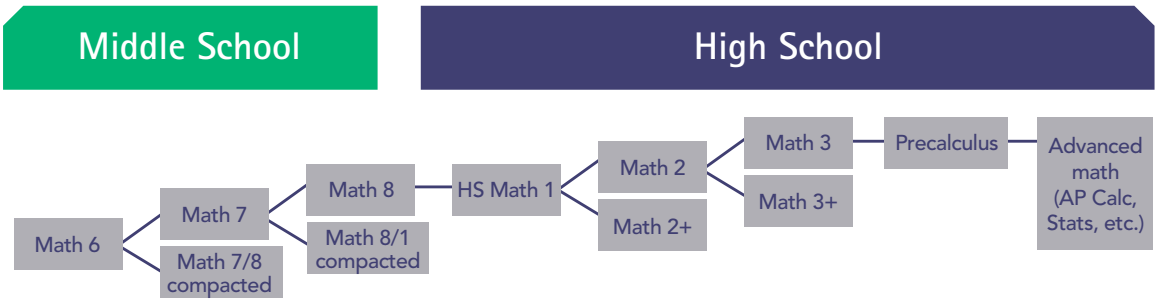
The pathway for students below grade level is less certain. Whereas a student who passes each course stays at grade level and moves on to the next course in the standard integrated sequence, a student who does not pass must repeat the course. The district offers support opportunities for students beginning in grade 9 and continuing through grade 11.

All students are required by Board policy to obtain 20 credits of high school mathematics (2 math courses: Math 1 and Math 2) to meet the math graduation requirements. (Depending on student success with the courses and additional support, students may obtain more than 20 credits, receiving, for example, credit for 3 math courses.) While the district is currently recognizing online course recovery options, it is "trying to minimize" student participation in such courses, especially to support students' mastery of the Standards for Mathematical Practice. As the district administrator indicated, "these are questionably rigorous courses that kids are being given credit for" and emphasized the point that students taking an online course alone would not, for example, have adequate opportunities to discuss and explain their mathematical thinking.

Options for students achieving above grade level

The district recognizes that some students are ready for acceleration in math, and as such it has provided various

Figure 3. Middle and High School Course Sequence in District H's Integrated Pathway



points of acceleration, including offering acceleration at both the middle and high school levels. At the middle school level, a compacted course sequence begins in grade 7, with a two-year sequence of Math 7–Math 8 the first year, and Math 8–Math 1 the second year. This course sequence gives a student access to three years of content in two years. The district also offers a point of acceleration at the high school level, at which a student can take a compressed course with Math 2+ and Math 3+ content and then sequence into calculus in the following year. (The plus standards indicate the CCSS-M precalculus standards.) The criteria for student acceleration include multiple measures.

As he was describing this accelerated course sequence, the district administrator also touched on an additional issue of concern that seemed to be "coming to a head" now for the district: the undefined acceleration paths for elementary school. Currently, district site administrators are making decisions at the elementary level that impact student opportunity and knowledge in subsequent grades. "The paradigm for acceleration was set years back at the elementary level — rather than go deeper, the paradigm is to move [for example] a fourth grader to fifth grade if they are deemed ready for it." Because the district has not yet defined acceleration points for elementary school or criteria for acceleration at elementary school, and because site administrators may not fully understand the course sequencing issues in later grades, site administrators may be bowing to parental pressures that may create difficulties for the students farther down the road. The administrator elaborated:

Some schools might consider compacting fifth and sixth grade, but fifth grade is the culmination of a lot of important things in mathematics, so you can't compact with sixth. But you can compact six and seven. But when compacting sixth and seventh, the next step afterwards is either for a student to go to Math 8 or go into Math 8/1. If you go into 8/1 next, half of the content has already been done by the time that student gets there, so there is a gap in knowledge.

Considering equity issues

This same district administrator also expressed a concern about the equity issues associated with course decisions. He said, "Which kids have the parental advocacy to push into higher math? Also there is the concern about the slide into leveling (i.e., tracking) that might happen when schools are trying to do the right thing, but don't understand." Such misunderstanding, he suggested, although happening only in an isolated way, might lead a school to offer three different math classes: an "on-grade level" Math 8, a "below-grade level" Math 8, and an "above-grade level" Math 8. He said, "At the district level, we are trying to put the kibosh on this leveling, but it happens. And it bleeds down into elementary school."

Importantly, the administrator added that many of the challenges that the district was facing were a function of it being early in the process of implementing its new

pathway, and that early "teething issues" would be corrected over time.

DISTRICT E CASE STUDY (TRADITIONAL PATHWAY)

District E is implementing a **traditional pathway** along which students have multiple ways to move through the math course sequence, but regardless of the path a student is on, the district goal for all students is to succeed in mathematics through Algebra II. Figure 4 and Table 2 display the possible course sequences, as included in the Board policy, that students might pursue in this district from middle through high school.

As in District H, District E offers its Core Math Sequence (Sequence A) for students at grade level, employs additional support options for lower-achieving students (Sequence B), and offers accelerated (compression) options for students "committed to intensive academic preparation for a STEM related major" (Sequence C). However, the result is a different picture of course sequencing than in District H, again with multiple decision points (see Figure 4) about support and accelerated options for students.

The district administrator with whom we spoke indicated that the primary goal initially was to help all students be successful with middle school math content:

> The equity imperative is that all kids earn a C or better in seventh grade, that all kids have the content of the Common Core. The key for me is, how many students are operating at grade level in Math 8? Is it 20%? 40%? 60%? 80%? 90? For students that are ready to be college math majors or be involved in math competitions, the district does offer the eighth-grade compression class (with Math 8 and Algebra I content), which is purposely structured in the district as a "challenge" option.

Opt-in approach to the compressed course sequence

In this district, students and parents are the main agents of the decision to move toward additional challenge, and students and their parents must sign an agreement acknowledging that the compression course doubles the content, and therefore the workload. Students are asked to sign this document before taking a placement exam that would contribute to their eligibility for enrollment

Figure 4. Middle and High School Course Sequence in District E's Traditional Pathway

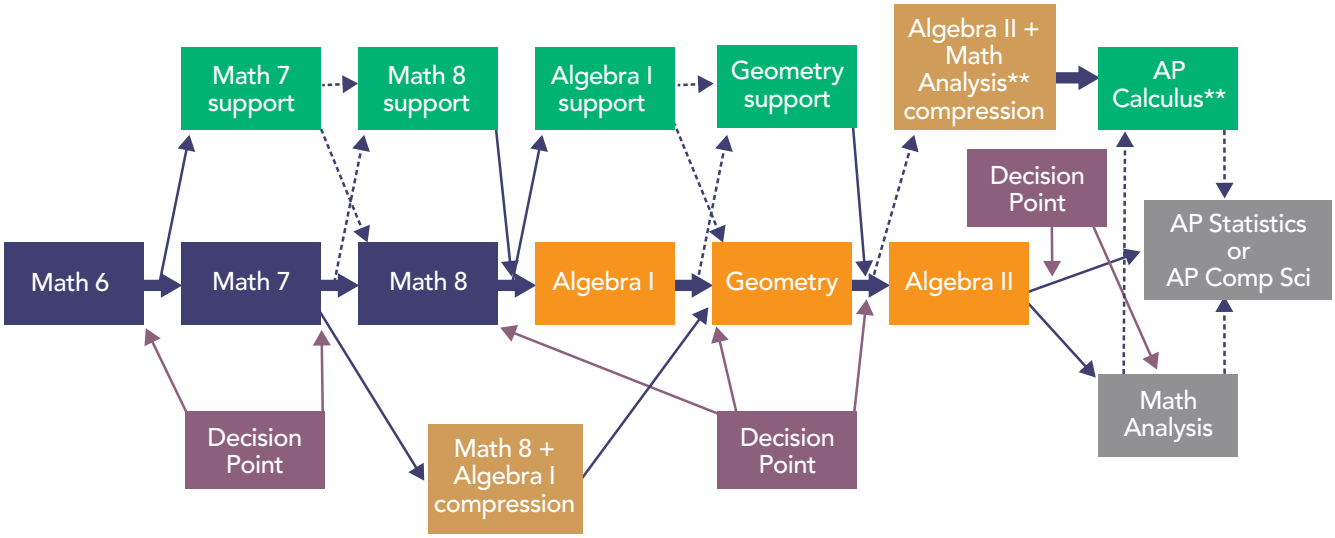


Table 2. Middle and High School Course Sequence Options in District E

SAMPLE COURSE SEQUENCE	GRADES 6–8	GRADES 9–11	GRADE 12
Sequence A All students take the Core Math Sequence, Math 6 through Algebra II, which prepares students to attend a 4-year college or university. A 4th year of math is recommended.	Math 6 → Math 7 → Math 8	Alg I → Geo → Alg II	Math Analysis AP Stats or Comp Sci (select a course)
		Alg I → Geo → Alg II/Math Analysis	AP Calculus
		Alg I + Support → Geo → Alg II	Math Analysis AP Stats or Comp Sci (select a course)
		Alg I + Support → Geo → Alg II/Math Analysis	AP Calculus
		Alg I → Geo + Support → Alg II	Math Analysis AP Stats or Comp Sci (select a course)
		Alg I + Support → Geo + Support → Alg II	Math Analysis AP Stats or Comp Sci (select a course)
Sequence B Recommended for students who are struggling to be successful in their math classes and want a chance to catch up and prepare to attend a 4-year college or university.	Math 6 → Math 7+Support → Math 8+Support	Alg I → Geo → Alg II	Math Analysis AP Stats or Comp Sci (select a course)
		Alg I + Support → Geo + Support → Alg II (double-period; same teacher, same students)	Math Analysis AP Stats or Comp Sci (select a course)
	Math 6 → Math 7→ Math 8 + Support	Alg I → Geo + Support → Alg II (double-period; same teacher, same students)	AP Calculus
		Alg I + Support → Geo → Alg II/Math Analysis (double-period; same teacher, same students)	AP Calculus
Sequence C Recommended for students who know early on they are interested in a STEM field related major or would like to apply to a highly selective college or university.	Math 6 → Math 7 → Math 8/Alg I	Geo → Alg II/ Math Analysis → AP Calculus	AP Stats or Comp Sci AP Calculus BC or another math course at a neighboring community college (select a course)
		Geo → Alg II → Math Analysis	AP Calculus AP Stats or Comp Sci (select a course)

Source: District E (2013).

in the compression course. The district administrator we spoke with indicated that, overall, about 25% of students in the district take the compressed eighth-grade course, but it has found after the first year of implementation that a "significant number had to retake algebra in high school because they did not demonstrate a deep understanding of the content." However, students can move out of the compression course — staff monitor a student's grades in the course, and if a student isn't doing better than a B-, the student may be counseled to move to the regular core sequence.

Courses to support struggling students

In addition to offering courses that enable students to accelerate through the content, the district also offers a range of support courses for students who are struggling unsuccessfully to meet the expectations of the core math sequence. Called "Success" courses, the support courses allow students to continue in the math course sequence, reaching Algebra II by grade 11. The courses that are offered are a Math 7 and Math 8 Success course, in which some students may opt to enroll simultaneously with their regular Math 7 or Math 8 course. The Success classes are intended to provide support for students to "review topics from earlier courses, to have additional time and exposure to new content introduced in their current course, and to preview advanced topics from their current course and other courses."

Availability of the courses varies by site

Although all these courses in the sequence are spelled out in the Board policy, some high school math courses are available at every site (e.g., Algebra I, Geometry, Algebra II, AP Calculus), while others are available only at selected sites and based on student enrollment (e.g., Math Analysis, AP courses). Similarly, in the first year, different school sites were likely to have different support and challenge options for their students (e.g., tutoring, summer intervention course). Our district contact indicated that the reality of implementing the Board policy was not simple:

> There are still some schools that don't offer full options for Success classes; quite a few schools, so, if you're a parent, how can you say that's what the course sequence options are if my child can't sign up for it? That's just where we are with our implementation so far. . . . When principals are making master schedules, they are making implicit decisions about what electives they'll offer and how to staff. In some cases, they feel that their staffing is fixed, and, well, "[Existing staff] are teaching [the existing] classes and we don't have any more math teachers to teach another section." So that happens in February, March, April at the site level, and there is inadequate direction and guidance and support. And so it's just this constant [question of], how do we get support on the ground and how do we get direction from principal supervisors to enforce or support the full implementation of this Board policy?

He continued to elaborate on the ways in which the content of the courses was shifting as a result of continuing implementation:

> Algebra I started last year in earnest. [But] there were still some schools that didn't shift to the new curriculum. This year, the Geometry and Algebra II curriculum is increasingly in place, but we have a question about the new Algebra II/Math Analysis (pre-calc) compression course: parents want to know if it can be called an honors course for UC system GPA calculation. Likely, this will be the last year we designate a particular Math Analysis course as honors. So what you see on the graphic in the Board policy is what we are trying to do and where we're headed, but there is still some grandfathering going on, there is still some wobble, there is still some bits of confusion we are having to clear up.

In both Districts H and E, the best intentions about enrolling students appropriately and setting them up for future success can seemingly be derailed by resistance or

habits of long-standing practice in the schools, variation in site resources and lack of coherence between district and site, and even parental pressure and misunderstandings about the potential consequences of early acceleration. Many districts may benefit from careful thinking at the district level about the importance of appropriate placement practices and how this thinking is shared with site leadership to support thoughtful decision-making across district sites.

District Recommendations Regarding Course Pathways and Sequencing

We asked districts what advice they would give to other districts and readers about choosing course pathways and sequencing courses to best support all students when implementing the CCSS-M. Many interviewees were very generous and forthcoming with their responses — some emphasized the value of working hard to get buy-in from stakeholders and the importance of the professional development for teachers.

Many districts wanted to stress the value of being inclusive of and transparent toward district stakeholders as well. Any shift in course sequence or curriculum can be controversial, but the political fallout can be lessened if all stakeholders are invited to provide input and ask questions. Some districts made concerted efforts to include district administrators, teachers, the school board, and parents in their decision-making and aimed to be "open and transparent to questions," for example, by sending out letters to keep families informed of progress throughout the decision-making process, or holding "town hall" meetings to spread information. The district that used the consensus process for choosing a curriculum referenced earlier reported that teachers and staff felt comfortable knowing that they were not out-voted or that their side had not "lost," and that everyone came to a consensus as a group.

Specific mention was made by some interviewees about the importance of keeping site administrators informed. One interviewee indicated that elementary school principals need to be given time and guidance to fully understand what course sequencing looks like all the way through grade 12, because principals will be the front line of communication with parents and can advocate for the course sequence that the district decides on. Similarly, other district administrators mentioned the specific emphasis on bringing teachers on board and getting them involved in the details of implementation:

> Teachers need to understand what is happening and need to be a part of decision-making. They need to pore through the standards and materials so that they can see the nuances. Textbooks at the high school level are so different now, especially with being "consumable," there's a lot of pedagogy shifts that need to take place, so you need to be sure teachers understand what is happening.

School districts also recommended robust, long-term professional development, saying it is a key to the implementation of the curriculum, in regular and accelerated classes.

Another recommendation we heard focused on the clarity of the guidelines for course placement. One administrator mentioned that this clear direction from the central office is important so that sites are not left in a vacuum, making up their own criteria. Another administrator mentioned how critical it is to carefully monitor student outcomes to see where implementation might need to be adjusted. Regardless of whether the district has chosen to accelerate students or not, we heard repeated refrains similar to what this official told us: "The focus has to be on how students are doing, on student learning and monitoring student learning."

Conclusion

Implementing new standards that focus on preparing students for college and career readiness involves more than enacting the guidelines for what students should know at grade level. As we have described, it encompasses rich and weighty discussions on curriculum choices, instructional vision, the needs of the students, and parent voice. In this report, we highlighted commonalities and differences across the MiC districts in their approaches to mathematics pathways and course sequences for middle and high school. With a wide range of variation and very little consistency across the 10 MiC districts, these districts are primed to collaborate in a fruitful discussion of their different approaches to math course sequences and pathways, and what actions or policies may be most beneficial to students in the CCSS-M era.[9] Even with understandable variation across the districts, including differences in student populations, teacher preferences, level of school site autonomy, and course sequences, we heard a consistent voice throughout our interviews: the districts want to offer a comprehensive mathematics program that prepares their students to succeed through and beyond high school.

But without more specific guidance from the state, districts are left to their own devices. We encourage them to look outward for guidance, community support, and insight. The MiC initiative provides a unique workspace for district staff to collaborate on common themes and lessons learned.

Resource allocation. Time and money (or the lack thereof) bubbled up frequently across our interviews. Several of the district interviewees reiterated that they wanted to move toward an integrated pathway, but the time and/or costs of retraining or bolstering the mathematical content knowledge of their teachers was too great an ask. For example, teachers who taught Algebra I would need significant training to now teach an integrated course that also included Geometry and Algebra II. With so much else shifting, moving to an entirely new pathway amounted to too many risks in an already overburdened system. With MiC districts split across the two pathways, we encourage the districts to continue sharing lessons learned about their chosen pathway, namely: how they have allocated their resources, what has proven most beneficial, how they ensure that teachers understand the refocused content, and how they know that students are moving through the pathway successfully.

Curricular materials. As districts are finding their footing along these pathways, they're also trying to gain a hold with regard to classroom textbooks and materials. While many of the MiC districts have chosen new curriculum materials for their middle and high school courses, the resounding response indicates that most are not satisfied with what is available on the market. Most districts supplement with additional resources, and some have even created their own curriculum.

Supporting lower-achieving students. An underlying goal of the CCSS-M is to define a set of mathematical ideas to which all students should have equal access. Our interviews confirmed that one of the many challenges that districts continue to face is how to support lower-achieving learners in the wake of the shift to CCSS-M. Helping students "catch up" under the new standards when they grew up under the old ones adds extra challenges. And our discussions with district staff raised understandable and very concrete concerns about quality, depth, and breadth of supports for lower-achieving students.

9 As described in the Common Core State Standards Initiative (NGACBP & CCSSO, 2010), "With the Common Core State Standards Initiative comes an unprecedented ability for schools, districts, and states to collaborate. . . . The Model Course Pathways in Mathematics are intended to launch the conversation, and give encouragement to all educators to collaborate for the benefit of our states' children" (p. 5).

Data use. But regardless of whether the MiC districts are able to come together to discuss their experiences, it appears crucial that, in this relatively new era of the CCSS, districts use data to assess whether the decisions they have made in the past few years are working out[10]. With respect to the decision to adopt a traditional or integrated pathway, the district could initiate formal focus groups of teachers to understand at the district level whether the pathway is meeting the needs of the students. With respect to the accelerated courses that are being offered, the district could examine how well the students in these classes do at the end of high school; it would be particularly useful to examine the academic achievement of students who took different courses to get on the accelerated pathway, such as accelerating early (middle school) or accelerating later (high school). And finally, with respect to the placement policies, it is important to periodically assess whether the policies are effective and equitable for all students. During this early implementation phase of the CCSS, many decisions are being made, and this presents an opportune time to use data to assess the soundness of all decisions in real time.

10 As noted in the CCSS-M (NGACBP & CCSSO, 2010), there should be "regular revision of pathways as student learning data becomes available" (p. 4).

References

Adelman, C. (1999). *Answers in the tool box: Academic intensity, attendance patterns, and bachelor's degree attainment.* Washington DC: National Institute on Postsecondary Education, Libraries, and Lifelong Learning (ED/OERI).

California Department of Education. (2015). *Mathematics framework for California public schools: Kindergarten through grade twelve.* Sacramento, CA.

Daro, P. (2014). *Oakland and San Francisco create course pathways through Common Core Mathematics.* Washington DC: Strategic Education Research Partnership.

Dweck, C. (2006). *Mindset: The new psychology of success.* New York, NY: Random House.

Finkelstein, N., Fong, A., Tiffany-Morales, J., Shields, P., & Huang, M. (2012). *College bound in middle school and high school? How math course sequences matter.* San Francisco, CA: WestEd.

Harlow, J. (2015, October 27). *California districts moving to new "integrated" high school math pathway.* EdSource.

Hodara, M. (2013). *Improving students' college math readiness: A review of the evidence on postsecondary interventions and reforms.*

National Governors Association Center for Best Practices, and Council of Chief State School Officers. (2010). *Common Core State Standards for Mathematics.* Washington DC: National Governors Association Center for Best Practices, Council of Chief State School Officers.

Rodriguez, O., Meguizao, T., & Willett, T. (2015, November). *Placement tests: What do we know about efficacy and equity?* Presented at the Testing and Beyond: The Future of College Math Placement in California, Jack London Aquatic Center.

SB-359 California Mathematics Placement Act, § 51224.7 (2015).

Appendix A. Most Common Ways for Students in Math in Common Districts to Reach Calculus AB in Grade 12

We identified eight different approaches to moving students to Calculus AB in grade 12, although within some districts there were as many as three different pathways that would lead to college-level math in high school. For instance, in a given district, one pathway might lead to Calculus AB in grade 12, one pathway might lead to AP Statistics in grade 12, and one pathway might lead to Calculus BC in grade 12. Moreover, some districts had multiple compacted course sequences that would lead to Calculus AB in grade 12 — for instance, by allowing students to take compacted courses either in middle school as an "early acceleration" option or in high school as a "late acceleration" option.[11] In this report we only discuss the course sequences that allow students to reach Calculus AB in grade 12, since this is the most common college-level course to which districts provide a direct pathway, as shown below.

The MiC districts reported three different compacted math sequences at the middle school level.[12] In Table A1 below, one sequence is referred to as "Compacting in grades 6 and 7," one sequence is referred to as "Compacting in grade 7," and one sequence is referred to as "Compacting in grades 7 and 8." A different option that did not involve compacting but did allow students to enroll in high school courses in middle school was to allow students to skip Math 7 and/or Math 8; this is referred to as "Skipping Math 7 and Math 8" in the table. At the high school level, districts offered one of the following two compaction options: 1) incorporating the integrated Math I/II/III courses each with the "plus" standards or 2) compacting Algebra II with either Precalculus or Math Analysis.

11 There are other options that would allow students to take college-level courses in high school, such as taking summer school or doubling up on math courses in a single year, but we limit the scope of this report to course sequences.

12 We only describe here the various options that were discussed in interviews with districts and through reviews of documents. We do not provide counts of the districts that employed each option because many districts employed many different pathways, meaning that each district would be double-, triple-, or quadruple-counted.

Table A1. Accelerated Math Course Sequences to Get to Calculus

GRADE	SKIPPING MATH 7 AND MATH 8 (DISTRICT D)	COMPACTING IN GRADES 6 AND 7 (DISTRICT I)	COMPACTING IN GRADE 7 (DISTRICT J)	COMPACTING IN GRADES 7 AND 8 – INTEGRATED (DISTRICT H)	COMPACTING IN GRADES 7 AND 8 – TRADITIONAL (DISTRICT G)	INCORPORATING THE PLUS STANDARDS (DISTRICTS A, C, F)	COMPACTING IN GRADE 11 – ALGEBRA II/ PRECALCULUS (DISTRICT B)	COMPACTING IN GRADE 11 – ALGEBRA II/MATH ANALYSIS (DISTRICT E)
12	Calculus AB	Calculus AB	Calculus AB	Calculus AB	Calculus AB	Calculus AB	Calculus AB	Calculus AB
11	Precalculus	Math Analysis	Math Analysis	Precalculus	Math Analysis	Compacted course: Math III+	Compacted course: Algebra II/Precalculus	Compacted course: Algebra II/Math Analysis
10	Trigonometry/ Statistics	Algebra II	Math III	Math III	Algebra II	Compacted course: Math II+	Geometry	Geometry
9	Algebra II	Geometry	Math II	Math II	Geometry	Compacted Course: Math I+	Algebra I	Algebra I
8	Geometry	Algebra I	Math I	Compacted course: Half of Math 8 and all of Math I	Compacted course: Half of Math 8 and all of Algebra I	Math 8	Math 8	Math 8
7	Algebra I	Compacted course: Half of Math 7 and all of Math 8	Compacted course: All of Math 7 and all of Math 8	Compacted course: All of Math 7 and half of Math 8	Compacted course: All of Math 7 and half of Math 8	Math 7	Math 7	Math 7
6	Math 6	Compacted course: All of Math 6 and half of Math 7	Math 6	Math 6	Math 6	Math 6	Math 6	Math 6

Appendix B. Measures Used in the Math in Common Districts to Place Students into Accelerated Courses

This appendix describes measures used in the MiC districts to place students in accelerated courses. Table B1 describes the specific measures and detail about how the districts use those measures. The use of different cut points on the same measure (such as the Mathematics Diagnostic Testing Project) for different districts may be necessary if each district is using the measure to place students into different math classes. For instance, in one district the measure may be used to place students into a grade 7 math course that covers the content of Math 7 and half of Math 8, while in another district the grade 7 math course may cover the content of all of Math 7 and all of Math 8. Because the latter course is more rigorous, this may explain why the two districts might use different cut points on the measure.

Table B1. Measures Used in the Math in Common Districts to Place Students into Accelerated Courses

DISTRICT	CAASPP SCORES	DIAGNOSTIC ASSESSMENT	ADDITIONAL ASSESSMENT	MATH COURSE GRADES	TEACHER RECOMMENDATION	OVERALL PLACEMENT POLICY
District A	N/A	At least 95% correct on the Algebra Readiness Mathematics Diagnostic Testing Project test	N/A	N/A	Yes	Site based
District B	N/A	N/A	N/A	N/A	N/A	Open enrollment — students ultimately decide whether they will be on the accelerated math pathway.
District C	N/A	N/A	Course final assessment	Yes	Yes	Teacher makes the recommendation.
District D	Will use the CAASPP results in the future	N/A	Benchmark assessment	N/A	Yes	Site based; district provides suggested data points to consider, but ultimately the site decides.
District E	Will use the CAASPP results in the future	N/A		Yes (final grade)	Yes	If students have good grades and the teacher recommends them, then the sites encourage students to accelerate. Parents also have to sign a contract for the student to be accelerated.
District F	Will use the CAASPP results in the future	Created a district placement exam that includes a diagnostic section	Interim assessments taken three times a year	Yes — academic performance throughout the school year	Yes	Site based; district provides suggested data points to consider, but ultimately the site decides.

DISTRICT	CAASPP SCORES	DIAGNOSTIC ASSESSMENT	ADDITIONAL ASSESSMENT	MATH COURSE GRADES	TEACHER RECOMMENDATION	OVERALL PLACEMENT POLICY
District G	N/A	N/A	Score 4 out of 5 on the fall benchmark extended-response questions, score 4 out of 5 on the spring extended-response questions, and fall MAP percentile	Yes — course grades of A or B in spring of prior year and fall of current year		The district makes recommendations for each student, and these recommendations are sent to the school sites. Some students are identified as being "on the border," and so the sites are asked to look more closely at these students with possibly additional data. If a school does not follow a recommendation for a particular student, the district and school try to arrive at a resolution.
District H	Will use the CAASPP results in the future	Algebra Readiness Mathematics Diagnostic Testing Project	Open-ended response items that align with different domains in grade 6 standards	Yes	Yes	If the student reaches mastery on the diagnostic assessment and the additional open-ended assessment, then the site next considers teacher and parent recommendations.
District I	N/A	N/A	Basic facts skills test in grade 5 for placement in grade 6	Yes (final grade)	N/A	Site based; district provides suggested data points to consider, but ultimately the site decides. Students cannot take the compacted grade 7 course if they did not take the compacted grade 6 course.
District J	Will use the CAASPP results in the future	N/A	Publisher assessment and benchmark assessment	Yes (specifically the recent trimester grade from grade 6)	N/A	Site based; district provides suggested data points to consider, but ultimately the site decides.

Note: In many cases districts did not use CAASPP scores for placement in the 2015–16 school year due to the timing of the release of the results and too much uncertainty around the scores in terms of interpreting their results. However, several districts will use these scores in future years.

Appendix C. Evaluating Placement Policies

With the first cohorts of students having now completed a year of CCSS implementation, there is a great opportunity to evaluate the appropriateness of the placement criteria and the supports that students are receiving to achieve mastery of the standards. Some districts that were interviewed talked about doing such an analysis. This appendix provides guidance on the data needed to conduct such analyses as well as how these analyses can be conducted.

DATA ELEMENTS NEEDED

The data needed to evaluate course placement criteria is often found in the district student information system. Specifically, the following data elements are necessary:

- Student Identification Number
- Grade level
- Math course name(s) enrolled in
- Math course number(s) enrolled in
- Course grade received (by term)
- Standardized assessment results (CAASPP, CST)
- Formative/Interim/Benchmark/Unit test results
- Gender
- Ethnicity
- Free- or reduced-price lunch status
- Special education indicator
- English language learner indicator

TYPES OF ANALYSES

Various types of analyses could be conducted to assess the appropriateness of placement criteria. A first analysis could examine the distribution of grades and standardized test scores in the compacted math course. For instance, what proportion of the students in the class received grades of "A," "B," "C," "D," and "F"? Similarly, what proportion of students scored in the "Standard Exceeded," "Standard Met," "Standard Nearly Met," and "Standard Not Met" achievement levels on standardized assessments?

For instance, assume that the goal of the district is for students to achieve at the "Standard Met" achievement level and earn a course grade of "B" or above in a compacted math course. Many students in the compacted course not achieving at these levels would be evidence that the placement criteria in the previous year were too low. In contrast, if all of the students in the compacted math course earned an "A" and performed at the "Standard Exceeded" achievement level, then it would appear that lower-performing students from the prior year could have been allowed into the compacted course, assuming these students could score at the "Standard Met" achievement level and earn a course grade of a "B"; this would suggest that the prior year's placement criteria may have been set too high.

Other goals of the district should be considered as well. For instance, if the district's goal is to increase the number of students on the accelerated math course sequence, then lowering the threshold for placement into such courses may be reasonable. But if decreasing the number of failing students in math classes is the goal, then increasing the placement threshold may be desired.

In addition, it is important to look at the performance of students who did not enroll in the compacted math course as well. How many students did well in the regular math course as measured by course grades and standardized test scores? If a large proportion of students did well in the regular math course, then

these students may have potentially been successful in the compacted math course. Therefore, this is possible evidence that the placement threshold could have been lower in the previous year. Alternatively, not many students doing well in the regular math course would not be evidence that the placement threshold should have been lower.

Another approach to evaluating the placement policy would be to map students' performance from one grade to the next. For instance, assume that grade 7 is the first year in which a compacted math course is offered. One could calculate the average CAASPP achievement level for all students in the compacted grade 7 math course, disaggregated by their average CAASPP achievement level in grade 6. More specifically, what was the average CAASPP achievement level (or scale score) in grade 7 among students who performed at the "Standard Exceeded" achievement level on the grade 6 CAASPP?[13] What was the average CAASPP achievement level in grade 7 among students who performed at the "Standard Met" achievement level in grade 6? What was the average achievement level in grade 7 among students who performed at the "Standard Nearly Met" level in grade 6? And continue to separate the students by each of the four achievement levels. This analysis would provide "expected" CAASPP achievement levels in the compacted grade 7 math course, dependent upon the students' grade 6 CAASPP performance.[14]

Table C1 provides hypothetical CAASPP achievement level data in the grade 7 compacted math course based on achievement level data in grade 6. This table of hypothetical data shows that among students placed in the compacted math course who performed at the "Standard Met" achievement level in grade 6, 10% performed at the "Standard Exceeded" achievement level in grade 7, 80% performed at the "Standard Met"

Table C1. Hypothetical Achievement Levels of Students Enrolled in a Compacted Math Grade 7 Course

PERCENTAGE OF ENROLLED STUDENTS BASED ON GRADE 6 ACHIEVEMENT LEVEL ON THE CAASPP	PERCENTAGE OF STUDENTS SCORING IN EACH OF THE ACHIEVEMENT LEVELS IN THE GRADE 7 COMPACTED COURSE
80% Standard Exceeded	90% Standard Exceeded 10% Standard Met
10% Standard Met	10% Standard Exceeded 80% Standard Met 10% Standard Nearly Met
10% Standard Nearly Met	20% Standard Met 60% Standard Nearly Met 20% Standard Not Met
0% Standard Not Met	0% Standard Exceeded 0% Standard Met 0% Standard Nearly Met 0% Standard Not Met

13 In order to get more fine-grained detail at the achievement level, one could further disaggregate each CAASPP achievement level into "high" and "low." For instance, "Standard Nearly Met – High" and "Standard Nearly Met – Low."

14 One important thing to keep in mind, however, is that we are relatively early in the implementation of the CCSS-M. As such, the implementation of the standards may improve over time. So for instance, it is possible that the relationship between CAASPP results in grades 6 and 7 may change over time, such that future cohorts of students performing at the "Standard Met" achievement level in grade 6 may do better on the grade 7 CAASPP as compared to the current cohort of students.

achievement level in grade 7, and 10% performed at the "Standard Nearly Met" achievement level in grade 7. Note also that the number of students performing at a lower achievement level in grade 6 who enrolled in the compacted math course in grade 7 is likely to be low, simply because fewer of these lower-performing students would be able to enroll in the compacted course. Nevertheless, the information on these students is still valuable because it shows how well they did when they were allowed to enroll in the compacted math course in grade 7.

One could set future placement criteria based on information from a table such as Table C1. For instance, if the district believes that students should not perform at a level lower than a "Standard Met" achievement level on the CAASPP assessment, then the placement criteria should be that students would need to perform at least at a "Standard Met" achievement level in their grade 6 CAASPP assessment.[15] Alternatively, if a district believes that students should achieve at least at the "Standard Nearly Met" achievement level, then based on the hypothetical data in Table C1 the district might use a threshold of "Standard Nearly Met" on the grade 6 CAASPP.

15 Note that table C1 only provides achievement levels in the grade 6 CAASPP test and the compacted grade 7 math course. However, this could also be done with scale scores. The analysis could map the scale score in grade 6 that best fits the performance level that the district wants students to achieve. For instance, it might be that students that score 2251 on the grade 6 CAASPP commonly perform at the low end of the "Standard Met" achievement level in the grade 7 CAASPP. Therefore, a district may choose to have the threshold be that students need to score at least 2251 in order to enroll in the compacted math course.