



Foreword

Amber M. Northern and Michael J. Petrilli

In 2010, when the final Common Core State Standards (CCSS) were unveiled, our content experts found them worthy of praise, awarding the math standards an A-minus and the English language arts standards a B-plus. That meant CCSS was “clearly superior” to the standards in the vast majority of states—and that the vast majority of American children would be better off if their schools taught them the content and skills they set forth.

Since then, we’ve remained steadfast in our belief that the standards, if adequately implemented and supported, could improve the educational trajectories and life prospects of all students.

We’ve been busy the last six years studying how this implementation has been going. Between our national and Ohio offices, we’ve published an average of two studies per year on Common-Core-related topics, totaling an even dozen. Yet our earnest, unequivocal support of the CCSS means that we’re subject to skepticism: Is Fordham wearing rose-colored glasses when it comes to how it’s going?

If you’ve read any of our dozen reports, you already know that the answer is no. We haven’t been shy about exposing implementation warts. In 2010, for instance, we raised a question in a white paper that *none* of our Common Core friends wanted to talk about at the time (and still don’t): How should the Common Core be governed going forward (including whether and how these standards may one day be updated)? In 2012, we reported that CCSS implementation was not going to be done on the cheap. In 2013, we explained how English language arts teachers in Common Core states still viewed instruction with a skills-based approach, versus one focused on content; that same year, we released another study reporting that a measly 12 percent of superintendents in our home state of Ohio described themselves as “high-level implementers.” And in 2014, we laid out the many struggles that “early implementer” districts faced in executing the CCSS.

The present study also seeks to offer relevant, honest and—we hope—practical research on CCSS implementation. Here, we’re interested in whether teachers responsible for elementary and middle school math instruction in Common Core states have changed what and how they teach—and whether they’re seeing improvements in students’ math understanding as a result. The teacher survey that forms the basis of this report was developed, in part, to help guide implementation efforts on the ground. (This is the math parallel to our English language arts study released in 2013.) This study joins a growing body of research showing that teacher familiarity with the Common Core standards is growing, as is their acceptance of them.^{1,2,3} But there’s plenty new here as well.

Successfully undertaking survey research that “speaks” to K–8 math teachers requires analysts who know the subject, who know teachers, and who also know survey design and analysis. Our trio of authors fits that bill. Lead analyst Jennifer Bay-Williams is professor and department chair of middle and secondary education at the University of Louisville. She’s the past president of the Association of Mathematics Teacher Educators and has published many articles in refereed journals (and a widely used book series for K–8 mathematics teachers) on how this subject is taught and learned. Just as important, she walks the walk by assisting teachers throughout Kentucky and other states who are in the throes of CCSS-M implementation.⁴

Bay-Williams is joined by Ann Duffett, a twenty-year veteran in the field of public opinion research. She is the former senior vice president at Public Agenda, venturing out in 2005 to found the FDR Group with her partner, Steve Farkas. Ann and Steve were Fordham’s first-ever contractors in the late 90s; we respected their work then and continue to in 2016.

Jennifer and Ann are joined by Fordham Research and Policy Associate David Griffith. David holds a master’s degree in public policy from Georgetown University and is a former high school social studies teacher. He excels in asking the right questions, pushing back against conventional wisdom, and writing user-friendly prose.

This able trio has produced a fine report that you’ll want to read in its entirety. Because you’ll find a thorough executive summary following these remarks, we won’t rehash all of its findings. But here are five key takeaways:

1. Most teachers are partial to the Common Core, but they don’t think all of their students and parents are.

Most teachers view the standards positively, believing that they will enhance their students’ math skills, prepare them to succeed in college, and bolster their ability to compete in a global economy. Further, most believe that the CCSS-M are an impetus for improving their *own* content knowledge. At the same time, teachers’ thoughts on the views of students and parents are considerably less rosy. They say that pupils are “frustrated” by having to learn multiple methods of solving a problem and worry that some have math anxiety, especially in grades 6–8. A whopping 85 percent say that “reinforcement of math learning at home is declining because parents don’t understand the way that math is being taught.” We know that teachers are the primary vehicle through which parents learn about the CCSS, so this raises a key question: How can they better help parents support their children’s success in math?

2. Kids seem to be hitting a wall in middle school. Or, possibly, their teachers are. Overall, middle school teachers tend to have a more negative assessment of their students’ math abilities and the broader impact of the standards. We can’t know why. Perhaps it’s the obvious reason: Middle school standards are simply tougher than elementary standards. Perhaps it’s because more teachers in middle school have math degrees (versus elementary education degrees) and thus better grasp the math prowess needed in the upper grades. Or maybe it’s because today’s middle school students did not “grow up” with these standards in earlier grades, and the transition has been difficult. The logical question is this: If the latter is true, will this transition problem eventually work itself out?

We were surprised to find that elementary teachers tend to have more positive views of the potential benefits of CCSS-M and their impact on students. After all, we’ve heard many anecdotal reports of elementary teachers who feel that these standards are “developmentally inappropriate,” and it’s no secret that many primary teachers haven’t themselves studied a great deal of math. Yet 61 percent of K–2 teachers say they have *fewer* or about the same number of “students who have math anxiety” than before the CCSS-M, and 68 percent agree that “students are developing a stronger capacity to persevere in math and come up with solutions on their own.” It’s the middle school teachers who report more distress.

3. Teaching multiple methods can yield multiple woes. The CCSS-M’s Standards for Mathematical Practice require that students “check their answers to problems using a different method.” And sure enough, 65 percent of K–5 teachers are teaching multiple methods more now than before the CCSS-M were implemented. Our focus group data and open-ended survey responses also reveal this to be one of the biggest lessons they’ve drawn from Common Core: Teach multiple ways to solve a problem. Makes sense to us. But this admonition has had

ramifications for both students and their parents. One likely reason that math learning is suffering at home is that parents simply don't know "multiple methods" themselves—they know the method they were taught two or three decades ago. Our authors recommend one solution (have students practice their *preferred* method at home), but surely there are other ways to teach students conceptual understanding without flummoxing them or their moms and dads.

4. **The math wars aren't over.** The Common Core math standards seek to bring a peaceful end to the "math wars" of recent years by requiring equal attention to conceptual understanding, procedural fluency, and application (applying math to real-world problems). Yet striking that balance has not been easy. We see in these results several examples of teachers over- or under-emphasizing one component to the detriment of another. A recent RAND study found the same thing and recommended that math teachers be given better guidance on how to balance the three areas in classrooms.⁵
5. Finally, the good news: **Teachers are teaching Common Core math content at the grade levels that the CCSS-M specify.** Though that may seem anticlimactic, it is noteworthy that teachers are able to identify from a list of topics (some of which are decoys) those that reflect the standards—and that they report teaching those topics at the grade levels where they're supposed to be taught. This finding resonates with a study earlier this year by Thomas Kane and colleagues in which 85 percent of teachers reported having good or excellent knowledge of the standards for the grades and subjects that they teach.

Once upon a time, teachers shut their doors and did their own thing. Now we have many instructors teaching to the same high standards nationwide. This is something to celebrate.

These results should inspire several mid-course adjustments. The report offers various suggestions on this front, such as the need to clarify a role for memorization in the early grades. (See "Implications" for more.) We hope that local and state officials, teachers, and teachers of teachers seize that opportunity.

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There is a growing body of research on CCSS implementation. We're learning what changes are occurring in classrooms, what misconceptions and struggles teachers are having, and what district and school leaders might do to address them.

Still, many people understandably find the shift to CCSS challenging, frustrating, and exasperating. (Politics has also reared its unlovable but inevitable head.) Implementation of a big change in practice is never easy in our large, decentralized, and change-resistant education system.

We've been around long enough to see a number of major reforms—all of which seemed controversial and hard to implement at the outset—achieve considerable good over the long run, including some that were prematurely deemed ineffective. (The "small schools" movement comes to mind.) What other policies, structures, or interventions might have borne fruit had we waited long enough to see them out?

The data here are mostly encouraging, even as they give us plenty of ideas for how to do better. If most teachers are implementing the standards, as they claim, we should expect to see improvements in student achievement going forward. Teachers are weary of the pendulum swings in schools; we must show more patience with the Common Core than we've shown in the past. Let's actually see this thing through.

Acknowledgments

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Executive Summary

Amber M. Northern and Michael J. Petrilli

Successful implementation of the Common Core State Standards for Mathematics (CCSS-M) should result in noticeable changes in primary and middle school classrooms across the United States. After all, compared to most of the state standards that they replaced, the CCSS-M focus on fewer topics, link concepts across grades more effectively, and increase attention to rigor. In turn, these “shifts” are intended to support more focused, coherent, and rigorous instruction, ostensibly leading to greater student learning. But are the intended and expected changes in educational practice actually occurring at the classroom level?

To find out, the Thomas B. Fordham Institute commissioned a survey of teachers in K–8 elementary and middle schools in Common Core states to glean how much they’ve changed the way they teach—and whether they are seeing improvements in students’ math achievement as a result.⁶

The present analysis is based on an online survey of a representative sample of 1,003 K–8 public school math teachers from the forty-three states (as well as the District of Columbia) that had adopted and retained the Common Core State Standards for Mathematics as of March 2015.⁷ The excluded “non-adopting” states are Alaska, Indiana, Minnesota, Nebraska, Oklahoma, Texas, and Virginia. The teachers who participated in the survey worked with a range of students in a variety of geographic and academic settings. Most taught in schools where the CCSS-M had been in place for at least two years—and the vast majority (85 percent) report having also taught to other math standards, giving them a strong point of comparison.

The study sought to answer the following questions:

1. **To what extent does the content being taught reflect the CCSS-M?**
2. **In which ways are teachers changing their instructional practices to implement the CCSS-M?**
3. **What impact do teachers think the CCSS-M are having on students’ mathematical preparation?**

Findings

Question 1: To what extent does the content being taught reflect the CCSS-M?

- *In general, teachers say that they are teaching the grade-level topics delineated in the CCSS-M.*

Across all grades, thirty-seven of the forty-four “major” topics included in the survey were identified by at least 90 percent of teachers (from the appropriate grades) as among those they teach.

- *Most teachers are not neglecting computation, though many report having fewer students who memorize basic math formulas or multiplication tables.*

For instance, in terms of computation, at least 90 percent of teachers report that they teach their students to “use place value understanding and properties of operations to add and subtract” (grade 2) and “solve problems involving the four operations, and identify and explain patterns in arithmetic” (grade 3). Furthermore, 29 percent of K–2 teachers report making computation a higher priority under CCSS-M—which makes sense given its stronger focus on math facts in the early grades.

Yet teachers in each grade band—and especially at the middle school level—are more likely to say that they have fewer students who memorize basic math formulas and times tables. The CCSS-M specify that by the end of grade 2, students will know from memory their addition facts; by the end of grade 3, they will know from memory their multiplication facts. As memorization is one strategy for doing so, it is unclear why more teachers report that fewer students are memorizing.

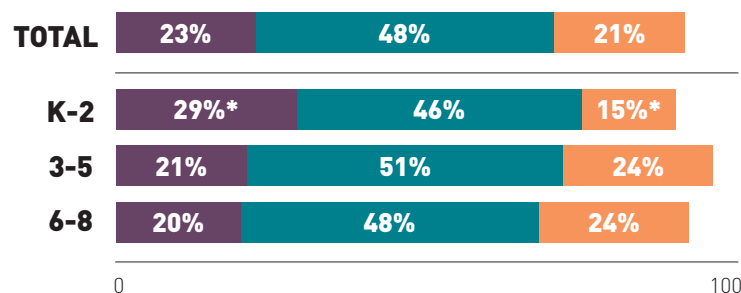
Table ES-1 • Little change in the priority given to computation

Q

Compared to before the Common Core math standards were implemented, are you now doing more, about the same, or less of each of the following in your classroom?

More
About the same
Less

Prioritizing computation



* Indicates statistically significant difference at the 95 percent confidence level when comparing grade bands. For instance, this table shows that K–2 teachers are more likely than teachers in the later grades to be doing “more” prioritizing of computation—and less likely to be doing “less.”

Note: Question wording in the tables throughout this report may be slightly edited for space. Column percentages may not total to 100 percent due to rounding or the omission of answer categories (e.g., “not sure” or “not applicable”). See Appendix B for complete question wording and data for all answer categories.

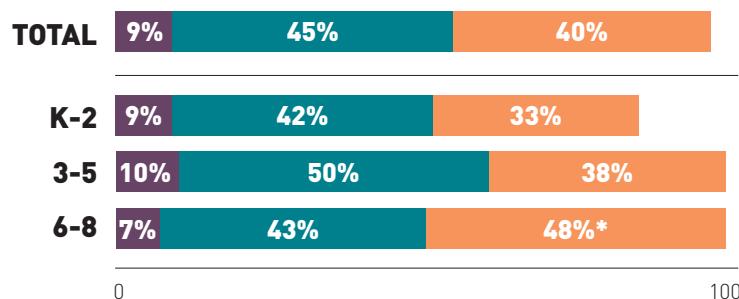
Table ES-2 • Fewer students are memorizing

Q

Compared to before the CCSS-M were implemented, do you think you now have more, about the same number, or fewer students who memorize basic math formulas or times-tables?

More
About the same
Fewer

Students who memorize basic math formulas or times tables



* Indicates statistically significant difference at the 95 percent confidence level when comparing grade bands. For instance, this table shows that teachers in grades 6–8 are more likely than teachers in the earlier grades to have “fewer” students who memorize basic math formulas or times tables.

- Teachers are paying more attention to the application of mathematics.

The standards expect students to use math in situations that require mathematical knowledge. At every grade level, application-related topics are taught by nearly all teachers. Further, many of the topics that teachers report spending the most time on are also related to application.

- Some teachers say that their curricula and instructional materials are not well aligned with the CCSS-M.⁸

Data show 42 percent reporting that the math materials available to them are not well aligned with the CCSS-M, though a slight majority (55 percent) disagree.

- Most teachers are modifying the pace of their curricula because the needs of their students demand it.

Two-thirds report that they “often modify” the pace of their curricula. Fifty-five percent often modify when it comes to deciding which math topics to cover, and approximately one-third modify when it comes to deciding the order of math topics.

Question 2: In which ways are teachers changing their instructional practices to implement the CCSS-M?

Overall, data show that teachers are changing their instructional practices in three key ways.

- More teachers are teaching students multiple methods to solve problems.

Consistent with the Common Core expectation that students be able to “access concepts from a number of perspectives,” 65 percent of both K–2 and 3–5 teachers and 41 percent of 6–8 teachers report that they are “teaching multiple methods to solve a problem” more often than they did before the CCSS-M were implemented; just 2–5 percent at all grade bands report doing this less frequently.

Many teachers report challenges with this shift, however; 53 percent overall agree that “students are frustrated because they are being asked to learn many different ways to solve the same problem.”

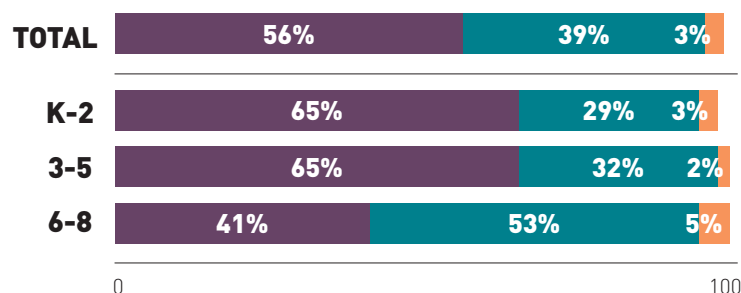
Table ES-3 • More teachers are teaching students multiple methods to solve a problem



Compared to before the CCSS-M were implemented, are you now doing more, about the same, or less of each of the following in your classroom?

More
About the same
Less

Teaching multiple methods to solve a problem



- *More teachers are requiring students to use writing to explain their thinking.*

The Standards for Mathematical Practice state that mathematically proficient students “construct viable arguments and critique the reasoning of others.”⁹ Across grades, teachers report a greater focus on verbal reasoning and the use of language since the CCSS-M were introduced. For instance, 64 percent of teachers say that they are more often “requiring students to explain in writing how they got their answers,” while just 3 percent say that they are doing so less frequently.

Interestingly, familiarity with the CCSS-M is associated with greater shifts in practice. For instance, teachers who have been teaching to the CCSS-M for longer (four years) are more likely than those who have taught to them for a shorter period (one year) to require that students explain in writing how they got their answers (67 percent versus 53 percent). Similar disparities appear relative to requiring the use of proper math vocabulary, teaching multiple methods, and teaching using the number line.

- *Overall, teachers are changing many of their practices in tune with the CCSS-M; other changes that they are making don’t appear in the CCSS-M at all.*

Overall, teachers’ responses suggest that they are changing many of their math practices in ways that are consistent with the CCSS-M. For example, 37 percent say that they are incorporating more teaching with the number line, which is consistent with a host of standards in grades 2–8.

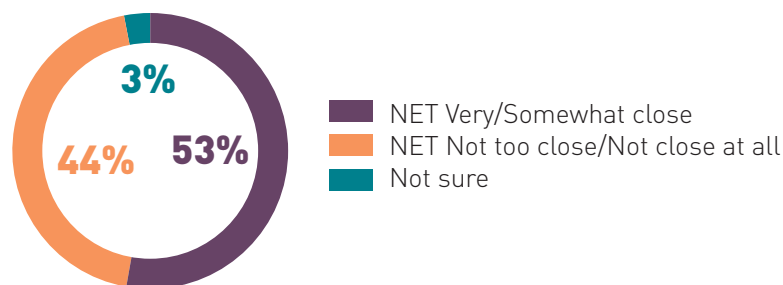
Yet in some cases, there is a murky connection between what the standards say and how teachers are implementing them. For example, 32 percent report that they are “using games and other student-directed activities” more, though there is nothing in the standards suggesting such a shift. Conversely, 40 percent say that they are using “flash cards and drills” less, though nothing in the standards discourages the use of these tools (especially since they are consistent with the expectation that students “know from memory” their multiplication tables by grade 3).

Table ES-4 • Frustration is high among students who are being asked to learn many different ways to solve the same problem

Q

How close does each of the following statements come to your view on the impact of the CCSS-M in the classroom?

Students are frustrated because they're being asked to learn many different ways to solve the same problem



Question 3: What impact do teachers think the CCSS-M are having on students' mathematical preparation?

The survey yielded a mixed bag of findings when it comes to how teachers perceive the CCSS-M impacting their students' mathematical preparation.

- *Teachers think students are developing better number sense.*

Seventy-seven percent of K–2 teachers, and majorities of teachers in grades 3–5 and 6–8, agree that “students are developing a stronger number sense and more ability to apply math in real-world situations.” This is a positive result that likely reflects the new standards’ increased emphasis on conceptual understanding and application.

- *Teachers are divided over students' ability to perform “simple calculations.”*

Consistent with the expectation in CCSS-M that students be fluent in the standard algorithm for each of the four basic operations, 32 percent of K–2 teachers say that they have more students who can “do simple calculations with speed and accuracy” now than before the CCSS-M (22 percent say fewer). This is reversed, however, in the other two grade bands, with larger numbers of teachers reporting that fewer students can complete simple calculations. The results for middle school teachers are particularly concerning, with just 13 percent reporting that more students can perform simple calculations and 39 percent reporting that fewer can. (Note that these middle school students started elementary school before the Common Core standards were adopted and implemented.)

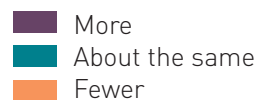
- *Teachers with students who are below grade level have a more negative view of the impact of the standards.*

The 18 percent of respondents who primarily teach students who are remedial or significantly below grade level in math evince significantly more pessimism about the impact of CCSS-M on students than teachers who primarily teach on-grade-level students. For instance, the former are less likely to agree that under CCSS-M, “students are developing a stronger number sense and more ability to apply math in real-world situations” (56 percent versus 66 percent) and more likely to report that fewer students “are able to do simple calculations with speed and accuracy” (44 percent versus 28 percent).

Table ES-5 • Teachers are divided over students’ ability to do simple calculations

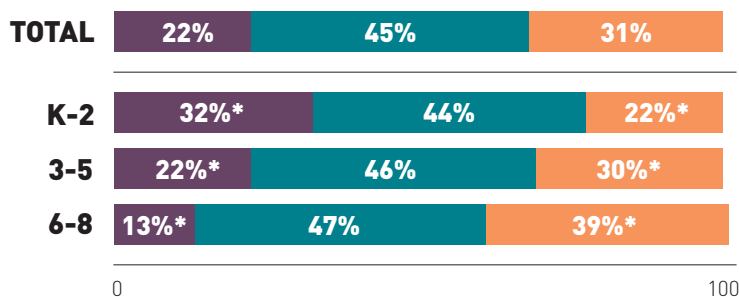


Compared to before the CCSS-M were implemented, do you think you now have more, about the same number, or fewer of the following kinds of students in your classroom?



Students who are able to do simple calculations with speed and accuracy

* Indicates statistically significant difference at the 95 percent confidence level when comparing grade bands.



- *Teachers think the new standards are stressful for students.*

In general, teachers see the CCSS-M as a source of stress for students. For instance, 42 percent of teachers overall say that they have more students with “math anxiety” than before the CCSS-M were implemented, and 53 percent agree that “expectations are unrealistic.” In each of these cases, the higher the grade band, the more likely teachers are to report that students are encountering difficulties. (Again, many of these teachers work with students who started elementary school in the pre-Common Core era.)

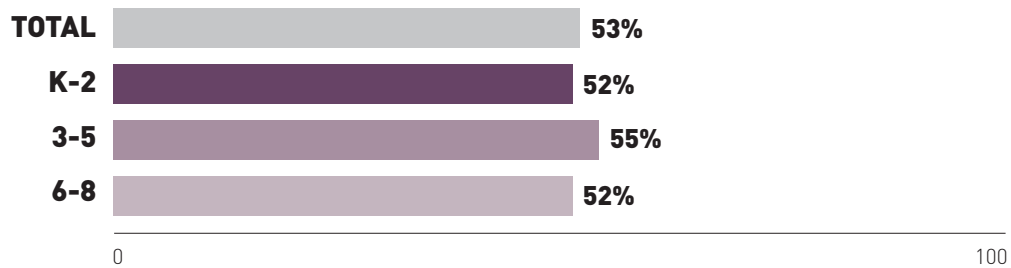
- *A majority of teachers think the CCSS-M will have long-term benefits for students.*

A majority of teachers overall (53 percent) report that the statement “Students are getting better prepared for the advanced math needed to succeed in selective colleges or as STEM majors” is very or somewhat close to their view; 34 percent say that it is not close, and 14 percent are not sure. Similarly, a majority (55 percent) report that the statement “The standards will help ensure that America’s young people have the math skills needed to compete in the global economy” is very or somewhat close to their view; 36 percent say that it is not close, and 9 percent are not sure.

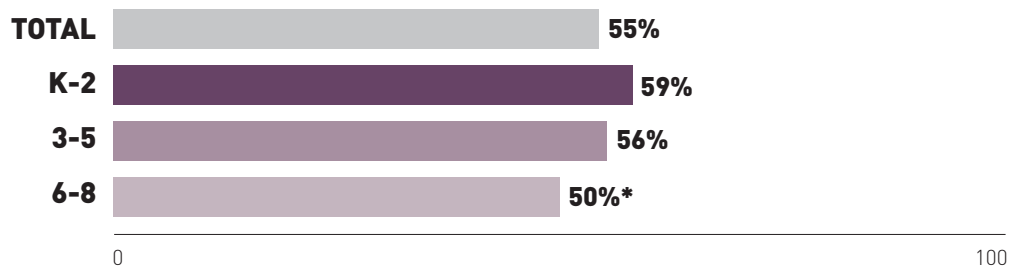
Table ES-6 • A majority of teachers think the CCSS-M will have long-term benefits for students

Q How close does each of the following statements come to your view on the broader impact of the CCSS-M beyond the classroom? (Very or somewhat close to my view)

Students are getting better prepared for the advanced math needed to succeed in selective colleges or as STEM majors



The standards will help ensure that America's young people have the math skills needed to compete in the global economy



* Indicates statistically significant difference at the 95 percent confidence level when comparing grade bands.

In sum, America's math teachers appear to be embracing the shifts articulated in the Common Core math standards and are, on the whole, optimistic that they will better prepare their students for advanced math and the changing economy. But challenges are apparent, including a lack of aligned curricular materials for some and the rather negative view about CCSS-M's impact held by teachers of below-grade-level students. Addressing these challenges will be imperative if the potential of the Common Core initiative is to be realized.