MARKET REPORT

K-8 Math Curriculum Quality:

The State of District-Led Selection



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THE CENTER FOR EDUCATION MARKET DYNAMICS

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This report has been updated from a prior version as of September 14, 2023.

About Us

The Center for Education Market Dynamics (CEMD) is a nonprofit education market intelligence organization. Our primary goal is to expand the access of historically underserved students (Black, Latino, and Indigenous students; students experiencing poverty; and multilingual learners) to high-quality teaching and learning solutions via the K-12 market.

We work to:

- **Illuminate** the education market – aggregating market data and disseminating it thoughtfully across the sector.
- **Guide** the education market – offering support and resources for key participants to engage with the market more effectively.
- **Elevate** the education market – making it work better over time for underserved students.

This Report

CEMD's first market report **explores district math curriculum selection from a quality perspective**. Here, we focus specifically on core curriculum (i.e. not supplemental), and on elementary and middle school math; future CEMD reports will investigate curriculum across other subject areas and grade levels.

This report represents the beginning of our long-term effort to illuminate the K-12 education market for all those with a stake in its improvement: policymakers at all levels, especially those who make decisions about curriculum; educators who want to better understand this ecosystem and what it has to offer their students; developers of instructional products; funders and philanthropists that invest in the market; researchers with a focus on curriculum and instruction; and non-profit and advocacy organizations working to advance better-quality academic experiences in America's classrooms.

Our goal in this report and its companion, **K-8 Curriculum Products and Publishers: The State of District-Led Selection**, is to quickly and efficiently make our readers more knowledgeable about today's math curriculum market, regardless of starting point. We expect that various stakeholders will be interested in this information for different reasons and will use it in different ways. We welcome that. We hope you come away with an evolved understanding of this complex and fast-changing sector, the better to do your work on behalf of students.

Executive Summary

- **High-quality math curriculum has research-based best practices for deepening student math learning baked into it.** Over the last decade, the sector has come a long way in terms of articulating what this looks like – via new research and quality arbiters like EdReports, for example – and such curricula establishing a steadier foothold in the market.

- **It's long been unclear the extent to which students and teachers have access to this crucial instructional resource.** Observational studies generally suggest that low curriculum quality persists in many math classrooms, especially those with high concentrations of historically underserved students. Very little exists in the way of aggregated, public information about district and school curriculum selection.

- **CEMD has set out to better understand this landscape, and to map the national footprint of high-quality math curriculum.** We focus on a subset of 934 districts we call the "Impact Core," which represents over 52% of all students nationwide. This also captures an outsized number of historically underserved students because we intentionally oversampled large, urban districts. We gathered data on math curriculum selection for these districts and analyzed it through the lens of quality.

- **We found that about 36% of these districts have selected exclusively high-quality math curriculum for elementary school, and about 22% for middle school.** Many other districts in the sample have selected a curriculum that is not fully aligned with quality criteria (per EdReports), or is state-specific and of indeterminate quality. There were also a significant number of districts for which we could not find sufficient information about curriculum selection, in spite of much dedicated effort – a void that in itself is telling in terms of the opacity that has traditionally reigned in this space.

- **While high-quality math curriculum still represents a minority of district-selected curricula overall, we believe the data is suggestive of sector-level progress towards quality.** Considering the relative newness of this push for high-quality math curriculum, we see its current status in district selection as notable and promising. We also see clear signals in the market that quality will continue to expand its footprint in coming years.

Introduction

Consider what it will take, mathematically speaking, for you to consume this report. We're going to pose research questions, present data, visualize it, interpret it. Your ability to come on this journey with us depends on a sophisticated math infrastructure in your brain – something that is tacitly but absolutely required for access to your academic-professional world, and central to life competencies like personal finance and consumption savvy. Our public schools must build this math foundation systematically for their students.

High-quality math curriculum is one of the best tools at our disposal to meet this challenge. Research shows that the structure and guidance of high-quality, grade-level math materials improve both teacher practice and student outcomes.[1] But research also suggests that such materials are scarce in classrooms nationwide – particularly in classrooms with high concentrations of historically underserved students.[2]

The Center for Education Market Dynamics (CEMD) works to better understand this curriculum landscape, to shed light on it for others, and to be an organizational voice that contributes to its improvement. Our approach is market-based: we view the question of student access to quality curriculum as a market question. Before it's brought to life in a classroom, a curriculum is a product, after all, which reaches that teacher and those students by means of a complex process of selection and procurement. We apply this market lens and language to examine the math curriculum landscape across the country.

[1] Opfer, V. D., Kaufman, J. H., Pane, J. D., & Thompson, L. E. Aligned Curricula and Implementation of Common Core State Mathematics Standards. 2017.
[2] TNTP. The Opportunity Myth. 2018.

This report focuses exclusively on instructional materials **quality**. It is the first of a two-part series; the second focuses on **publishers and products** in the math market. This first report addresses four key questions:

- **Let's Talk About Quality:** What does "quality" mean when it comes to math curriculum?
- **Getting the Quality Picture:** How did we build a clearer understanding of quality in math curriculum selection across the country?
- **Quality in the Impact Core:** How prevalent is high-quality math curriculum in our focal districts?
- **The Future of Quality:** How is the math market trending in terms of quality – and what are the implications for students?

These are not trivial questions, nor questions just for avid market-watchers. They're fundamentally about the kinds of math opportunities students get in school. And math, at heart, is about grasping problems and figuring out pathways to solutions; it's about learning how to think.

All students should have a math curriculum that's equal to that task. Our effort to illuminate the current curriculum quality landscape is on their behalf, and especially on behalf of those students who depend most on school to set them up for success in life.

Let's Talk About Quality

High-quality math curriculum offers students deep, sustained engagement with the central math concepts of their grade level.

Exercises A and B hit on the same topic: equivalent fractions, a conceptual anchor of third and fourth grade math.[3] What's the difference between them?

A.

Are They Equivalent?

Place a checkmark next to the equations that show equivalent fractions.

$\frac{4}{6} = \frac{16}{24}$ $\frac{3}{3} = \frac{17}{17}$ $\frac{1}{3} = \frac{15}{30}$ $\frac{8}{11} = \frac{40}{44}$

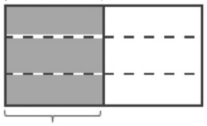
$\frac{2}{6} = \frac{3}{10}$ $\frac{7}{11} = \frac{21}{33}$ $\frac{5}{7} = \frac{10}{12}$ $\frac{1}{3} = \frac{15}{45}$

B.

Exploring Equivalent Fractions

Draw horizontal lines to decompose each rectangle into the number of rows as indicated. Use the model to show the shaded areas, written as both a sum of unit fractions and as a multiplication sentence.

a. 3 rows

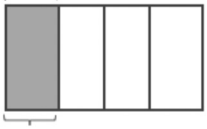


$\frac{1}{2} = \frac{3}{__}$

$\frac{1}{2} = \frac{1}{6} + __ + __ = \frac{3}{6}$

$\frac{1}{2} = 3 \times __ = \frac{3}{6}$

b. 2 rows



For many students (and for us adults too), Exercise A may feel somewhat more comfortable. But it effectively teaches students an isolated process – cross multiply, and check if the products are equal – which doesn't help them reason about the numbers, and which they can't transfer to new problem types.[4] Exercise B, on the other hand, asks students to visually model a fraction by dividing a rectangle into subsections, and then to express that fraction using addition and multiplication sentences.[5]

[3] Per Common Core State Standards, a foundation for many state-specific standard sets.
[4] Sarama, J., & Clements, D. H. (2009). Early childhood mathematics education research: Learning trajectories for young children. New York: Routledge.
[5] Carpenter, T., et al. (2014). Children's Mathematics: Cognitively Guided Instruction (2nd Ed.). Portsmouth, NH: Heinemann

In short, Exercise B aims to build deeper understanding of what a fraction is, and what it means for fractions to be equal. These are building-block math concepts, which students will later rely on to understand proportional relationships and functions. And research resoundingly tells us that this kind of challenging, conceptual engagement is vital to math motivation and learning.[6]

That's not to say that Exercise A is inherently bad, or that there's no place for the procedural or the routine in mathematics. But if Exercise A is the mainstay experience – which observational studies suggest is the case in many classrooms[7] – many students may not build the mental architecture they need to keep adding ever-more advanced layers of math.[8]

IT'S NOT EASY BEING GREEN

How does EdReports rate math curriculum?

EdReports releases free evaluations of commonly used math, science, and English language arts core curriculum (they don't rate supplemental curricula aside from foundational reading products). Reports are developed by educators and other subject matter experts, who assess curricula against criteria from college- and career-ready standards and research-based best practices for the subject.

An "**aligned**" rating indicates that a curriculum fully meets these quality criteria (as opposed to being "partially aligned" or "not aligned"). Every rating is the result of an in-depth review process.

Math curriculum is reviewed on the basis of the following "gateways":

1. Focus and Coherence
2. Rigor and Mathematical Practices
3. Usability

EdReports reviews curricula using a Gateway system. A math curriculum must satisfactorily pass through the first Gateway (Focus and Coherence) to be rated for Gateway 2 (Rigor and Mathematical Practices) (see page 4 of the EdReports math review tool for an overview of the gateways). Together, Gateway 1 (Focus and Coherence) and Gateway 2 (Rigor and Mathematical Practices) make up the "alignment" rating. In order to be reviewed and attain a rating for Gateway 3 (Usability), the instructional materials must first meet expectations for alignment (Gateways 1 and 2). Throughout the report, this is the EdReports rating we refer to (e.g., if a product received an alignment rating of "aligned"; if a product receives a "partially aligned" rating, we refer to it as "partially aligned" or "yellow-rated"). We encourage you to explore the EdReports evidence guide for further details on their process.

[6] Relevant research is collected here.
[7] See, for example, TNTP's Opportunity Myth and particularly the associated student work samples.
[8] Warshauer, H. K. (2015). Strategies to support productive struggle. Mathematics Teaching in the Middle School, 20(7), 390-393.

The purposeful construction of this architecture is what it means for a math curriculum to be **"high-quality" or "aligned"** to quality standards - terms that we use often and interchangeably in this report, and which come from the materials evaluator EdReports (see *It's Not Easy Being Green* for further information on EdReports). An aligned curriculum:

- focuses tightly on the central math concepts for a grade level.
- offers many opportunities to explore these concepts in depth.
- builds understanding of the concepts strategically over time.
- emphasizes rigor and the standards for mathematical practice.

We also use EdReports' other curriculum rating terms: "**partially aligned**" (or "**yellow-rated**") and "**not aligned**" (or "**red-rated**"). But we caution readers that this three-level rating heuristic should not obscure the complexity of quality – which is multifaceted and exists on a continuum rather than in discrete categories. With this caveat in mind, let's turn to the data that we gathered about district-selected math curriculum.

Market Context

We lean heavily on EdReports ratings because they represent the most practical, comprehensive effort to assess curriculum quality that the sector has seen to date. But we're aware that there are other possible ways to measure curriculum quality – and that this quality measurement landscape is likely to evolve over time.

One rising trend we're keeping an eye on is "rapid cycle evaluations" in education, and the ways that technology may soon enable faster, easier efficacy studies of curricula at scale.

QUESTIONS TO CONSIDER

How could trends like this impact math curriculum, and the way that the broader field conceptualizes quality?

Getting the Quality Picture

We dug deep into available data to build a clearer understanding of the nationwide reach of high-quality math curriculum.

What do we know about the quality of math curriculum in schools? What kind of footprint does high-quality curriculum have? What proportion of teachers and students have access to this crucial resource?

These questions are straightforward, but remarkably tough to answer. Centralized databases of curriculum adoption information simply do not exist at the state, let alone national, level.

So we designed and built such a database ourselves, making creative use of publicly accessible information on district curriculum selection. The district is our unit of analysis because district leaders are key instructional decision-makers and buyers. Although some districts defer this process to the school level, the selection of formal, core curriculum happens most often at the district level nationwide. And research suggests that district selection is especially influential in places with high concentrations of historically underserved students (especially Black and Latino students), where teachers may rely more heavily on a district-level instructional vision.[10]

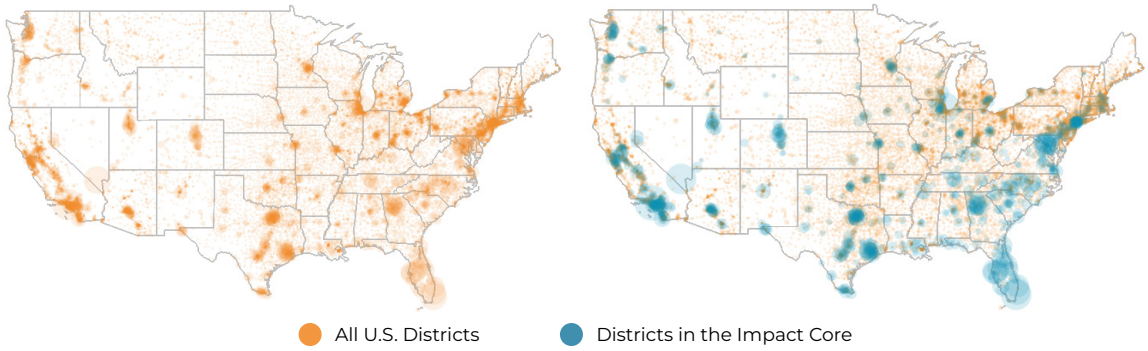
Of course, it's impracticable to collect curriculum information for every district in the country – there are over 18,000, if we include charter networks – so CEMD focuses all of our research on a critical subset of districts we call the **Impact Core**. The CEMD Impact Core includes all districts with over 10,000 students, as well as the three largest districts in every state (see *Figure 1*). This encompasses more than 900 districts, representing 52% of the entire student population and skewing heavily towards historically underserved students (Black, Latino, and Indigenous students; students experiencing poverty; multilingual learners). In other words, the Impact Core represents more than half of all students in the United States and the vast majority of the students we most want to impact.

[9] Pak et al, 2020

[10] We disaggregated data from the RAND 2021 American School Leader Panel (ASLP) and found that significantly higher numbers of teachers and school leaders in low-income schools and predominantly Black schools reported that district curriculum selection informs what they do in the classroom daily.

Figure 1 | All US School Districts and Impact Core Districts

In *Figure 1,* the left image shows all US school districts, in orange; the right image shows Impact Core districts, overlaid in blue. The size of the circles represents student enrollment. As the maps illustrate, the Impact Core sample is concentrated in areas of high student enrollment.



CEMD took several approaches to collecting math curriculum data for districts in the Impact Core, but information could be sparse and variable. Only eight states currently have policies that require curriculum reporting from districts. Nationwide, most districts have wide latitude in terms of which curriculum they select, the process they use to select it, and whether/how they publicize this information.

It's common, for example, for districts to identify a publisher without a specific product, or a product without a specific edition/copyright year – which is not enough information to make determinations about quality. In other cases, districts did not make *any* math curriculum information publicly available. We view this not as "missing" data, but as data in itself about the challenge of curriculum transparency across the country.

To clarify how this affected the analyses in this report:

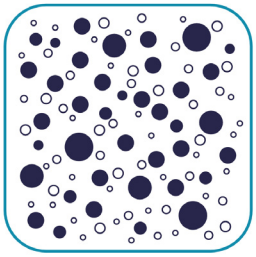
- **The Impact Core represents our base sample of 934 districts.** Three-quarters of these districts make full math curriculum information clear on their district website or in other public documents that we reviewed.
- **But curriculum selection percentages in this report are based on a smaller, analytic sample.** Though the Impact Core is our base sample (and the sample that CEMD centers in all of our research, beyond this report), most analyses here are conducted using the refined analytic sample of districts for which we have data on core math curriculum selection in elementary school (N = 635) and middle school (N = 639).
- **Instances where complete curriculum information was not available are referred to as "unknown"** in the following analyses, as we could not make quality determinations in those cases (e.g., a district identified the publisher but not the specific product and/or edition). Districts with "unknown" curricula are, on average, smaller, less diverse, and more often located in rural areas.

See *Untangling Curriculum Selection* for further details on the Impact Core and our methodology for determining district curriculum selection rates; next, let's explore the story our data tells about students' access to high-quality math curriculum.

UNTANGLING CURRICULUM SELECTION

How did we calculate curriculum selection rates in the Impact Core?

The **Impact Core** is a subset of all U.S. districts



The CEMD Impact Core is a national subset of school districts on which we focus all of our organizational research and analyses. It includes all districts with over 10,000 students, as well as the three largest districts in each state. We used descriptive data from the National Center for Education Statistics (NCES) to identify qualifying districts.

The Impact Core is made up of 934 large, diverse districts across a broad range of geographies. We use the term "districts" throughout this report, but note that this actually includes 912 traditional districts, 20 charter networks, and two virtual/technical education centers.

Altogether, this sample represents about 5% of all districts but 52% of students in the U.S., and it's purposefully over-indexed on historically underserved students. For example, it includes 64% of Black students, 63% of Latino students, 68% of multilingual learners, and 56% of students enrolled in the National School Lunch Program (a proxy for low family income).

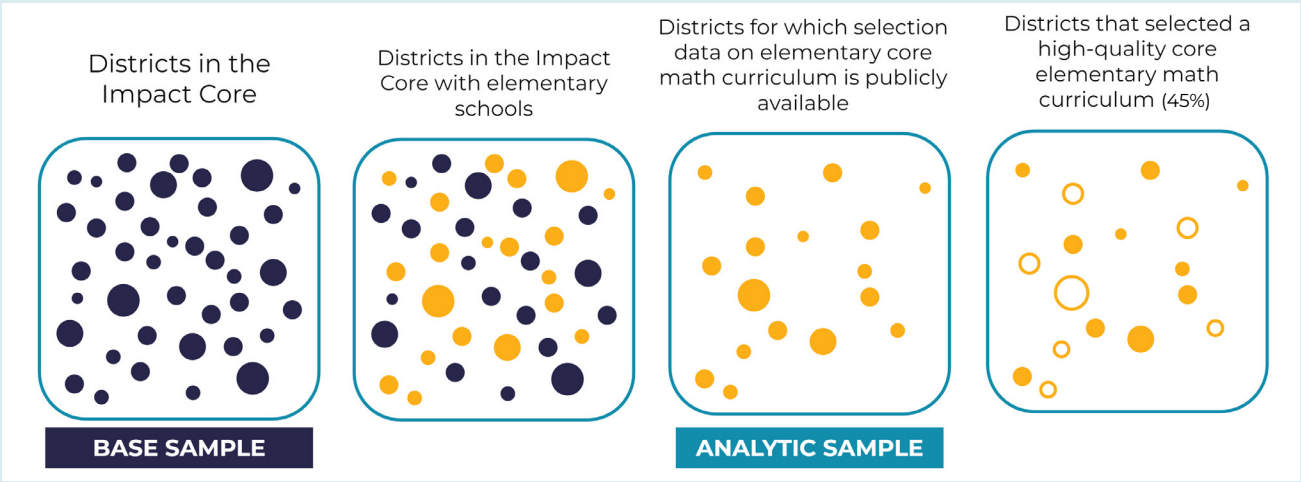
To learn what districts in the Impact Core selected for core math curriculum, we used multiple data collection methods: manual research of district websites, direct communication with district offices, and examination of other publicly available sources like contracts with curriculum vendors. This data collection occurred mostly in 2022 and is a picture of the most recent curricula that districts reported using at that time. We will continue to collect and update this data each year.

To calculate district curriculum selection rates, we divided the number of districts that selected a specific type of curriculum (e.g., a high-quality elementary math curriculum) by the total number of districts in the sample that selected any curriculum for the same grade band and subject (e.g., for elementary math), and for which curriculum information was available.

Number of districts selecting X type of core math curriculum at Y grade band

Total number of districts selecting (any) core math curriculum at Y grade band for which selection data is publicly available

Figure 2 | Example of Calculating District Selection Rate of High-Quality Math Curriculum for Elementary School



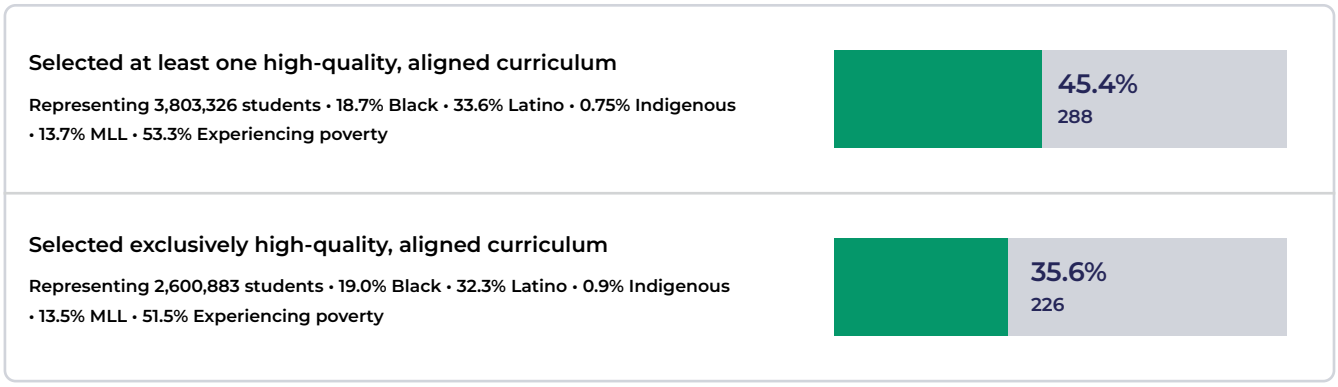
Quality in the Impact Core

High-quality math materials have a significant but not sweeping footprint; the overall picture is brighter for elementary school than middle school.

Quality of Elementary School Math Curriculum in the Impact Core

CEMD's district selection data paints a mixed picture of math curriculum quality in the Impact Core. Let's take a look at **elementary school** selection first.

Figure 3 | District* Selection of High-Quality Curricula for Elementary Mathematics

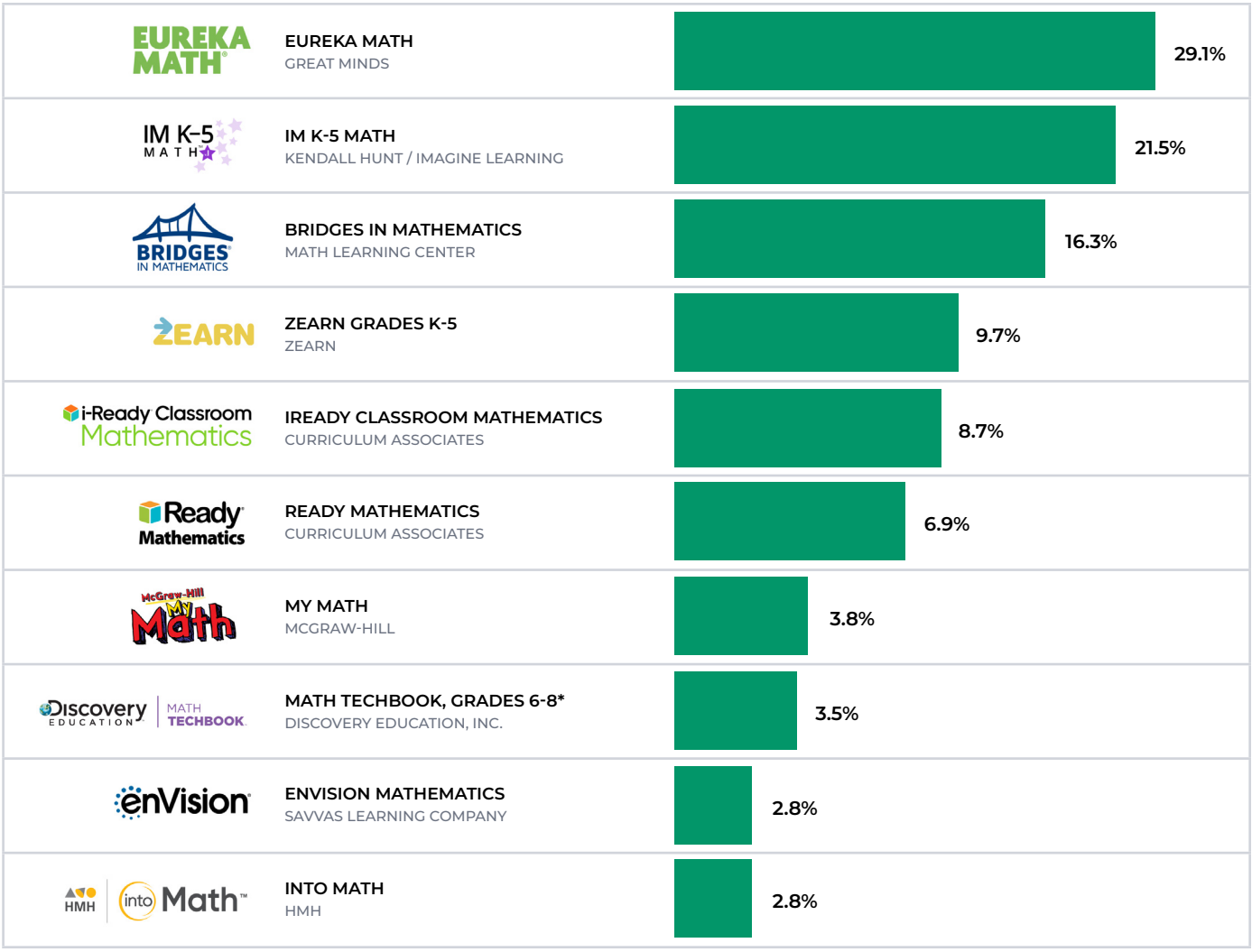


* Total districts with data = 635

As we see in *Figure 3*, **45% of districts have selected at least one high-quality product for elementary school math.** This represents about 3.8 million students. **36% of districts have selected *only* high-quality materials for elementary school**; this represents about 2.6 million students.

Figure 4 shows the most commonly selected high-quality curricula at the elementary school level; Eureka Math is the clear leader among high-quality elementary math curricula selected by districts.

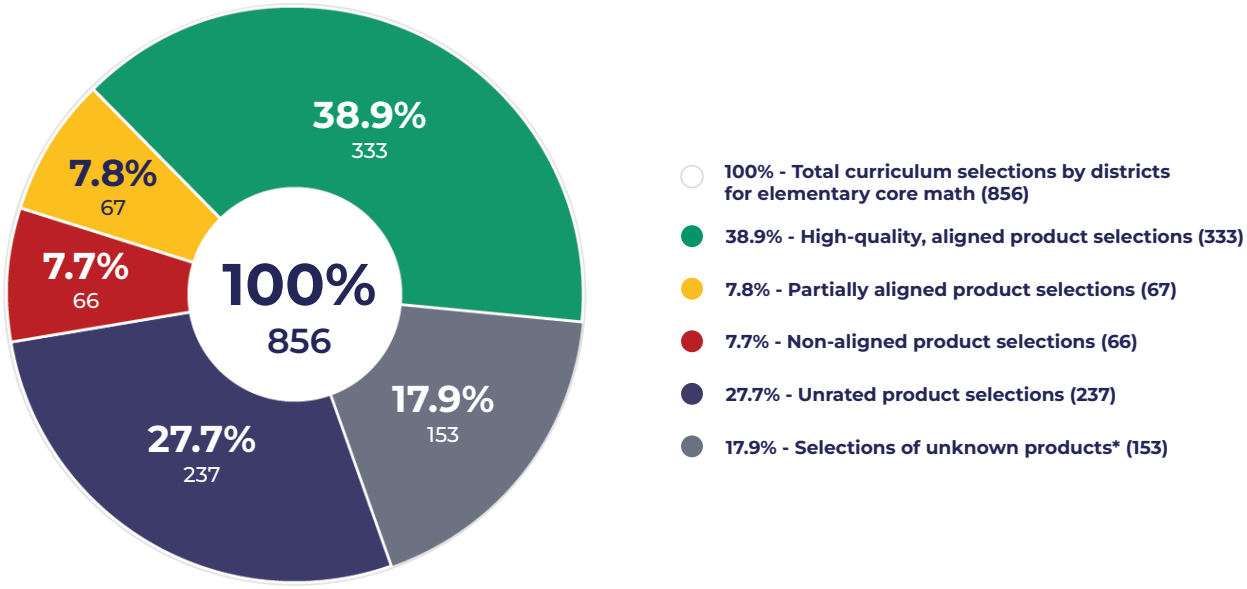
Figure 4 | High-Quality Curricula* Most Commonly Selected for Elementary Math by Districts



*** Of the districts that selected at least one high-quality, aligned elementary math product (see Fig. 3), this chart reflects the percentage of those districts that selected the curricula listed – not overall among all districts selecting any elementary math curricula.**
*** Other (n = 10): 10.4%.**
*** Math Techbook, Grades 6-8 is a middle school core math product that was selected by some districts to serve elementary students. The majority of these districts also adopted Math Techbook for middle school, and most selected at least one other core math product(s) for elementary school.**

As *Figure 3* shows, however, 55% of districts have not selected any aligned curricula for elementary math; this represents about 4.7 million total students. However, "not aligned" doesn't imply that all of those selections were rated yellow (partially aligned) or red (not aligned). More commonly, these selections were either unrated by EdReports or unknown at the level of specificity needed to make a quality determination (see *Figure 5* for a detailed breakdown of district selection by rating).

Figure 5 | Breakdown of Product Ratings in Elementary Math Curricula Selected by Districts

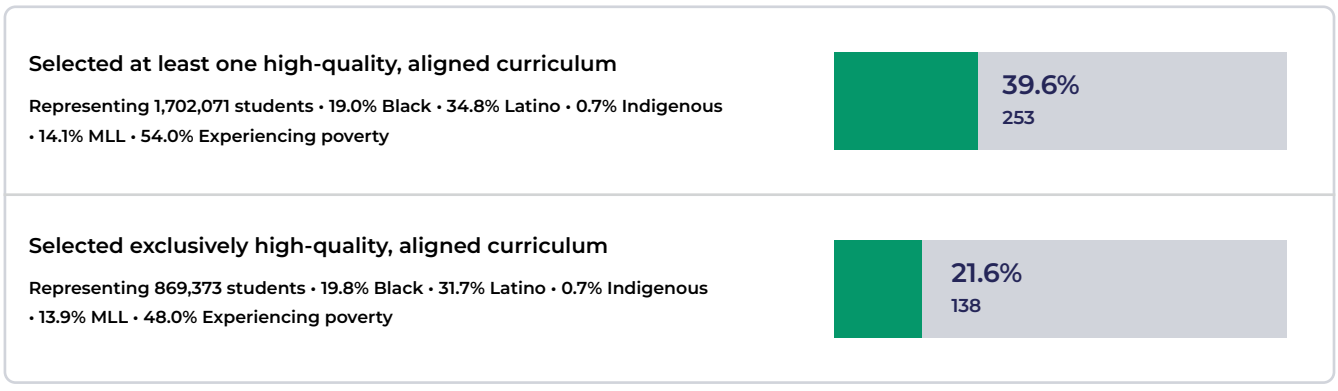


* Represents elementary math curriculum selected by districts for which sufficient information to identify product quality was not publicly available.

Quality of Middle School Math Curriculum in the Impact Core

The landscape of **middle school** math curriculum selection is similar overall, though with slightly less penetration of high-quality curricula, especially as an exclusive choice.

Figure 6 | District* Selection of High-Quality Curricula for Middle School Mathematics

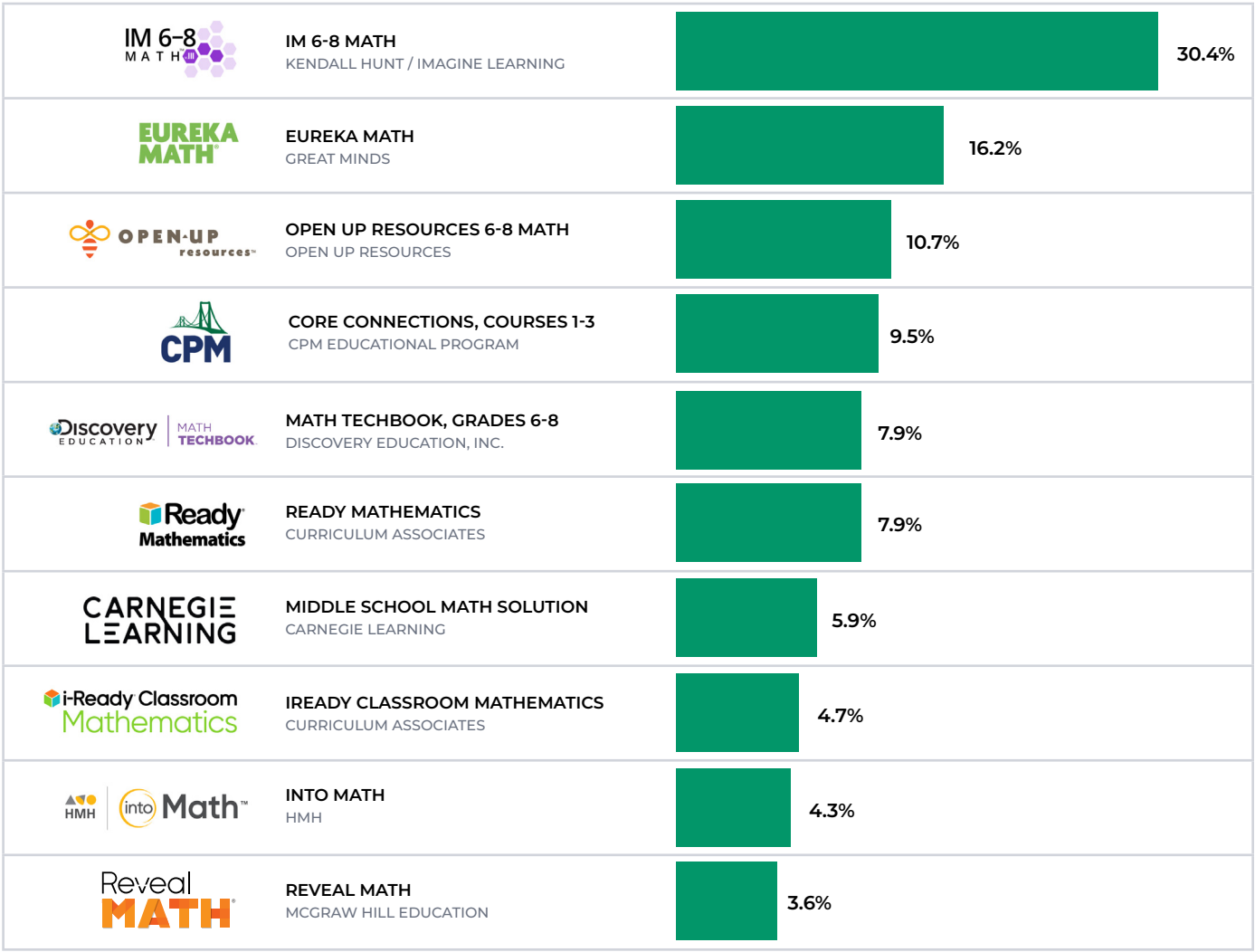


* Total districts with data = 639

As shown in *Figure 6*, **40% of districts have selected at least one high-quality curriculum for middle school math**. This represents about 1.7 million students. About **22% have selected *only* high-quality curricula for middle school math**; this represents about 869,000 students.

Figure 7 shows the most commonly selected high-quality curricula for middle school; Illustrative Math is the clear leader among high-quality math curricula selected by districts.

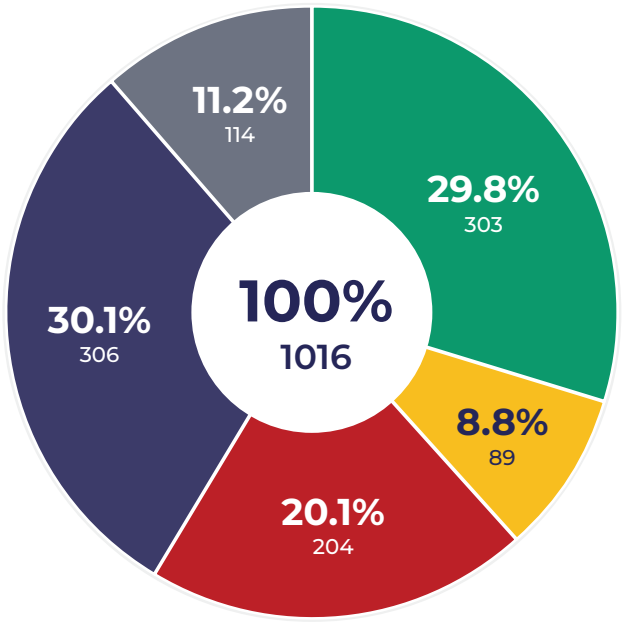
Figure 7 | High-Quality Curricula* Most Commonly Selected for Middle School Math by Districts



*** Of the districts that selected at least one high-quality, aligned middle school math product (see Fig. 6), this chart reflects the percentage of those districts that selected the curricula listed – not overall among all districts selecting any middle school math curricula.**
*** * Other (n = 21): 21.8%**

60% of districts have not selected any aligned curriculum for middle school math; this represents about 2.9 million students. Again in the middle school case, the majority of "not aligned" curricula are unrated, with a smaller number non-aligned or partially aligned (see *Figure 8* for a detailed breakdown of district selection by quality rating).

Figure 8 | Breakdown of Product Ratings in Middle School Math Curricula Selected by Districts



- 100% - Total curriculum selections by districts for middle school core math (1016)
- 29.8% - High-quality, aligned product selections (303)
- 8.8% - Partially aligned product selections (89)
- 20.1% - Non-aligned product selections (204)
- 30.1% - Unrated product selections (306)
- 11.2% - Selections of unknown products* (114)

* Represents middle school math curriculum selected by districts for which sufficient information to identify product quality was not publicly available.

Market Context

CEMD collected district-level curriculum data for this report. However, a district may actually select multiple core math curricula – setting out a vetted list rather than a single, definitive choice, and devolving final choice to the school level. Hence our data descriptor of "at least one" high-quality curriculum, which often denotes this more flexible district approach. In our sample, larger districts and charter networks were more likely than small districts to operate this way.

QUESTIONS TO CONSIDER

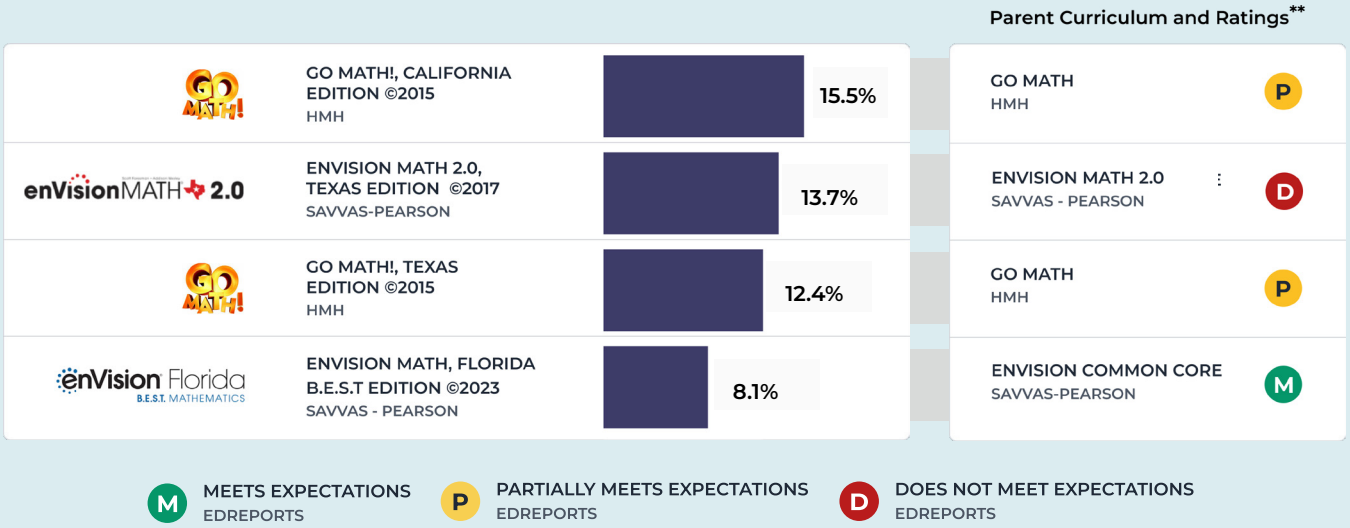
What are the advantages of this "menu of options" approach by districts? What are the possible disadvantages?

THE GRAY AREA

What about district-selected curriculum that EdReports hasn't rated?

Most of the "unrated" curricula in our dataset are state-specific versions of an otherwise rated curriculum (many state-specific curricula have not been rated by EdReports). *Figure 9* shows the unrated curricula that were selected most often in our elementary sample.

Figure 9 | Most Commonly Selected Unrated Curricula for Elementary School Math* by Districts

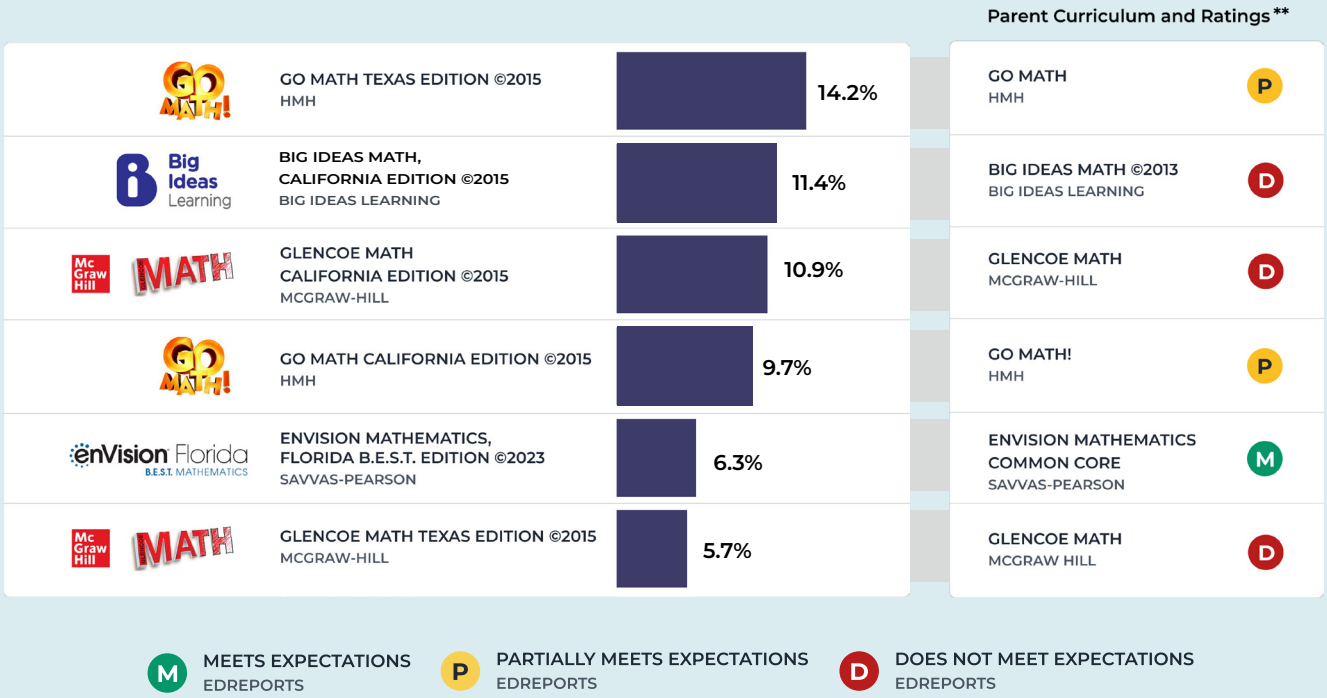


*** Of the districts that selected no rated elementary math curricula, this chart reflects the percentage of those districts that selected the curriculum listed — not the overall percentage among all districts selecting any elementary math curricula.**
*** Other (n = 39): 59.0%.**
Districts may have selected unknown products as well.

****We cannot assume that these unrated state-specific versions are of the same quality as their EdReports-rated parent versions.**

Figure 10 shows the unrated curricula that came up most often in our middle school sample.

Figure 10 | Most Commonly Selected Unrated Curricula for Middle School Math* by Districts



*** Of the districts that selected no rated middle school math curricula, this chart reflects the percentage of those districts that selected the curriculum listed -- not the overall percentage among all districts selecting any middle school math curricula.**
*** Other (n = 42): 50.2%.**
*** Districts may have selected unknown products as well.**

****We cannot assume that these unrated state-specific versions are of the same quality as their EdReports-rated parent versions.**

Again, can we assume that these state-specific versions are of the same quality as their parent version? That seems logical, but we didn't want to make this assumption – particularly in light of recent efforts by many states to assert greater control over curriculum. We see this as a potentially compelling line of inquiry both for quality arbiters like EdReports and for a market intelligence organization like CEMD as we monitor curriculum selection over time.

The Future of Quality

There are grounds for cautious optimism about the spread of high-quality math curriculum.

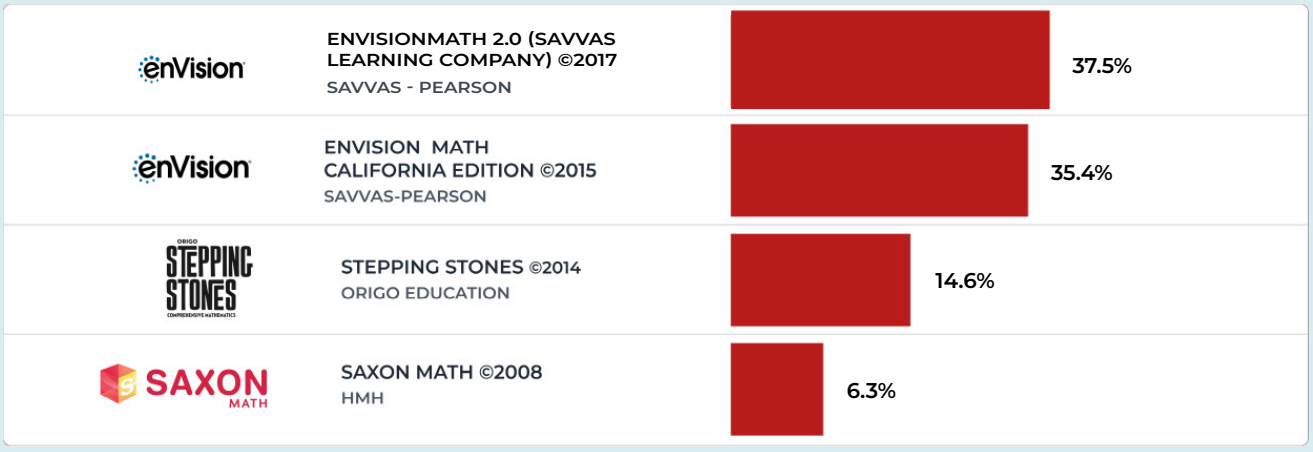
Of course, we'd like the majority of students and teachers to have access to high-quality math materials that are focused, coherent, and rigorous. Our data suggests that's not where we are. But in our view, this picture is significantly happier than the numbers might strike a casual observer.

First, consider the newness of this entire ecosystem. Common Core State Standards debuted in 2010, demanding profound shifts in math curriculum and instruction; EdReports launched in 2015. The fact that today, over a third of the districts in our sample have selected exclusively high-quality math materials for their youngest students suggests that we're getting somewhere as a system, and it's somewhere better.

A RED SUNSET ON THE HORIZON?

Several of the most commonly selected lower-quality math curricula are retiring or being revised.

Figure 11 | Most Commonly Selected Non-Aligned Curriculum for Elementary Math* by Districts



*** Of the districts in which non-aligned products represent the highest rated elementary math curriculum selected, this chart reflects the percentage of those districts that selected the curriculum listed – not the overall percentage among all districts selecting any elementary math curricula.**

*** These districts may have selected unknown and unrated products as well.**

As we can see, enVisionmath 2.0 (and the related California edition of this curriculum) was by far the most common low-quality choice for elementary school (and also a common choice for middle school). In 2020, Savvas updated this product with a high-quality version, which will likely be a big player in forthcoming district adoptions. This picture is similar in middle school: the most common non-aligned curriculum (Big Ideas Math) was improved in the more recent iteration, and now partially meets EdReports criteria.

It's also important to bear in mind that this data – as in any study of curriculum – is a snapshot of decisions made several years ago. District curriculum adoption tends to unfold in multi-year cycles, with many of those cycles recently rattled off track by the pandemic. We think this quality picture will look brighter in the coming years, as districts move into their next adoptions.

Why? Because encouragingly, the math market that awaits them offers higher-quality choices overall. For example, several of the most common lower-quality curricula that came up in our study are undergoing significant revisions (see further details on this shift in *A Red Sunset on the Horizon?*); and the market now features many newer, high-quality entrants as well.

So while there's much we still don't know about what will drive and influence the next round of district selection, we think it's fair to speculate that we're on the ledge of systemic movement towards higher-quality math curriculum overall.

Market Context

CEMD dedicated significant time and resources to tracking down data about all Impact Core districts' math curriculum selection. As we've mentioned, in quite a few cases we still couldn't get complete information. We find this to be notable data in itself.

QUESTIONS TO CONSIDER

What is the impact of this lack of transparency? How could greater curriculum transparency improve the market overall?

Our next report digs deeper into this market, examining the specific publishers and products that constitute it, as well as the important shifts that are in progress. Join us for this finer-grain look at the curricula that shape our students' daily learning experiences in math.

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