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ACCESS TO QUALIFIED MATH TEACHERS FOR ALL STUDENTS

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Access to qualified math teachers for all students is a foundational element of student achievement and instructional opportunity. As concerns about students' math performance persist, it is increasingly important to understand the current landscape of access to qualified math educators. This issue brief outlines three necessary but not sufficient conditions for ensuring such access: **teacher availability, instructional expertise, and the use of high-quality instructional materials.** These conditions serve as the lens through which we examine current challenges and available strategies to strengthen the math teacher workforce, deepen instructional capacity, and ensure the availability of coherent, standards-aligned math curricula.

CONTEXT AND BACKGROUND

Concerns about the quality of math education in the United States are longstanding. For decades, researchers have been advocating for improvements in curricular content, teacher preparation, instructional practices, materials, assessments, and policy. As the COVID-19 pandemic exacerbated existing disparities and contributed to declines in student achievement, news reports highlighted a potential national teacher shortage, citing increased local vacancy and attrition rates.[1] Public concern over staffing intensified at the start of the 2022–23 school year, reigniting efforts to strengthen and sustain the national teacher workforce.[2] The release of the 2024 National Assessment of Educational Progress (NAEP) results only reinforced these concerns. While math performance improved modestly after a return to in-person learning, the latest results indicated that average scores in Grades 4 and 8 remained below pre-pandemic levels: Only 39% of fourth graders and 28% of eighth graders scored at or above the NAEP "Proficient" levels.

1. ERS, 2025; Loerhke, 2024.
2. Will, 2024.

FRAMING THE ACCESS QUESTION

In response to these concerns, we convened a panel of experts to identify the most pressing priorities in math education. The panel converged on a deceptively simple but critically important question: **Do all students have access to qualified math teachers who can deliver effective math instruction?** With input from several math researchers, we identified three essential—but not sufficient—conditions that must be met to provide such access. Following this framework, we then reviewed what is currently known about each condition, highlighting challenges and examples of strategies used to address them. This issue brief summarizes key findings and considerations drawn from the detailed technical report, available under "Resources," along with several supplementary data dashboards.

THREE ACCESS CONDITIONS

A detailed exploration of the access question reveals complex considerations around how experts define a "qualified" math teacher, what constitutes "effective" instruction, and whether, when we say "all students," we are including students across the achievement spectrum, those with disabilities, and learners from diverse socioeconomic, linguistic, and cultural backgrounds. Rather than attempt a comprehensive review of decades of research, this issue brief offers a focused assessment of the necessary but not sufficient conditions that must be in place for all students to have access to qualified math teachers.

- **Condition 1: There are enough qualified math teachers to fill open positions.** Student learning in math cannot be expected to improve if too many teaching positions remain vacant or are filled by individuals without appropriate certification or content knowledge. Adequate staffing is the first step in ensuring that students have consistent access to formal math instruction delivered by professionals trained in the subject.
- **Condition 2: Math teachers demonstrate the knowledge, skills, and practices to deliver effective instruction.** Simply filling open math positions is not enough. Teachers must be equipped with evidence-based knowledge and skills, as well as culturally and linguistically responsive practices that promote understanding across diverse learners. Ensuring this level of instructional capacity requires high-quality teacher preparation programs, ongoing professional development, and clarity on the specific knowledge, skills, and practices most critical to student learning in math, drawn from rigorous research.
- **Condition 3: Math teachers have access to high-quality instructional materials aligned to standards.** Even well-prepared math teachers must utilize high-quality materials to perform their jobs effectively. Access to focused, coherent math curricula—along with adequate training on their implementation—is essential for effective instruction. Without such materials, teachers' efforts may be undermined, limiting their ability to assist students in meeting rigorous math standards.

Together, these three conditions establish the foundation for meaningful access to qualified math teachers. They are neither exhaustive nor individually sufficient, but each is essential for improving students' learning opportunities and long-term success in mathematics.

CONDITION 1: THERE ARE ENOUGH QUALIFIED MATH TEACHERS TO FILL OPEN POSITIONS

Ensuring students have access to qualified math teachers begins with addressing the most basic prerequisite: There must be enough certified teachers available to fill all open math teaching positions. However, persistent shortages[3] in the math teacher workforce present a serious barrier to fulfilling this condition, particularly in high-needs schools and communities.

Challenges

Limited Workforce Data. Understanding the scope and distribution of teacher shortages requires high-quality data. Yet, states and districts differ significantly in the types of teacher workforce information they collect and report. This lack of consistency can severely hinder policymakers and education leaders from developing targeted solutions based on accurate and comprehensive insights**.** Without consistent state-level and national reporting, it is difficult to fully assess where shortages are most severe and which students are most affected. Based on a review of state websites by the National Council on Teacher Quality and CRPE's review of each state's public school report card systems, available data are limited:

- **Only 16 states (32%) publicly report major components of their teacher workforce data on their state website.**
- **Just 12% of states disaggregate vacancy data by subject area.[4]**
- **Only two states (Nevada and South Carolina) include teacher vacancy data in their school report cards; nine states (18%) provide public state-level data on teacher vacancies elsewhere on their state website.**

3. e.g., Nguyen, Lam & Bruno, 2022. Nguyen and colleagues operate a website that provides updated data.

4. National Council on Teacher Quality, 2022.

General Shortages and Vacancy Rates. Despite variations in reporting, existing data indicate widespread shortages in the teacher workforce. These shortages are reflected in both the number of unfilled positions and the prevalence of underqualified teachers in classrooms. Based on survey data[5] collected by the National Center for Education Statistics (NCES), 34% of public school leaders reported feeling understaffed in the area of math for the 2024-25 school year. Such gaps limit students' access to consistent, effective instruction in mathematics. Based on available estimates for the 2024–25 school year, we can note the following:[6]

- **Between 365,000 and 400,000 teachers are not fully certified for their positions, which accounts for roughly 11–12% of the national teaching workforce.**
- **There are at least 49,000 unfilled teaching positions nationwide, with states such as North Carolina, Florida, Illinois, and Virginia reporting over 3,000 vacancies each.**
- **When measured by vacancies per 10,000 students, Mississippi leads with 62 vacancies per 10,000 students, followed by West Virginia, Maine, North Dakota, and North Carolina—all above 30 per 10,000.**

Inequitable Distribution of Math Shortages. The shortage of math teachers does not affect all schools equally. Schools in high-poverty neighborhoods and those predominantly serving students of color report significantly higher vacancy rates. These disparities further entrench opportunity gaps in mathematics learning. Additional data from the School Pulse Panel indicated the following:

- **As of March 2024, 36% of surveyed public schools reported one or more math teacher vacancies.**
- **The percentages rise to 39% in schools serving higher-poverty neighborhoods and 44% in schools serving a majority of students of color.**
- **As of October 2024, school leaders who felt the most understaffed in the area of math came from high schools, particularly those located in the South, as well as more urban areas and large schools with 1,000 or more students.**

Teacher Turnover and Pipeline Issues. Beyond vacancies, the profession faces ongoing challenges with retention and recruitment. Teacher turnover remains costly and disruptive, while declining enrollment and completion rates in teacher preparation programs (TPPs) raise concerns about the future supply of teachers.

5. NCES, 2025.

6. Teacher Shortages in the United States, 2025.

- **Teacher turnover for math teachers was estimated at 8.1% in 2021–22, close to the overall national average of 7.9%, but still concerning.[7]**
- **The estimated cost of replacing a teacher is approximately $25,000.[8]**
- **Enrollment and completion in TPPs have declined significantly[9]:**
  - **TPP completions decreased by 27% compared to over a decade ago.**
  - **The number of graduates prepared to teach math declined by 36% between 2012–13 and 2019–20, with a 45% decline in traditional TPPs alone, which enroll about 70% of all students pursuing a teaching degree.**

Strategy Examples

Alternative TPPs. Alternative routes into teaching, particularly in high-need subjects like mathematics, have become increasingly important. These programs offer flexible pathways for individuals who hold a degree in another field to gain certification while teaching. Alternative programs not affiliated with institutes of higher education (alternative non-IHEs) have experienced a **117% increase in enrollment** since the 2012–13 academic year. These programs are particularly prominent in several states, with Texas leading the way, and have helped address shortages in urban and rural districts.[10] Rigorous research yields mixed results on the long-term impact of alternative programs on outcomes such as teacher retention and student achievement. What cannot be denied is that these alternative programs have opened the doors to large numbers of prospective teachers and remain one of the most effective means of increasing the number of teachers available for students.

Financial Incentives. To attract teachers to hard-to-staff schools and subjects, many states and districts offer financial incentives, including signing bonuses, loan forgiveness, tuition reimbursement, and housing assistance. These incentives have demonstrated effectiveness in short-term recruitment; however, evidence regarding their long-term impact on retention is limited.[11] Sustained financial incentives—including differentiated pay and performance-based rewards—are emerging as more effective solutions for retaining experienced teachers in the classroom, particularly in high-need areas.[12]

7. Taie & Lewis, 2023.
8. See the interactive Learning Policy Institute's turnover cost calculator.
9. U.S. Department of Education, 2023.
10. King & Yin, 2022.
11. e.g., See et al., 2020.
12. Nguyen, Angllum & Crouch, 2023.

Visa Exchange Programs. To address urgent staffing needs, some states rely on international teachers through the **J-1 Exchange Visitor Program**, which brought over **6,700 teachers** to U.S. schools in 2023.[13] In states like North Carolina and Florida, J-1 teachers accounted for more than **17%** of the teaching positions filled that year. These programs help alleviate immediate shortages but raise concerns about sustainability, training alignment, and long-term impacts on school communities. Additionally, oversight and transparency regarding the use of these programs vary widely.

Apprenticeships and Career Pathways. Some states are piloting **teacher apprenticeship programs** that provide structured, paid pathways from support roles (such as paraprofessionals) to certified teaching positions. These programs aim to eliminate financial and logistical barriers for individuals who might otherwise be excluded from traditional preparation routes. In some instances, career and technical education tracks beginning in high school offer students early exposure to teaching careers and a clear progression from classroom experience to licensure. These models show promise in diversifying and expanding the teacher pipeline but require significant coordination among districts, institutions, and states.

GENERAL CONSIDERATIONS

1. **Standardize Data Collection Nationwide.** Develop and implement centralized protocols for collecting and reporting teacher workforce data—including subject-area vacancies, certification levels, and attrition—at state and national levels.
2. **Invest in Research on Preparation Pathways.** Evaluate the long-term outcomes of different TPP models, particularly new alternative programs that offer immediate classroom employment.
3. **Sustain Financial Incentives Thoughtfully.** Prioritize long-term, structured financial incentives, such as salary supplements and career-ladder opportunities, to promote teacher retention.

13. See BridgeUSA, 2025.

CONDITION 2: MATH TEACHERS DEMONSTRATE THE KNOWLEDGE, SKILLS, AND PRACTICES TO DELIVER EFFECTIVE INSTRUCTION

Ensuring that students receive effective math instruction requires more than simply filling positions with certified teachers. It requires teachers to demonstrate a deep understanding of math content and the pedagogical expertise to teach it effectively. While certification is important, it is an imperfect proxy for qualification. Therefore, robust teacher preparation, ongoing professional development, and coherent standards for instructional quality are essential to equip teachers with the tools they need to support all learners.

Challenges

Consensus and Debate on Effective Math Teaching. Clarity about which mathematical knowledge, skills, and practices are most effective for improving the math achievement of diverse learners across the grade span is essential for informing teacher preparation, practice, and policy. The last consensus panel, created by a presidential executive order to review the best available scientific evidence to inform mathematics education, published its final report in 2008. This report was based on a review of over 16,000 research publications and policy reports, as well as input from hundreds of experts, organizations, and mathematics teachers. Nearly two decades have passed since then, and an updated consensus panel that incorporates newly available research on the teaching and learning of math, parallel findings from the developmental and cognitive sciences regarding how students learn, and the use of technological advancements, such as artificial intelligence, is urgently needed. Teachers depend on recommendations from national organizations to summarize available research and inform their daily teaching practices. For example, the National Council of Teachers of Mathematics provides numerous resources offering practitioners research-based recommendations for teaching standards and practices. However, in the latest iteration of the "math wars," a group of researchers has questioned the science behind certain endorsed math practices, challenging prevalent recommendations such as teaching conceptual understanding before procedural fluency and the importance of engaging students in productive struggle.

- **Research indicates that many U.S. teachers have gaps in mathematical understanding, particularly in areas such as fractions and proportional reasoning, and that stronger preparation is needed to enhance conceptual knowledge. This is especially true when U.S. teachers are compared to teachers in countries with high-performing students on international assessments, such as TIMSS (Trends in International Mathematics and Science Study) and PISA (Programme for International Student Assessment).**[14]

14. See Darling-Hammond, 2000; Stevenson, Chen & Lee, 1993, Ginsburg et al., 2005; Ma, 1999; Schmidt et al., 2007; Ball & Bass, 2000.

- **The impact of high-quality math instruction and intervention is clear. Instruction based on research evidence derived from a body of clinical and school-based studies can change the trajectories of student outcomes over time, even within a single school year.[15] Researchers further estimate that differences in teachers' instruction account for 12–14% of total differences in students' math achievement gains in a given school year.[16] Over time, this impact can accumulate,[17] underscoring the importance of ensuring that all students have access to qualified math teachers who use evidence-based math practices.**
- **Several studies indicate that more work is needed to overcome the research-to-practice gap, as math teachers continue to implement instructional practices that are either disproven or lack sufficient research to support their use to the same extent or more than evidence-based practices.[18]**
- **With the last consensus panel dating back nearly two decades, current debates are too often not informed by recent rigorous research and fail to acknowledge the areas of consensus and disagreement that exist.**

Inconsistent Preparation Across Pathways. Teacher preparation requirements vary widely by state and certification pathway. Traditional teacher preparation programs may provide limited coursework in mathematics, especially for elementary educators. Alternative certification programs also vary in rigor and focus, raising questions about how well-prepared their graduates are to teach complex mathematical concepts.

- **Many elementary teachers receive minimal math-specific training, yet are responsible for teaching foundational math concepts.**
- **Certification content and rigor vary across states, resulting in uneven levels of teacher preparedness.**

Nonspecific Teacher Evaluation Systems. Current systems for evaluating teacher effectiveness include multiple measures, including teacher-level observational measures, value-added models (VAMs), student surveys, and/or student learning objectives (SLOs). Available data indicate that observational measures are used in the majority of states (71%), followed by SLOs (55%), VAMs (29%), and student surveys (27%).[19] However, observational measures often rely on a general teaching framework rather than content-specific expertise. As a result, evaluations may fail to capture the full range of a teacher's ability to deliver high-quality mathematics instruction.

15. Clarke et al., 2016; Fuchs et al., 2014.
16. Gordon et al., 2006.
17. Rivkin, Hanushek & Kain, 2005; Sanders & Rivers, 1996.
18. Hott et al., 2019; Peltier et al., 2021; van Dijk & Lane, 2020.
19. Close et al., 2020.

- **Most popular teacher observation frameworks are not designed to assess math-specific knowledge, skills, and practices.**
- **Besides determining annual performance levels, the data collected through teacher evaluation systems is rarely used to drive or customize professional development.**

Strategy Examples

Resources for Effective Math Instruction. Professional organizations and their experts have provided research-based standards and practice recommendations for the effective teaching and learning of mathematics. The National Council of Teachers of Mathematics (NCTM), for example, offers a range of resources and recommendations, including books, professional development opportunities, and conferences. These types of offerings can help math teachers learn more about important knowledge and skills, as well as the instructional practices that support diverse learners. However, the extent to which some of these resources and recommendations are sufficiently grounded in research, such as the 2024 position statement on teaching mathematics to students with disabilities, by NCTM and the Council for Exceptional Children, is currently under debate.

Professional Development and Coaching. The professional development of in-service math teachers serves as the primary approach for improving their knowledge, skills, and practices. Over the past two decades, research has significantly advanced our understanding of the most effective elements and methods of professional development. Traditional professional development workshops often fail to lead to the intended transfer of knowledge and skills in the classroom. Core components associated with improved teacher and student outcomes include:[20] (a) specific content focus (focus on math teaching strategies for math teachers); (b) active learning (novice teachers observing experts or being observed; interactive feedback); (c) coherence (messaging that is consistent across different channels); (d) collective participation (among teachers from the same school, grade, or department); (e) duration (professional learning that is ongoing and iterative); and (f) concrete curricular materials (rather than a focus on general principles). One training modality that has led to measurable improvements in teacher and student outcomes[21] is instructional coaching, which utilizes a coach to support individual teachers through ongoing job-embedded professional development. Instructional coaches are estimated to support

20. See Desimone, 2009; Hill & Papay, 2022.

21. See Kraft et al., 2018; Hunter & Redding, 2023; Donaldson & Johnson, 2011.

teachers in nearly half of U.S. schools. Rigorous research studies focused on math have shown that coaches can positively affect elementary students' mathematics achievement, particularly after coaches receive their own extensive professional development,[22] and that planning discussions focused on content, pedagogy, and student learning can enhance teachers' ability to maintain the cognitive demand of high-level mathematics tasks.

GENERAL CONSIDERATIONS

1. **Create a New National Advisory Panel.** An updated consensus on the best available scientific evidence for the teaching and learning of mathematics is needed to inform teacher preparation, practice, and policy based on relevant progress over the last two decades. The panel should consider progress in mathematics research and advancements in related fields, such as the developmental sciences and technology.
2. **Improve Data Systems.** Collect and analyze data on the effectiveness of various teacher preparation pathways. Disaggregate results by subject area and grade band to better understand which programs produce effective math teachers, considering a range of outcome measures.
3. **Identify and Scale Effective Practices.** Utilize statewide data to identify mathematics teachers who are associated with improvements in student math achievement across multiple assessment cycles. Analyze contributors to successful instruction (e.g., preparation program, degree field, completed professional development opportunities) to inform policy and practice decisions.
4. **Implement Math Content Assessments for Licensure.** Consider using mathematics content assessments to inform licensure decisions and individualized in-service professional development plans.
5. **Provide Statewide, Job-Embedded Training.** Develop professional learning systems that incorporate coaching, mentoring, and training aligned with state standards and the needs of students. Create structured learning opportunities to deepen teachers' understanding of math content and pedagogy. Such investments enable teachers to stay current with research-based practices and promote instructional excellence across all schools within a given state.

22. Campbell & Malkus, 2011.

CONDITION 3: MATH TEACHERS HAVE ACCESS TO HIGH-QUALITY INSTRUCTIONAL MATERIALS ALIGNED TO STANDARDS

Even an experienced and qualified teacher may struggle to meet the needs of students without access to high-quality instructional materials. The standards themselves do not dictate the content of daily lessons; they merely provide goalposts for learning. Instructional materials serve as a bridge between state standards and classroom instruction, guiding teachers as they plan and implement their lessons. The content of instructional materials, particularly the scope and sequencing of topics, does affect how teachers teach their students.[23]

While there are few rigorously designed studies comparing the effectiveness of math curricula, the existing research does indicate that materials can make a difference in student achievement.[24] These achievement effects can even persist into the next school year, and they are larger among students in low-income schools. With reliable data on the quality of different instructional materials, educational agencies can choose a more effective set of materials at little to no additional cost.[25]

Challenges

Lack of Consensus on Scope and Sequence. The availability of effective, high-quality materials is hindered by a lack of consensus on the scope and sequence of math topics that students should learn across grades. While experts largely agree on broad topics (e.g., addition should precede subtraction, multiplication, and division; whole numbers should be learned before fractions), there is less agreement over the specific content and methods of instruction. This means that students using different sets of instructional materials may be exposed to the same math concepts at different times and even in different grades. These differences become apparent when students transition between states and encounter a fragmented learning progression, or when standardized tests like the NAEP highlight specific content areas in which students are struggling.

23. Opfer, Kaufman & Thompson, 2016.

24. Several rigorous experimental and quasi-experimental designs have shown that choosing one math curriculum over another can be associated with differences in student achievement (Agodini & Harris, 2010; Bhatt & Koedel, 2012; Bhatt, Koedel, & Lehmann, 2013; Polikoff, 2017).

25. Boser, Chingos & Straus, 2015.

Publisher Influence on the Adoption Process. States with the largest populations of students (e.g., California, Texas, Florida) represent the largest markets for instructional materials, so publishers make a concerted effort to align their materials to these states' standards. The content of nationally available curriculum materials can be recycled from materials written specifically for these states and their standards, which becomes problematic because the complexity, scope, and sequence of math standards vary widely between states. Partisan interest groups also have a significant influence on the materials adopted in certain states, such as Florida and Texas. For example, book bans in these and other states have resulted in references to concepts like gender, sexual identity, and climate change being removed from the instructional materials entirely. In a recent math textbook adoption year, Florida rejected 54 out of 132 submitted textbooks due to the inclusion of perceived references to a wide range of topics, including critical race theory, social-emotional learning, and the Common Core.

Questionable Alignment to Standards. Publishers typically aim to produce materials "aligned" with new standards as quickly as possible, which does not allow sufficient time for a meaningful overhaul. Researchers analyzing alignment found that the earliest editions of the most popular Common Core math textbooks were at most only 28% to 40% aligned with the content and rigor of the new standards. Even several years and editions later, alignment ranged from 36% to 60%, with an average of 51%.[26] In an analysis of Common Core–aligned math materials adopted in California, these researchers found that 40% to 64% of the content in the materials was extraneous to the standards for that grade level. Teachers and district leaders also feel that publisher materials are poorly aligned and inadequate in supporting teachers as they implement new standards. When teachers perceive instructional materials as lacking, they must use valuable time searching for suitable alternatives. In a recent survey, a majority of teachers reported spending at least a few hours each week searching for additional instructional materials. In one recent national survey, over half of the teachers reported using instructional materials they create themselves because they find the quality, alignment, or rigor of their school's adopted materials insufficient.[27]

Time and Resource Constraints. In most states, the actual adoption decision is up to local education agencies (schools and districts) through a process that typically involves an evaluation cycle with teacher input and the piloting of new materials. This effort demands a significant investment of resources that can divert attention from classroom instruction. Interviews with teachers and school leaders reveal that they lack dependable and impartial information about the quality, alignment, and usability of materials being evaluated.[28]

26. Polikoff et al., 2021.

27. Doan, et al., 2022.

28. Polikoff et al., 2020.

Strategy Examples

Identify a Clear Scope and Sequence for Math Topics. The adoption of the Common Core State Standards was the closest we have come to achieving consistency in curriculum expectations for all students. Beginning in the early 2010s, many states chose to adopt the Common Core Standards or a variation of them. Theoretically, widespread adoption of rigorous standards should provide a universal measure for publishers to align their materials, fostering consistency and coherence in the quality of resources used across the country.

Educational Technology. Educational software, often featuring adaptive learning, immediate feedback, and AI assistance, can provide a better option for meeting the individual needs of students compared to traditional curriculum materials. Many of these resources are open-access, meaning they are available to anyone with an internet connection and are formatted for use on mobile devices. Recently, 22% of teachers surveyed reported using open educational resources as part of their instructional materials.[29] Because of this disruption to the traditional textbook industry, publishers are now incorporating more features such as adaptive assessments and interactive lessons into their instructional materials as they attempt to compete with independent curriculum developers.

Use Independent Evaluations. Currently, we are aware of few resources for districts wanting an impartial evaluation of instructional materials. Perhaps the best known is EdReports, which offers free, independent evaluations based on usability, rigor, and adherence to standards. The What Works Clearinghouse compiles data on research studies of instructional materials. The IMET (Instructional Materials Evaluation Tool) toolkit is a useful way of evaluating biases in instructional materials. The Council of Chief State School Officers (CCSSO) is a reputable resource that presents a roadmap and links for states to consult when evaluating curriculum materials. The CCSSO also offers professional development resources that have been vetted to align with the adoption of new standards and materials.

State Guidance and Incentives. Informational toolkits can reduce the burden on local education agencies, and financial incentives can encourage districts to adopt high-quality materials. Evidence for ESSA is a website that curates a database on programs with evidence of effectiveness, and the Professional Learning Partner Guide provides a searchable database of vetted professional development that supports the implementation of high-quality instructional materials. The CCSSO identifies several states that provide a rubric and tools for their local education agencies that other states may use for guidance. For example, Massachusetts launched the Curriculum Matters initiative, emphasizing high-quality instructional materials and aligned professional development, with a focus on ratings provided by teachers who actually use the materials.

29. Doan, et al., 2022.

GENERAL CONSIDERATIONS

1. **Provide Recommendations.** State education agencies should offer a list of recommended high-quality instructional materials for each subject and encourage or incentivize districts and schools to adopt materials solely from that list.
2. **Provide Ample Time for Selection.** Provide local education agencies sufficient time to evaluate instructional materials before committing to a new adoption. Provide resources for districts to enact a transition period with the option of using an interim set of instructional materials.
3. **Align Professional Development to High-Quality Instructional Materials.** Provide teachers with ongoing, iterative professional development that instructs them on how to align new materials and instructional practices with adopted standards.

CONCLUSION

A core value of our education system is that our nation's children, regardless of who they are, where they are from, or where they live, deserve access to a free public education that meets their needs. Access to qualified teachers who can deliver effective instruction for all students is key to fulfilling that aspiration. With contributions from renowned experts, we have provided a landscape analysis of the three necessary access conditions with a focus on mathematics. We have highlighted key challenges and several strategies currently employed to address them. We have examined available information sequentially to answer the extent to which mathematics teachers are (1) available to fill open teaching positions, (2) possess important knowledge, skills, and practices, and (3) have high-quality instructional materials available for use. While each condition deserves its own report to be adequately addressed, we wanted to show the importance of collectively addressing all three conditions.

While the much-discussed results of the 2024 NAEP assessments showed the instructional sensitivity of students' mathematics achievement, they also indicated a growing achievement gap between lower- and higher-performing students. Providing all students access to qualified mathematics teachers remains a critical policy lever for improving student performance. When the three access conditions are not met, student achievement may suffer; however, when they are met, there is potential for all students to excel mathematically. The three conditions discussed in this paper are fraught with challenges, some of which we have attempted to highlight. Naturally, there are other challenges we did not cover, and disentangling the various causes and effects in education is not straightforward.

Since the initial preparation of this report in the Fall of 2024, significant events and changes have taken place in the U.S., with lasting impacts that directly affect the conditions mentioned above. Without reiterating our various challenges and recommendations, the general answer to the access question is that we currently lack enough fully certified mathematics teachers for the various open positions, many of which are in large urban schools located in lower-income neighborhoods, serving predominantly minority students. Strengthening the teacher pipeline remains the primary strategy for increasing the supply of future teachers, with alternative pathways into teaching representing a promising avenue for achieving this goal. Ensuring that the research community provides school leaders and professional organizations with guidance on the consensus for critical knowledge, skills, and practices to enhance the teaching and learning of mathematics remains essential for bridging the research-to-practice gap and putting current debates into perspective. Even decisions regarding the creation and selection of high-quality materials at both the state and local levels will benefit from independent guidance and support through evidence-based recommendations provided by the research community and shared by professional organizations.

The common denominators among all these challenges and strategies are accurate data and rigorous research. Without the systematic collection of reliable data on our nation's schools, we are flying blind with nearly 50 million children onboard, unable to identify growing problems and emerging solutions efficiently. We need leadership at the local, state, and national levels of our education system to exert a coordinated effort to gather the necessary data for understanding the state of the education system. We also need continued investment in independent, publicly funded education research, or we risk losing our ability to understand what works in education, as well as the capacity to develop solutions and innovations. Aside from being a valuable return on investment, education research is essential to continuing the hard-earned progress we have made in educating one of the world's most diverse student populations.

REFERENCES

Agodini, Roberto, and Barbara Harris. 2010. "An experimental evaluation of four elementary school math curricula." *Journal of Research on Educational Effectiveness* 3, no. 3: 199–253. https://doi.org/10.1080/19345741003770693.

Ball, Deborah L., and Hyman Bass. 2000. "Interweaving content and pedagogy in teaching and learning to teach: Knowing and using mathematics." *Multiple Perspectives on the Teaching and Learning of Mathematics* 4, no. 1: 83–104.

Bhatt, Rachana, and Cory Koedel. 2012. "Large-scale evaluations of curricular effectiveness: The case of elementary mathematics in Indiana." *Educational Evaluation and Policy Analysis* 34, no. 4: 391–412. https://doi.org/10.3102/0162373712440040.

Bhatt, Rachana, Cory Koedel, and Douglas Lehmann. 2013. "Is curriculum quality uniform? Evidence from Florida." *Economics of Education Review* 34: 107–121. https://doi.org/10.1016/j.econedurev.2013.01.014.

Boser, Ulrich, Matthew Chingos, and Chelsea Straus. 2015. *The hidden value of curriculum reform*. Washington, D.C.: Center for American Progress.

BridgeUSA. 2025. "Facts and Figures." Accessed June 3, 2025. https://j1visa.state.gov/basics/facts-and-figures/#participants.

Campbell, Patricia F., and Nathaniel N. Malkus. 2011. "The impact of elementary mathematics coaches on student achievement." *The Elementary School Journal 111*, no. 3: 430–454. https://doi.org/10.1086/657654.

Clarke, Ben, Christian T. Doabler, Keith Smolkowski, Scott K. Baker, Hank Fien, and Mari Strand Cary. 2016. "Examining the efficacy of a Tier 2 kindergarten mathematics intervention." *Journal of Learning Disabilities* 49, no. 2: 152–165. https://doi.org/10.1177/0022219414538514.

Close, K., Amrein-Beardsley, A., & Collins, C. (2020). Putting teacher evaluation systems on the map: An overview of states' teacher evaluation systems post–Every Student Succeeds Act. Education Policy Analysis Archives, 28(58). https://doi.org/10.14507/epaa.28.5252

Darling-Hammond, Linda. 2000. "Teacher quality and student achievement." *Education Policy Analysis Archives* 8, no. 1. https://doi.org/10.14507/epaa.v8n1.2000.

Desimone, Laura M. 2009. "Improving impact studies of teachers' professional development: Toward better conceptualizations and measures." *Educational Researcher* 38, no. 3: 181–199. https://doi.org/10.3102/0013189X08331140.

Doan, Sy, Joshua Eagan, David Grant, Julia H. Kaufman, and Claude Messan Setodji. 2022. "American instructional resources surveys." RAND Corporation.

Donaldson, Morgaen L., and Susan Moore Johnson. 2011. "Teach for America teachers: How long do they teach? Why do they leave?." Phi Delta Kappan 93, no. 2: 47-51. https://doi.org/10.1177/003172171109300211.

ERS. 2025. Examining school-level teacher turnover trends. May 1. Author. https://www.erstrategies.org/tap/teacher-turnover-trends-analysis/?utm_source=chatgpt.com.

Fuchs, Lynn S., Sarah R. Powell, Paul T. Cirino, Robin F. Schumacher, Sarah Marrin, Carol L. Hamlett, Douglas Fuchs, Donald L. Compton, and Paul C. Changas. 2014. "Does calculation or word-problem instruction provide a stronger route to pre-algebraic knowledge?" *Journal of Educational Psychology* 106, no. 4: 990–1006. https://doi.org/10.1037/a0036793.

Ginsburg, Alan, Geneise Cooke, Steve Leinwand, Jay Noell, and Elizabeth Pollock. 2005. *Reassessing US international mathematics performance: New findings from the 2003 TIMSS and PISA*. Arlington, VA: American Institutes for Research.

Gordon, Robert, Thomas J. Kane, and Douglas O. Staiger. 2006. "Identifying effective teachers using performance on the job." *The Hamilton Project Policy Brief No. 2006-01:* 189-226.
Hill, Heather C., and John P. Papay. 2022. *Building better PL: How to strengthen teacher learning*. Providence, RI: Research Partnership for Professional Learning: 1–19.

Hott, Brittany L., Rebecca-Anne Dibbs, Gil Naizer, Lesli Raymond, Campbell C. Reid, and Amelia Martin. 2019. "Practitioner perceptions of algebra strategy and intervention use to support students with mathematics difficulty or disability in rural Texas." *Rural Special Education Quarterly* 38, no. 1: 3–14. https://doi.org/10.1177/0363546519830644.

Hunter, Seth B., and Christopher Redding. 2023. "Examining the presence and equitable distribution of instructional coaching programs and coaches' teaching expertise across Tennessee schools." Educational Policy 37, no. 4: 1151-1178. https://doi.org/10.1177/08959048221087201.

King, Jacqueline E., and Jessica Yin. 2022. *The alternative teacher certification sector outside higher education. 2022 update*. Washington, D.C.: Center for American Progress.

Kraft, Matthew A., David Blazar, and Dylan Hogan. 2018. "The effect of teacher coaching on instruction and achievement: A meta-analysis of the causal evidence." Review of Educational Research 88, no. 4: 547-588. https://doi.org/10.3102/0034654318759268.

Loerhke, Janet. 2024. "Where are all the teachers? Breaking down America's teacher shortage crisis in 5 charts." USA Today, March. 19, 2024. https://www.usatoday.com/story/graphics/2024/03/19/teacher-shortage-crisis-explained/72958393007/.

Ma, Xin. 1999. "A meta-analysis of the relationship between anxiety toward mathematics and achievement in mathematics." *Journal for Research in Mathematics Education 30*, no. 5: 520–540. https://doi.org/10.2307/749772.

National Council on Teacher Quality. 2022. *Teacher supply & demand state data guide: A resource for leaders & advocates*. Washington, D.C.: Author.

NCES (National Center for Education Statistics). 2025. *School Pulse Panel: Surveying high-priority, education-related topics*. Washington, D.C.: Author. https://nces.ed.gov/surveys/spp/about.asp.

Nguyen, Tuan D., J. Cameron Anglum, and Michael Crouch. 2023. "The effects of school finance reforms on teacher salary and turnover: Evidence from national data." *AERA Open* 9. https://doi.org/10.1177/23328584231174447.

Nguyen, Tuan D., Chanh B. Lam, and Paul Bruno. 2022. "Is there a national teacher shortage? A systematic examination of reports of teacher shortages in the United States." EdWorkingPaper No. 22-631. Annenberg Institute for School Reform at Brown University.

Opfer, V. Darleen, Julia H. Kaufman, and Lindsey E. Thompson. 2016, *Implementation of K–12 state standards for mathematics and English language arts and literacy*. Santa Monica, CA: RAND Corporation.

Peltier, Marliese R., Elizabeth M. Bemiss, Courtney Shimek, Ann Van Wig, Laura J. Hopkins, Stephanie G. Davis, Roya Q. Scales, and W. David Scales. 2021. "Examining learning experiences designed to help teacher candidates bridge coursework and fieldwork." *Teaching and Teacher Education* 107: 103468. https://doi.org/10.1016/j.tate.2021.103468.

Polikoff, Morgan S. 2017. "Is Common Core 'working'? And where does Common Core research go from here?." *AERA Open* 3, no. 1.

Polikoff, Morgan S., Shauna E. Campbell, Sarah Rabovsky, Cory Koedel, Quynh Tien Le, Tenice Hardaway, and Hovanes Gasparian. 2020. "The formalized processes districts use to evaluate mathematics textbooks." *Journal of Curriculum Studies* 52, no. 4: 451–77. https://doi:10.1080/00220272.2020.1747116.

Polikoff, Morgan S., Sarah J. Rabovsky, Daniel Silver, and Rosalynn Lazar-Wolfe. 2021. "The equitable distribution of opportunity to learn in mathematics textbooks." *AERA Open* 7: https://doi.org/10.1177/23328584211065712.

Rivkin, Steven G., Eric A. Hanushek, and John F. Kain. 2005. "Teachers, schools, and academic achievement." *Econometrica* 73, no. 2: 417–458. https://doi.org/10.1111/j.1468-0262.2005.00584.

Sanders, William L., and June C. Rivers. 1996. "Cumulative and residual effects of teachers on future student academic achievement." Research paper, University of Tennessee.

Schmidt, William H., Maria Teresa Tatto, Kiril Bankov, Sigrid Blömeke, Tenoch Cedillo, Leland Cogan, and Shin Il Han. 2007. "The preparation gap: Teacher education for middle school mathematics in six countries." *MT21 Report* 32, no. 12: 53–85.

See, Beng Huat, Rebecca Morris, Stephen Gorard, and Nada El Soufi. 2020. "What works in attracting and retaining teachers in challenging schools and areas?" *Oxford Review of Education* 46, no. 6: 678–697. https://doi.org/10.1080/03054985.2020.1775566.

Stevenson, Harold W., Chuansheng Chen, and Shin-Ying Lee. 1993. "Mathematics achievement of Chinese, Japanese, and American children: Ten years later." *Science* 259, no. 5091: 53–58. https://doi.org/10.1126/science.8418494.

Taie, Soheyla, and Laurie Lewis. 2023. *Teacher attrition and mobility: Results from the 2021-22 Teacher Follow-Up Survey to the National Teacher and Principal Survey. First look. NCES 2024-039*. Washington, D.C.: National Center for Education Statistics.

Tan, Tiffany S., Ivett Arellano, and Susan Kemper Patrick. 2024. State teacher shortages 2024 update: Teaching positions left vacant or filled by teachers without full certification. Palo Alto, CA: Learning Policy Institute.

Teacher Shortages in the United States. 2025. Accessed June 3, 2025. https://www.teachershortages.com/.

U.S. Department of Education, Office of Postsecondary Education. 2023. Preparing and credentialing the nation's teachers: *The Secretary's 13th report on the teacher workforce.* Washington, D.C.

van Dijk, Wilhelmina, and Holly B. Lane. 2020. "The brain and the US education system: Perpetuation of neuromyths." *Exceptionality* 28, no. 1: 16–29. https://doi.org/10.1080/09362835.2018.1480954.

Will, Madeline. 2024. "What one record-setting teacher shortage can tell us about the profession." *Education Week*, March 6, 2024. https://www.edweek.org/teaching-learning/what-one-record-setting-teacher-shortage-can-tell-us-about-the-profession/2024/03.