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Fostering Mathematics Success in Elementary Grades

Mathematics is a crucial subject area—it not only opens doors to learning opportunity and professional pathways, but as noted by the National Council of Teachers of Mathematics (NCTM), it also helps people to understand and critique the world, and experience joy, wonder, and beauty. The Public Education Department (PED) introduces the New Mexico Math Framework using this lens from NCTM on the three primary purposes for learning mathematics in prekindergarten through 12th grade. Mathematical reasoning is an inherent human endeavor, and mathematical problem solving can be an authentic act of individual creativity. Broadening the purpose of mathematics education to empower students to understand the world through mathematics contributes to students developing a positive math identity, a critical component of math achievement, according to [NCTM](#).

Effective elementary math instruction is critical in a statewide vision for mathematics success. [Research](#) shows early mathematical thinking forms a foundation for future learning. Mathematics knowledge is also cumulative as the ability to master a new concept is dependent on mastering the concept that came before. [Research](#) shows children from low-income families usually have less exposure to math and demonstrate less extensive math knowledge than their peers from more affluent families, even as early as prekindergarten. Additionally, achievement gaps in secondary school can be traced back to elementary school. This is important considering the persistent achievement gaps in math identified in the consolidated *Martinez-Yazzie* lawsuit. According to the most recent statewide summative assessment results available:

- 15 percent of economically disadvantaged students are proficient in math, compared with 32 percent of non-disadvantaged students;
- 10 percent of English learners are proficient in math, compared with 28 percent of native English speakers; and
- 7 percent of special education students are proficient in math, compared with 28 percent of non-special education students.

New Mexico must address achievement gaps and overall student proficiency in mathematics in response to the *Martinez-Yazzie* lawsuit and to ensure all students are prepared for college, career, and civic life.

Key Takeaways

Early math instruction and early mathematical thinking are critical to forming a foundation for future learning.

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Elementary student proficiency rates in math remain low, with less than a third of students testing as proficient on summative assessments.

Page 2

The status quo of math education was declared “unacceptable” by a collective of mathematics professional organizations prior to the Covid-19 pandemic.

Page 3

Policymakers should consider investing in supports for both pre-service and in-service mathematics educators as a lever to improve student achievement.

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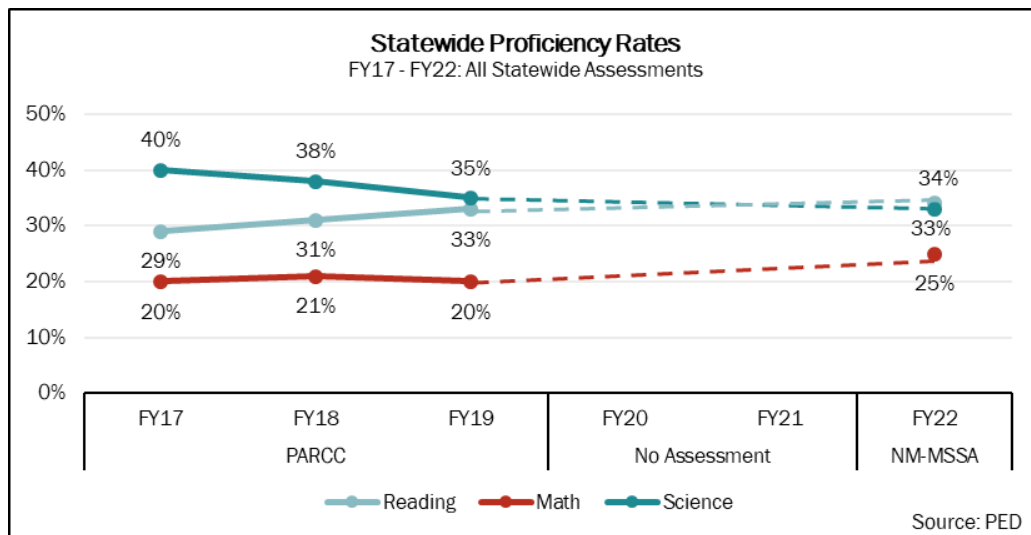
Math Achievement in Elementary School

New Mexico has a history of low math proficiency across all student groups. The court's findings in the *Martinez-Yazzie* consolidated lawsuit pointed to low proficiency rates in math—not just for at-risk students, but for all students—noting New Mexico children rank at the very bottom of the country for educational achievement.

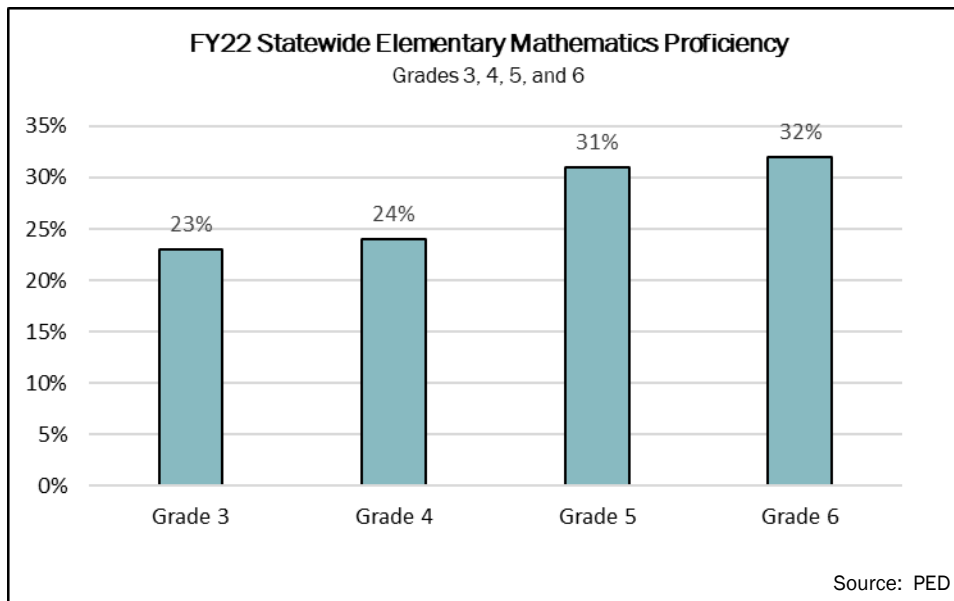
Assessment Scores

Across all grade levels in 2021-2022 the most recent data available from PED, 25 percent of students scored proficient on the New Mexico Measures of Student Success & Achievement (NM-MSSA) statewide summative math assessment, trailing student statewide proficiency in reading and science. The NM-MSSA is part of New Mexico's system of [required assessments](#) to meet state and [federal testing requirements](#), and is a relatively new assessment, as it was first administered in the 2021-2022 school year.

Due to the Covid-19 pandemic, the United States Department of Education temporarily waived federal testing requirements for states, resulting in a lack of New Mexico statewide summative assessment data for the 2019-2020 and 2020-2021 school years. As the 2021-2022 school year was the first year of statewide participation in standardized assessments since the beginning of the Covid-19 pandemic, and the first year of implementation of the NM-MSSA, PED has referred to 2021-2022 assessment results as a "[a new baseline.](#)" While the results of the 2021-2022 NM-MSSA assessment are not perfectly comparable to PARCC, the statewide summative assessment administered before the Covid-19 pandemic, it is clear student proficiency in math overall remains low year over year, as shown by the graph below.



Elementary Statewide Summative Assessment Scores. Elementary student proficiency rates in math also remain low, with less than a third of students scoring proficient on NM-MSSA. As shown by the graph below, proficiency rates in math rise as elementary school progresses, peaking in sixth grade. Sixth grade proficiency scores are included in this analysis as schools are structured differently across New Mexico, and some elementary schools include sixth grade students. Additionally, data shows sixth grade appears to be an important pivot point in math, with proficiency rates declining as secondary school progresses.



National Assessment of Educational Progress. New Mexico is not alone in its focus to improve student proficiency in mathematics in the wake of the Covid-19 pandemic, as the National Assessment of Educational Progress (NAEP) shows student proficiency in math dipped nationwide in 2022. In 2019, NAEP scores in fourth grade math—the only elementary school grade tested by NAEP—showed only 35 percent of students nationwide tested as proficient in math, compared with 41 percent of students proficient nationwide before the Covid-19 pandemic. According to the most recent NAEP data, New Mexico’s math proficiency rates lag behind the nation, with 19 percent of students in New Mexico testing as proficient, compared with 35 percent nationally in 2022.

State and National Math Education Initiatives

At the state and national level, many math stakeholders, including educators, researchers, and policymakers, are examining how mathematics instruction contributed to low student achievement before and after the Covid-19 pandemic. In 2015, the Mathematical Association of America, the American Mathematical Associations of Two-Year Colleges, the American Mathematical Society, the American Statistical Association, and the Society for Industrial and Applied Mathematics collectively [declared](#) the status quo for mathematics education is “unacceptable” and must change significantly. Fortunately, research and best practices, as well as identification of existing challenges, indicate directions for improvement.

Public Education Department Initiatives

In 2007, the Legislature passed the Math and Science Education Act, establishing the Math and Science Bureau in PED and a statewide Math and Science Advisory Council (MSAC). The MSAC operates under and works with the Math and Science Bureau at PED. According to PED, the pillars of the statewide approach to math instruction are the New Mexico Math Framework, the New Mexico Instructional Scope for Mathematics (NMIS), and PED’s strategic plan. The common core math standards, high quality instructional materials, as well as PED’s professional learning opportunities, also support statewide math

education. According to PED, the Math and Science Bureau is looking at the landscape of math education across the nation to see what other states are doing to prepare students for college and career, and are working to leverage what is working to improve student success in mathematics.

Math and Science Advisory Council. The statutory purpose of MSAC is to 1) advise the Math and Science Bureau at PED regarding the statewide strategic plan for improving math and science education; 2) advise the bureau, PED, and the legislature regarding appropriations for and administration of math and science education; and 3) work with the Math and Science Bureau to determine the need for improvement in math and science achievement among public school students and make recommendations to PED about how to meet those needs. The MSAC includes 12 members appointed by the department secretary for staggered four-year terms. The secretary uses a statewide application process to appoint MSAC members; new council members will be appointed for a four-year term beginning January 1, 2024. The council meets quarterly. Annually, MSAC produces a [report](#) on public and secondary mathematics and science achievement that is submitted to PED, the governor, and the legislature by November 30 of each year.

The New Mexico Math Framework, New Mexico Instructional Scope, and Strategic Plan. The [New Mexico Math Framework](#), the [instructional scope for mathematics](#), and PED's [strategic plan](#) guide PED's approach math education, according to the department.

- ***The New Mexico Math Framework.*** The New Mexico Math Framework, published in 2021, was written by a working group of PED staff, MSAC members, and educators. The framework is grounded in national research and provides clear guidance on the critical components to build, implement, and strengthen math instruction in New Mexico. The intent is for the framework to serve as a tool, alongside a companion framework on literacy and additional instructional scopes, to ensure equitable, culturally responsive learning occurs in New Mexico classrooms.
- ***New Mexico Instructional Scope.*** The New Mexico Instructional Scope (NMIS) for mathematics is a tool written by New Mexico educators to outline the components of a successful math program and help classroom teachers scaffold lessons to make sure students learn priority standards first. The NMIS for mathematics was first released in August 2020, revised based on public feedback, and released again in summer 2021. The NMIS for mathematics, like other instructional scopes in content areas such as literacy, contains individual grade-level supports for educators with the goal of providing a guaranteed, viable, and equitable instruction to all students.
- ***Strategic Plan.*** The PED strategic plan was updated in 2022 and is grounded in PED's mission, vision, and core values. According to PED, the strategic plan was created with the student groups identified in the *Martinez-Yazzie* lawsuit at the forefront, as "the department recognizes the past failures of New Mexico's education system to provide an equitable education for its most underrepresented students." The pillars of the strategic plan are the educator ecosystem, whole child and culturally responsive education, profiles and pathways, and asset-based supports and opportunities. Math is embedded in all these pathways.

National Research and Alignment with PED



The PED strategic plan references a 2020 [report](#) by the Learning Policy Institute that urges New Mexico to “design a system that places students at the center and builds the state and local capacity to meet their diverse needs.” PED notes their strategic plan begins the long journey of transforming education in New Mexico to meet the needs of New Mexico’s most unserved students. Centering research- and evidence-based practices in this work is critical to improving educational outcomes for students. Although it appears PED is beginning the process of building a road map to long-term improvements in the state’s educational system, PED’s Math and Science Bureau has been working diligently to incorporate national research into their approach to math education prior to the release of the department’s strategic plan.

Fostering Positive Math Identities. Emerging [research](#) emphasizes the importance of how students perceive their own ability to do math. For decades, research has shown all students can learn at high levels, and students’ brains adapt and grow in response to any learning opportunity. However, stubborn myths that only some students can do math persist. Research shows students’ ideas about their own ability to do math—including whether or not they have a growth mindset—determines their learning pathways and math achievement. For example, research shows fixed mindset thinking leads to avoidance of challenging work and high level courses.

Recently PED launched a [professional learning series](#) called “Fostering Positive Math Identities” that appears to be aligned with this research, in partnership with the non-profit Teaching Lab, a nonpartisan organization that focuses on professional learning. This learning series supports mathematics teachers and school leaders to deepen their practice on equitable and learning-focused classroom culture. According to PED, the professional learning series will help teachers and leaders sustain mathematical pedagogical shifts in practice by promoting productive mindsets and beliefs through learning. The series is offered at no cost, teachers receive stipends for their participation for working outside contract hours, and PED provides substitute reimbursements if needed. However, the learning series is only open to secondary mathematics teachers and school leaders. PED reports 26 people have registered for the Fostering Positive Math Identities Training.

Coaching to Support High Quality Math Instruction. Research shows mathematics instruction for the 21st century requires a different approach. Engaging students in rich, open, visual, and creative tasks is a more effective approach to math instruction than rote instruction where the teacher shows students methods, and students then repeat these. However, in practice, rote instruction remains common. Other similarly outdated practices that are now far from the research base also persist in math education, such as ability grouping. International education research concludes that the most successful countries are those that group students by ability the latest and the least. Emerging ideas regarding other approaches to group work show us there are other ways to encourage students to work together and combat inequities and promote high achievement. For example, Stanford Graduate School of Education Jo Boaler’s approach to [group work](#) in her teaching of summer school has a structured approach that begins by group members asking each other how they saw and thought about ideas. This structured approach, combined with teacher modeling of valuing different approaches to mathematics that students internalized and practiced with each other, led to more effective and equitable group work and showed strong outcomes regarding student achievement.

PED is continuing its partnership with Teaching Lab to offer [coaching](#) for math instructors. According to PED, this program supports schools in continuously improving teacher instructional practices and student learning through the implementation of

Teaching Lab’s coaching inquiry cycle. This can include supporting coaches across identified schools to implement observation and feedback cycles and how to provide targeted feedback to teachers aligned with evidence-based subject matter practices. However, more specific details on implementation are sparse. Additionally, it appears interest in the program has exceeded PED’s capacity to support it. The math coaching interest form is [closed](#) and PED notes it has “stopped soliciting interest as we’ve reached an exceeding number of requests.” PED reports they have 25 educators who are participating in the coaching being offered in partnership with Teaching Lab.

Micro-credentials. NCTM, a professional organization for mathematics teachers in the United States that PED references extensively in the New Mexico Math Framework [notes](#) that too many math teachers remain professional isolated, without the benefits of collaborative structures and coaching, and with inadequate opportunities for professional development related to mathematics teaching and learning. To ensure mathematics success for all students, NCTM asserts that providing professional development training, and coaching must be a priority.

According to PED, the department is in the process of piloting a series of micro-credentials to foster professional learning in mathematics. Development began in September 2022, and a statewide rollout is planned for August 2024. Currently, as of August 2023, the department is in the initial rollout phase, which includes piloting, and then revising, the series of micro-credentials. The series was developed with New Mexico State University Mathematically Connected Communities and feedback from teacher leaders. This series of micro-credentials is being used for K-5 educators and is designed to enhance mathematics conceptual knowledge and reasoning in students. PED noted it has a series of four micro-credential courses, designed to be completed in one year. This work is based on research from NCTM’s 2014 book *Principals to Action: Ensuring Mathematics Success for All* as well as their 2020 book, *Catalyzing Change in Early Childhood and Elementary Mathematics*. PED reports they are hoping to recruit 60 educators for the piloting of the micro-credential series. PED has noted a legislative lever would increase success. Policy makers could consider micro-credentials as a mechanism of the teacher career ladder as well as to support comprehensive mathematics knowledge and improved practice for all teachers.

Policy Considerations

Research and data show the status quo in mathematics education is unacceptable and must change. Policymakers should consider investing in supports for both pre-service and in-service mathematics educators as a lever to improve student achievement.

Educator Preparation

Research shows high-quality teacher preparation ensures teachers are equipped to provide deeper learning experiences that enable students to not only learn content, but also to think critically. Teaching elementary math requires a conceptual understanding of foundational mathematics and pedagogical knowledge, and teacher preparation programs must dedicate sufficient time to both, the National Council on Teacher Quality (NCTQ) notes in its recent [report](#): “Preparation for Teaching Elementary Mathematics.” However, NCTQ’s report notes there is still room for improvement to ensure essential mathematical content is adequately covered. LESC staff will continue to study specific policy options and budget considerations to improve preparation programs for elementary mathematics teachers in preparation for the 60-day legislative session in 2025.

Professional Learning

Participation in research-based professional learning that is sustained, student-centered, participatory, and supported by adequate resources can have a significant impact on teacher learning and practice, [research](#) shows. New Mexico lawmakers have previously used mandatory teacher learning as a lever to improve student outcomes and to ensure instructional practices are evidence-based (for example, through the implementation of Laws 2019, Chapter 256 (SB398), which required educator training in structured literacy, among other actions). While PED has implemented optional professional learning opportunities—the previously mentioned Fostering Positive Math Identities learning series and coaching opportunities—these are not reaching all educators. Supporting in-service educators with solid professional learning that includes both content knowledge and pedagogical knowledge, and which centers on math instruction as a mechanism for critical thinking, could be used as a lever to improve teacher practice and student proficiency. This would be similar to what the state has done in support of literacy instruction.

LESC staff will closely follow PED's development and implementation of the series of math micro-credentials and update committee members on this ongoing work as this appears to tie to the department's proposal to have a statutory lever, similar to structured literacy initiatives, by developing a set of courses that can be used as required professional learning for educators with a focus on mathematics. However, it is important for policy makers to consider that this series of micro-credentials should be strengthening core instruction—an opportunity to deepen teachers own understanding of mathematics and implement evidence-based instructional methods—and not considered a specialized skill set.

National Recommendations

NCTM also provides the following key recommendations in their 2020 book, *Catalyzing Change in Early Childhood and Elementary Mathematics*:

- Broadening the purpose of school mathematics to prioritize development of deep conceptual understanding so that children experience joy and confidence in themselves as emerging mathematicians;
- Dismantling structural obstacles that stand in the way of mathematics working for each and every student;
- Implementing equitable instructional practices to cultivate students' positive mathematical identities and a strong sense of agency; and
- Organizing mathematics along a common shared pathway grounded in the use of mathematical practices and processes to coherently develop a strong foundation of deep mathematical understanding for each and every child.