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Modernizing and Engaging Secondary Students in Mathematics

School disengagement is a critical education issue with long-term consequences for youth. Data from the 2019 New Mexico Youth Risk and Resiliency [Survey](#) revealed 23.4 percent of high school students reported feeling disengaged from school. Further, national [research](#) published in 2022 shows 19.6 percent of youth—or 47,900 young adults—in New Mexico are entirely disconnected, meaning youth between the ages of 16 and 24 who are neither in school or working.

Disengagement from school can negatively affect academic performance and student wellbeing, lead to higher dropout rates, and ultimately influence opportunities for future success. Improving student engagement will require an approach that takes numerous factors into account: the learning and school environment, students' relationships with educators, how students learn and are taught, and the integration of applied learning experiences that are relevant to today's workforce needs, among other strategies. Despite its complexity in both its causes and impacts, research shows student engagement can be bolstered by modernizing instruction to make academics relevant to students.

Mathematics and Student Engagement: Why Focus There?

There is particular concern about mathematics given the state's current standing in mathematics outcomes for students. Only about 25 percent of New Mexico students statewide are currently proficient in math—of major academic subjects, students are doing the worst in math in New Mexico (See Figure 1). Modernizing and engaging middle and high school students in mathematics is a critical strategy in a broader vision to improve both student outcomes and student engagement. A modernized approach to mathematics education would ideally equip students with essential skills such as critical thinking, analytical reasoning, and data and statistical fluency, empowering them to tackle complex challenges in various academic disciplines, in future careers, and in any pathway a student may choose after high school.

Ultimately, modernizing secondary school math is crucial in developing future generations of mathematically literate students who are well prepared to thrive in an increasingly globalized, complex, and technology-driven world.

Key Takeaways

19.6 percent of young people ages 16-24 are disconnected, meaning they are neither in school nor working. Bolstering mathematics education matters in improving student engagement.

Page 1

Assessment results from spring 2022 suggest about 25 percent of students across all grades statewide are proficient in math.

Page 2

Proficiency rates in mathematics reach a peak in sixth grade (32 percent) and decline into high school years (16 percent).

Page 3

In designing course requirements, decision makers must maintain rigorous academic expectations matched with the flexibility to meet student needs.

Page 6

What Does it Mean to Modernize Mathematics?

As described by the Association of Mathematics Teacher Educators (AMTE) in 2022, [mathematics modernization](#) “is a catch-all term that refers to curriculum reforms centered on secondary and early college mathematics.” The goal of modernization, as defined by AMTE, is to better meet 21st century learning needs and support equitable outcomes for students.

AMTE notes math modernization efforts include activities such as developing multiple and flexible curricular options for late high school math courses, strengthening core instruction in middle and high school grades, implementing quantitative reasoning, mathematics modeling, and data science coursework in late high school, and addressing guidance and admissions policies to recognize a broader range of rigorous math options for students.

began to make changes to the states’ system of assessments right before the pandemic. Federal testing waivers and changes to assessments that have made comparability to historic assessment data troublesome meant spring 2022 was the first statewide summative testing since spring 2019. As LESC has [previously reported](#), spring 2022 assessment results have been characterized by PED as “a new baseline” as PED is now using its new statewide assessments—the NM-MSSA in grades three through eight, and the SAT in grade 11—to measure proficiency in grade level content, including mathematics.

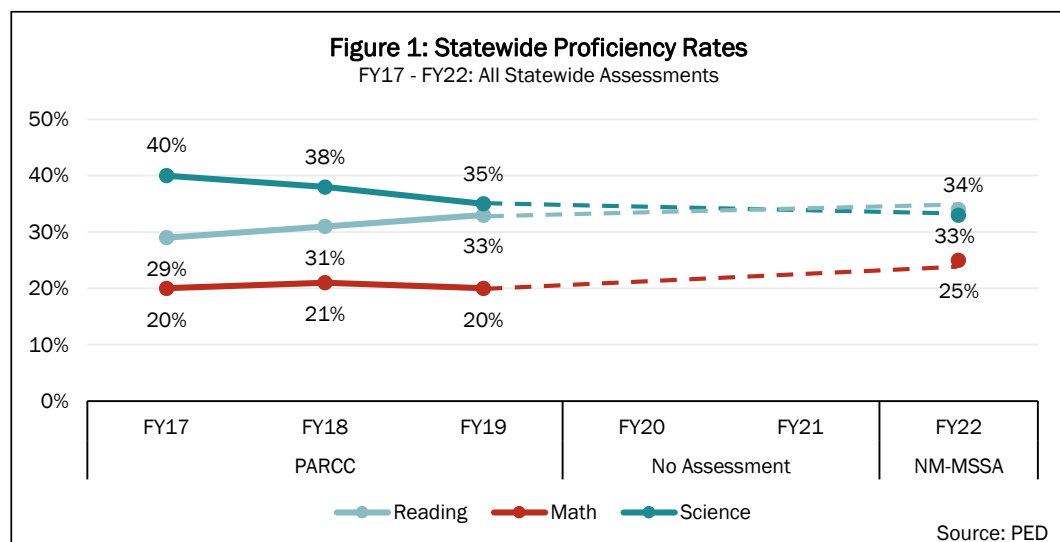
Assessment Scores

Assessment results from spring 2022 suggest about 25 percent of students across all grades statewide are proficient in math. As shown in Figure 1, assessment results are lowest for mathematics at a statewide level when compared with reading and science proficiency. Mathematics scores have historically been low among New Mexico’s students.

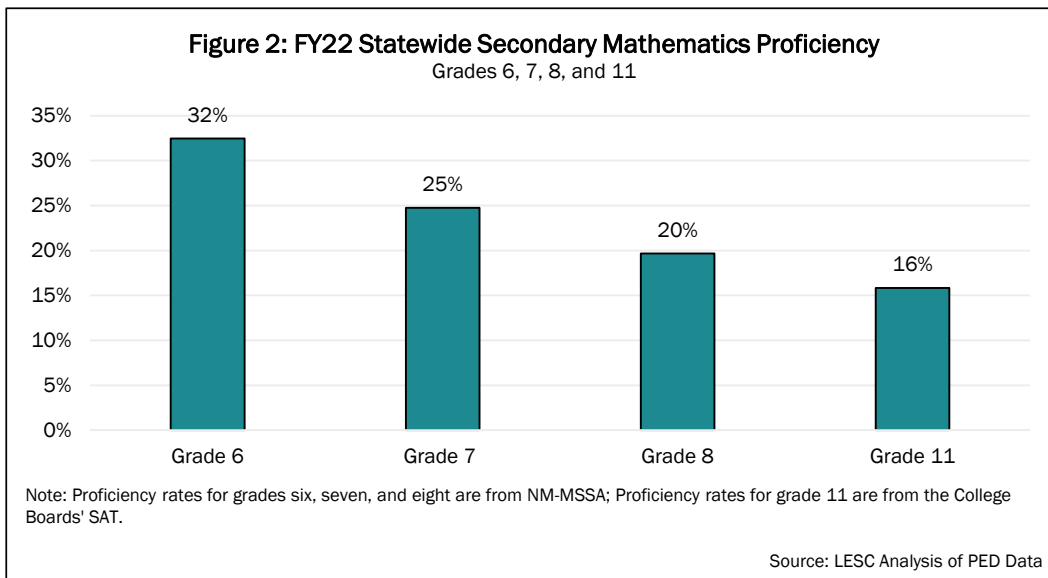
Status of Secondary Math: Assessments and Scores

New Mexico’s [system](#) of assessments includes several federal- and state-level summative, formative, and interim assessments. This system was disrupted in spring 2020 as the pandemic put a halt to assessments nationwide. The U.S. Department of Education waived federal testing requirements for all states in the spring of 2020 and later, issued a second waiver in spring 2021 to waive the 95 percent participation requirement, resulting in a limited number of New Mexico schools participating in assessments that year.

Combined with this assessment “holiday,” the Public Education Department (PED) also



Proficiency in mathematics in middle and high school years shows a steady decline across middle school years and into high school. Figure 2 shows proficiency rates in mathematics for grades six, seven, and eight (as measured by the NM-MSSA), and in grade 11 (as measured by the SAT). Proficiency rates in mathematics reach a peak in sixth grade and decline into high school years.



Current Statutory Requirements and Options

There are statutory requirements for both middle and high school students as it relates to mathematics instruction.

High School. New Mexico state [law](#) requires high school students to earn 24 units and to demonstrate competency in all core academic subjects to earn a high school diploma. Of these units, four units are required to be in mathematics and one of the four mathematics units must be equivalent to or higher than the level of Algebra II. Algebra II is currently a requirement for all students, unless a parent submits a written, signed permission note for the student to complete a different mathematics unit. State law also permits a financial literacy course or a PED-approved work-based training or career technical education course that meets state mathematics academic content and performance standards to qualify as one of the four required mathematics units.

Middle School. For middle school students, state [law](#) also requires instruction that meets academic content and performance studies in specific subject areas—including mathematics—for students in grades four through eight. Additionally, state law requires algebra I to be offered in eighth grade statewide, either through regular classroom settings or through online courses or agreements with high schools.

Course Considerations

A few specific courses have garnered particular interest as it relates to high school math. These include Algebra II, financial literacy, and courses that relate to data and technological fluency including statistics and data science.

Algebra Considerations. Currently, state law requires algebra I to be offered in eighth grade and for students to take Algebra II to graduate from high school. Students can opt out of this with a written note from parents but it is unknown how many students choose not to take Algebra II.

Whether or not states should require students to take Algebra II as part of graduation requirements is a complex issue. New Mexico is currently one of 12 states that requires students to take Algebra II without the ability to substitute this for mathematics courses of comparable complexity. Often the requirement to complete Algebra II is deemed important for college and career readiness and to meet admissions requirements at universities.

In a 2020 [report](#) from the Charles A. Dana Center at The University of Texas at Austin's Launch Years Initiative, *Launch Years: A New Vision for the Transition from High School to Postsecondary Mathematics*, researchers note Algebra II, however, is often used as a proxy for rigor and without consideration of other upper-level mathematics courses that may also benefit students depending on their educational and career goals. This use of Algebra II as a proxy for rigor continues to be the case despite a lack of consensus about what it actually means for a course to be rigorous or careful consideration of mathematics courses that may be more relevant to a student's academic goals. The researchers also note that mathematics is often used as an admissions gatekeeper in many colleges and universities even though requirements that prioritize algebra have "little to no relation to students' readiness to succeed in courses such as statistics or quantitative reasoning—which are more relevant to a wide range of credentials and careers."

Researchers in this report go on to write that "using Algebra II as a gatekeeper to college admission might be defensible were there evidence that this content is essential to students' success in college or in their future lives and careers," however, "there is mounting evidence that those students who do not take algebra courses that have been traditionally required are still successful in college."

It is important that policymakers strike a balance in ensuring access to upper level math, such as Algebra II, which may still be a necessary course for some students' career and education goals, while also prioritizing the many types of mathematics courses that are valuable to students in today's world. Included in this debate should be careful consideration of how to best align secondary and postsecondary mathematics expectations to both foster postsecondary participation and options in these programs that lead to a well-prepared, diverse economy.

Financial Literacy. Current state law requires financial literacy be offered as an elective to high school students. Financial literacy can also count towards a mathematics credit if it meets state academic content and performance standards. It is not, however, a required standalone course for students to earn a high school diploma.

In 2022, the Public Education Department (PED) published revised social studies academic and content performance standards. The newly revised social studies standards for grades kindergarten through grade 12 include six strands: 1) Civics; 2) **Economics and personal financial literacy**; 3) Geography; 4) History; 5) Ethnic, cultural, and identity studies; and 6) Inquiry. The updated standards include substantial revisions to include financial literacy as required embedded content within social studies courses across all grades. **There are now 33 distinct personal financial literacy standards included in the final version the new social studies standards** (See 6.29.11 NMAC).

Students who take financial literacy or personal finance courses can see many personal benefits throughout their life, including fewer loan defaults and higher credit scores. While financial literacy continues to be studied, there is existing research that shows similar benefits of personal finance no matter if a state chooses to require a standalone course or to embed this content into broader required coursework. A study that compared Georgia, which requires a standalone personal finance course requirement, and Texas, which requires personal finance embedded into economics—as New Mexico now does as of 2022—found similar outcomes in both states. In high school in particular, students are now required to take economics *and personal financial literacy*, which requires content in both subjects, connecting personal finance content to economic content.

Courses Providing Statistical and Data Fluency. Math courses that offer the opportunity to develop statistical and data fluency—such as statistics, data science, and mathematical modeling—are crucial for students to thrive in today’s data-driven world. Despite this opportunity, students in New Mexico are not currently required to take courses such as statistics or data science as part of requirements to earn a diploma and may also lack equitable access to such courses.

The National Council of Teachers of Mathematics (NCTM) in a 2018 book and [executive summary](#), *Catalyzing Change in High School Mathematics: Initiating Critical Conversations*, noted improvements and innovations in mathematics seen in elementary and middle school grades has “not been shared at the high school level.” In its set of recommendations, NCTM urged the importance of considering fundamental shifts in high school mathematics education to improve student outcomes. NCTM recommends all high schools offer continuous four-year mathematics pathways—with pathways meaning course sequences designed to align with the students’ personal goals, interests, and chosen fields of study—and that students take mathematics each year of high school. However, NCTM also urged broader consideration of high-value courses and moving away from “traditional” high school mathematics sequences. NCTM notes the need for courses that foster readiness not just for postsecondary admission, but also the development of quantitative literacy and critical thinking skills needed for success in a broad range of careers and in students’ personal lives.

The Trade Space of Required Courses

There are important considerations for both students and schools related to any graduation requirement. All courses offer benefits to students whether these are focused on arts, mathematics, a language other than English, career technical education, or any other subject. When students fulfill mandated coursework, they inherently forego other potential benefits or opportunities. While a standard set of expectations that ensure a strong academic foundation are needed, too rigid of requirements limit the time and flexibility students have to pursue their interests. Inflexible requirements may also discourage students from exploring educational pathways such as career technical education, taking electives, or participating in extracurricular activities, all of which also offer valuable experiences and skill development. However, as schools design possible pathways available, high quality educators and resources play a role in course availability as well.

More rigid requirements may contribute to students feeling disengaged due to a lack of personalization and choice in their academic journey—this disengagement maps back to lower academic performance. Additionally, some students may struggle to meet demanding graduation requirements, leading to a sense of hopelessness or disengagement

and a focus on earning units rather than genuine learning. The potential cost, in this case, is a loss of enthusiasm for learning and a diminished sense of curiosity and personal growth.

Given various bodies of research that support the benefits of numerous options for students, it is difficult to establish the relative merit of any particular mandate as compared with any other courses a student may be required to take. A balance must be struck between providing a well-rounded education and granting students flexibility to pursue their interests and career goals. Understanding the complex trade space to finding this equilibrium, can lead to well-designed high school pathways and educational environments that foster well-rounded individuals ready to succeed in their chosen paths after high school can be created.

In designing graduation requirements and considering what courses a student must take, it is of paramount importance that decision makers maintain rigorous academic expectations matched with the flexibility to meet student needs and ready them for the world that awaits them after high school. While this is often framed as “readiness for the 21st century,” it is important to acknowledge we are already 20 years into the 21st century. Preparing students for the world that *now* awaits them is a responsibility for today.

Policy Considerations

Modernizing of Graduation Requirements. During the 2023 legislative session, the Legislature passed [House Bill 126](#) (HB126), a bill designed to modernize high school graduation requirements, although the measure was ultimately vetoed. As it relates to math, the bill proposed the following changes:

- Continued to require four units of mathematics to earn a high school diploma
 - Including a required sequence of algebra I and geometry, or an equivalent pathway
 - Career technical education and work-based learning could have satisfied mathematics unit requirements if mathematics academic content and performance standards were met
- Omitted the Algebra II requirement to earn a diploma but required Algebra II to be offered in all high schools
- Required local education agencies to set two units for graduation, which could have been in core academics, such as mathematics, or in electives
- Required the development of graduate profiles and for Next Step Plans to align to graduate profiles to strengthen student advising in high school, including guidance on mathematics courses and pathways
- Continued to require that financial literacy and computer science be offered as electives

Future Statutory Considerations. Ensuring New Mexico’s school system and expectations for graduation are aligned to college, career, and civic readiness that fosters opportunities and ensure a strong academic foundation for students continues to be a concern for lawmakers to consider. As the LESC studies strategies, policy options, and budget considerations to address secondary school engagement and improve student outcomes, ensuring access to modernized mathematics is of utmost importance.

National Recommendations. In a book published by the National Council of Teachers of Mathematics, recommendations include the following:

- Each and every student should learn the essential concepts to expand professional opportunities, understand and critique the world, and experience the joy, wonder, and beauty of mathematics; Policymakers should support meaningful four-year pathways of mathematics.
- High school mathematics should be mindful to avoid the practice of tracking teachers as well as the practice of tracking students into qualitatively different or dead-end course pathways.
- Classroom instruction should be consistent with research-informed and equitable teaching practices.
- High schools should offer continuous four-year mathematics pathways with all students studying mathematics each year, include two to three years of mathematics in a common shared pathway focusing on the essential concepts to ensure the highest quality mathematics education for all students.