

Making the Case—Re-Envisioned High School Math Pathways

April 2025

Prepared by: Re-Envision Mathematics Pathways Working Group

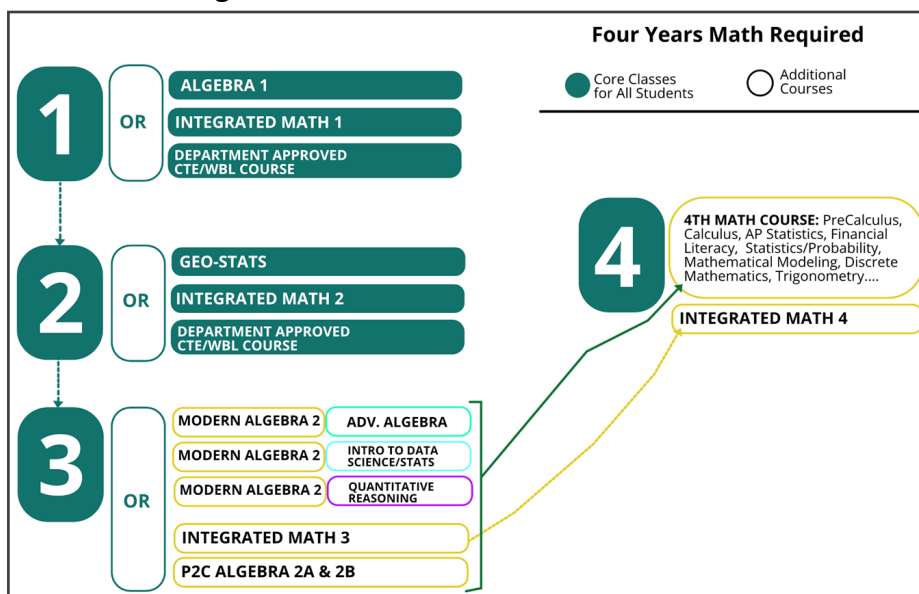
The State of New Mexico convened community members from K–12 mathematics, postsecondary, workforce informal education, and national laboratories for the Re-Envision Mathematics Pathways Working Group. The group started its work in March 2023 to create modern and innovative mathematics pathways aligned with students’ goals and aspirations.

The re-envisioned pathways expand access and engage students in rigorous and relevant mathematics instruction to help them meet their aspirations. All pathways are designed for all students, and each pathway is equally rigorous. These pathways keep doors open for students rather than act as gatekeepers.

This working group developed recommendations for re-envisioned high school pathways for all students, inclusive of:

- Modernized Algebra 2 and subsequent flexible pathways:
 - data science,
 - quantitative reasoning,
 - advanced algebraic concepts, and
- Modernized Geometry.

Figure 1: A Model of Potential Pathways for Students with Geo-Stats and Modern Algebra 2 courses.



Source: Re-Envision High School Math Pathways Working Group (2024)

Key Takeaways

- NM math community working group recommends re-envisioned high school math pathways
- Beginning in SY2025–26, offer the Modernized Pathway in parallel to the Traditional Pathway
- Replace course Algebra 2 (2041) with Modernized Algebra 2 and Introduction to Data Science/Stats, or Quantitative Reasoning, or Advanced Algebraic Concepts by SY2027–28
- Replace Geometry (2034) with Geo-Stats by SY2027–28

Preface

The Math and Science Bureau would like to thank the members of the Re-Envisioning High School Math Pathways Working Group, whose hard work and collaboration from March 2023–June 2024 were invaluable. The recommendations before you come from the working group, reviewed and enhanced by the PED staff, and approved by the Public Education Department.

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Special thanks to our former colleague David Ubinger, who supported the working group and the Charles A. Dana Center team with logistical and programmatic support from the Math and Science Bureau. Special thanks to staff at High Plains Regional Education Cooperative #3 who supported the Math and Science Bureau and working groups in securing venues, logistical support and hosting a listening tour stop in Raton.

Introduction

Many of the current high school math policies originated during the 1950s, at the height of tensions of the Cold War. The Space Race with the Soviet Union created a demand for scientists with an intensive focus on algebra and calculus techniques that relied on 1950's technology. Many of these math topics remain as important as ever for students intending to pursue postsecondary degrees in many STEM (science, technology, engineering and math) fields.

However, the majority of students today have more quantitative tools at their disposal and face distinctly different challenges than these 80-year-old policies were designed to address.

...U.S. young adults lack not only quantitative and problem-solving skills necessary for success in the workplace and postsecondary education, but also the numeracy and problem-solving skills necessary for “meaningful participation in our democratic institutions” (Goodman, Sands, and Coley 2015, p.5).

Current trends in mathematics education indicate that:

- The majority of 9th grade students took Algebra 1, and after 9th grade, students follow many different paths to graduation in terms of math credits (NAEP, 2018).
- Many students repeat algebra, but few achieve proficiency on their second attempt — typically not cost effective, direct implications for how resources are being used (West Ed, 2012).
- Although most students pursue postsecondary education, they are not necessarily taking the high school



courses that will best prepare them for success in postsecondary coursework (ACT, 2005).

- Only 28% of 2-year college students nationally enroll in programs of study that require Calculus (Burdman, 2015).
- Only 30% of 4-year college students nationally enroll in programs of study that require Calculus (Chen & Soldner, 2013).
- Among the top post-secondary institutions receiving SAT scores from New Mexico students, none require Algebra 2 for admission (College Board, 2023).
- There is little evidence that growing enrollments in Algebra 2 have improved students' math performance, but there is strong evidence that students can succeed in rigorous college level math courses without being proficient in Algebra 2 (ECS, 2020).
- The rigor of high school coursework should be improved, with a greater focus on in-depth content coverage and considerably greater secondary-to-postsecondary curriculum alignment (ACT, 2005).
- Every high school student should graduate with an understanding of data, spreadsheets, and the difference between correlation and causality (Boaler & Levitt, 2019).

The traditional high school math pathway, which is often based on a one-size-fits-all approach, can be challenging for many students, particularly those who have been at-risk (i.e. English Learners, Native American, students experiencing poverty, and students with disabilities). At-risk students may not have access to the same quality of math instruction in elementary and middle school, which can put them at a disadvantage in high school.

Modernized, rigorous high school math pathways address these inequities by offering multiple options for math courses that are tailored to students' career goals and aspirations. Rigorous pathways offer students flexibility to engage in one pathway and allow

students to change pathways, based on their goals and aspirations, whether a degree, certificate, etc.

Overall, equitable high school math pathways are an important way to promote equity and access in education, particularly in STEM fields, where there is a significant achievement gap. By offering multiple pathways and providing support for all students, we can help to ensure that every student has the opportunity to succeed in math and beyond.

Context

The New Mexico Public Education Department (PED) Math and Science Bureau staff sought to evaluate and interrogate the current state of mathematics education in the secondary (grades 9–12) space. Coming out of

Mathematics Pathways

Mathematics Pathways enable students to take different paths through the math curriculum, making the math students learn relevant to their programs of study and careers. Model pathways vary but often focus on statistics, quantitative reasoning, or algebra/calculus (Dana Center, 2019).



the pandemic, it brought to the forefront the inequitable educational system many students, especially historically disenfranchised students, face in their K–12 career. Staff began researching state policies and practices around high school mathematics. Our goal and charge are to modernize and align mathematics pathways to fields of study and address inequities in the system that disproportionately affect historically marginalized students.

Stakeholders from K–12 mathematics, postsecondary, workforce informal education, and national laboratories were accepted into the Re-Envision Mathematics Pathways Working Group. They started their work in March 2023 with the task of creating modern and innovative mathematics pathways aligned with students’ goals and aspirations. They presented their recommendations for re-envisioning high school math pathways to the PED in June 2024.

The overall goal of the project was to make recommendations to:

- 1. Improve learning opportunities for each student during their high school career and into the transition to their postsecondary education and other future endeavors.
- 2. Dismantle institutional and systemic barriers that block equitable access and opportunities to succeed in math, especially for Martinez/Yazzie student groups.

The PED contracted with an independent third-party organization, the Charles A. Dana Center at University of Texas at Austin, which has done this work in several other states and is leading the national discourse in expanding mathematics pathways for all students to be successful. They facilitated the working groups and provided contextual expertise throughout the process.

The working group reviewed the latest research from other states and research publications, bringing in their classroom expertise or lens from postsecondary and workforce into the conversations. The working group broke into two sub groups.

- 1. VISIONS Working Group: This group set the vision for the equitable math pathways and outlined items such as course frameworks, expectations of the pathways.
- 2. PATHWAYS Working Group: This group did the work of developing the course pathways as set forth by the Vision Working Group.

The VISIONS Working Group

The working group believes math curricula should promote student-centered cultures of learning that support students in developing as learners, emphasize communication and collaboration among peers, and engage students in meaningful mathematical tasks. Math curricula should also make meaningful interdisciplinary connections and leverage technology appropriately to promote student engagement and critical thinking. Pathways should not limit students if their interests change, and students can switch pathways during their HS career.

The PATHWAYS Working Group

This group of mathematics teachers and specialists assembled for numerous official convenings and small group work sessions over the course of six months. With the support of the Charles A. Dana Center, the working group members reviewed and discussed current trends and research centered on pathways in mathematics education. Based on their discussions and review of research, the group focused on creating a new third year high school mathematics course. They kept the importance of student aspirations at the forefront during this development. The PATHWAYS group worked to provide access to mathematics aligned to students' future college and career aspirations, while ensuring doors remain open for students as their aspirations can change. This report presents the consensus recommendations of the working groups for the design of re-envisioned, modernized, more relevant course pathways intended to support all students being successful in their mathematical aspirations and to keep doors open to college or career success.

Meetings. The working group met over an 18-month period to develop and refine their recommendations:

Table 1: Meeting Dates

March 6–7, 2023	October 5–6, 2023
April 21, 2023	November 11–12, 2023
April 27, 2023	December 9, 2023
May 19, 2023	April 12, 2024
June 9, 2023	May 3, 2024
September 23, 2023	June 6–7, 2024

Listening Tour. As part of this work, the PED and the working group asked the community to weigh in on the recommendations and changes in modernizing Algebra 2. The working group spent the majority of September–December 2023 preparing documents with their rationale and instructional scope drafts.

The PED and the working group had their documents translated into Spanish to make it more accessible for all New Mexicans to engage in the materials and the rationale for the changes. The group released all documents on January 18, 2024, on a website (see Appendix B) and encouraged members of the public to view the draft documents, provide input at listening tour stops (see Appendix A) and provide feedback. We



received 450 unique visits over the course of the two-month engagement period, from January–March 2024. We collaborated with the Regional Education Cooperative Association in hosting a listening tour across the state. They welcomed the opportunity to host a listening tour at their offices or at a nearby venue, such as district offices or higher education institutions. We also hosted three virtual listening sessions through Zoom. Below is the engagement calendar:

- January 22, 2024 — Virtual
- January 23, 2024 — Farmington - Farmington Municipal Schools Boardroom, 3401 E. 30th St. Farmington, NM, 87402
- January 25, 2024 — Albuquerque - Central Regional Education Cooperative, Semilla Conference Room, 4216 Balloon Park Road NE, Albuquerque, NM, 87109
- January 29, 2024 — Las Vegas - New Mexico Highlands University, Student Union Building Room 322, 905 Baca Ave, Las Vegas, NM, 87701
- February 5, 2024 — Raton - High Plains Regional Education Cooperative #3 Conference Room, 101 North 2nd Street, Raton, NM, 87740
- February 12, 2024 — Virtual
- February 22, 2024 — Portales - Eastern New Mexico University, Student Union Campus, Golden Student Success Center, Room 217, 1500 S Avenue K Station 32, Portales, NM, 88130
- February 26, 2024 — Deming - Southwest Regional Education Cooperative #10 Conference Room, 1321 E Poplar St, Deming, NM, 88030
- February 27, 2024 — Ruidoso - Region IX Education Cooperative #9 Conference Room, 143 El Paso Rd, Ruidoso, NM, 88345
- March 4, 2024 — Virtual

After the two-month listening tour concluded and feedback was collected via the website and comments at the in-person/virtual sessions, the working group came together, reviewed the feedback, and made refinements. They also tackled modernization of Geometry from April–June 2024. Their recommendations and rationale are outlined below.

Case-Making

The PATHWAYS Working Group worked to develop a third-year high school course that would prepare students for future academic and professional goals while emphasizing the relevance of mathematics. Modern Algebra 2 provides students with the opportunity to choose a pathway that aligns to their individualized college and career aspirations. Allowing students to select content aligned to their aspirations



after high school to connect mathematics to their relevant path will ensure students see the practical value of mathematics in their future endeavors. A majority of American students indicate they would like mathematics more if they better understood how it applied to their future (Texas Instruments, 2018). Modern Algebra 2 addresses students' needs and aspirations by covering essential Algebra 2 content while also connecting mathematics to their future goals.

The current one-size-fits-all expectations of students progressing through Algebra, Geometry, Algebra 2, and Precalculus does not meet the needs of all our students. This path is designed to meet the needs of students pursuing majors that require calculus. Although STEM careers requiring calculus are important to our society and diversifying these fields is important, only about 30% of New Mexico high school students have indicated their intention to pursue a major in a field that requires calculus (College Board, 2023). Providing students with additional pathways and the choice of different mathematics courses will better address the preparation of our students for their future college and career goals.

To better serve all students, the PATHWAYS Working Group is recommending a new course, Modern Algebra 2. This course serves students pursuing any major or career field, no matter the calculus requirement. In this course, students learn foundational Algebra 2 content in the first semester and are provided a choice for the second semester to focus on data science and statistics, quantitative reasoning, or advanced algebra concepts. Throughout both semesters students see the relevance of algebra, statistics, and quantitative reasoning in the real world and understand how mathematics connects to their future aspirations. The proposed pathways better prepares all students for their future by equipping them with essential skills and igniting their enthusiasm for mathematics.

Background

As Algebra 2 changed over time, partly influenced by the implementation of the Common Core State Standards in 2010, it evolved from focusing on solution methods for a variety of types of equations, to including the study of functions as well as data and statistics. Currently, in a typical Algebra 2 course, students are expected to explore polynomial equations and functions, rational expressions and functions, radical expressions and functions, trigonometric functions, and linear, quadratic, and exponential models. During the course, students build, interpret, and perform operations with all these different functions. In addition, students explore statistics and probability, and data analysis. By covering all this content, the course has become “unwieldy” for teachers and students (Daro & Asturias, 2019).

Algebra 2 has also become a gateway to high school graduation, regardless of student aspirations for their own college and career goals. According to Daro and Asturias (2019), “Many students who don’t successfully navigate the pathway to calculus sink into a bog of remediation and ineligibility from which few escape” (p. 7). Thus, the unwieldy content expectations, along with the disparity in serving students’ future aspirations, limit student opportunities to succeed.

Sociologist Robert K. Merton (1968) coined the “Matthew Effect” to describe the phenomenon of how an achievement gap widens over time. Daro and Asturias (2019) elaborate:

Two little girls join the soccer team. They have nearly identical athletic skills. Both are good



runners, but Maria runs a half step faster than Gail. When the first soccer lesson begins, there's one ball. They both run forward, and Maria gets to the ball first and kicks it. After they've done this 20 times, Maria has practiced kicking the ball 19 times, and Gail has had only one opportunity. A week later, Maria has learned a lot more about kicking the ball than Gail (p. 10)

Daro and Asturias (2019) observe the parallel between the soccer analogy and the typical Algebra 2 classroom, where students continue to fall further and further behind, not receiving feedback or instruction that makes sense to them. They observe, “Day after day, the opportunity gap accumulates, and aspirations—especially STEM aspirations—erode, particularly for students of color and low-income students” (p. 10).

In 2023, 64% of New Mexico seniors who took the SAT reported that they planned to attend a postsecondary institution of higher education after graduation (College Board, 2023). However, only about 30 % reported that they were planning to pursue a major requiring calculus. 16% of New Mexico senior high school SAT takers in Fall 2023 scored at or above benchmark on the math portion of the test.

As New Mexico moves further into the new, post-Covid, post-digital revolution age, with artificial intelligence technology exponentially advancing, it is becoming increasingly clear that the way we are offering our students mathematics needs to change. Students are no longer served by the one-size-fits-all framework that has served as the bedrock of mathematics education since the 1800s (Leinwand and Milou, 2021). This one-size-fits-all framework does not support the transition to college as a variety of math pathways will be available to students entering college. Modern Algebra 2 gives students an opportunity to explore these pathways in high school.

Rationale

The National Council of Teachers of Mathematics says the purpose of school mathematics is “to expand professional opportunity, understand and critique the world, and experience wonder, joy, and beauty” (NCTM, 2018). Modern Algebra 2 will provide students the opportunity to see mathematics as relevant to their lives and future aspirations. In New Mexico, Modern Algebra 2 will build a mathematical foundation during the first semester for all students, while meeting individual students’ needs for their individual future plans through the available choices during the second semester. Universities and colleges around the country have begun to implement pathway initiatives to align students’ entry college mathematics courses with their intended majors. These initiatives have proven to better prepare students for success in college-level math courses.

To better serve all students, the PATHWAYS Working Group is recommending a new course, Modern Algebra 2. This course serves students pursuing any major or career field, no matter the calculus requirement. In this course, students learn foundational Algebra 2 content in the first semester and are provided a choice for the second semester to focus on data science and statistics, quantitative reasoning, or Advanced Algebra Concepts. Throughout both semesters students see the relevance of algebra, statistics, and quantitative reasoning in the real world and understand how mathematics connects to their future aspirations. The



proposed pathways better prepares all students for their future by equipping them with essential skills and igniting their enthusiasm for mathematics.

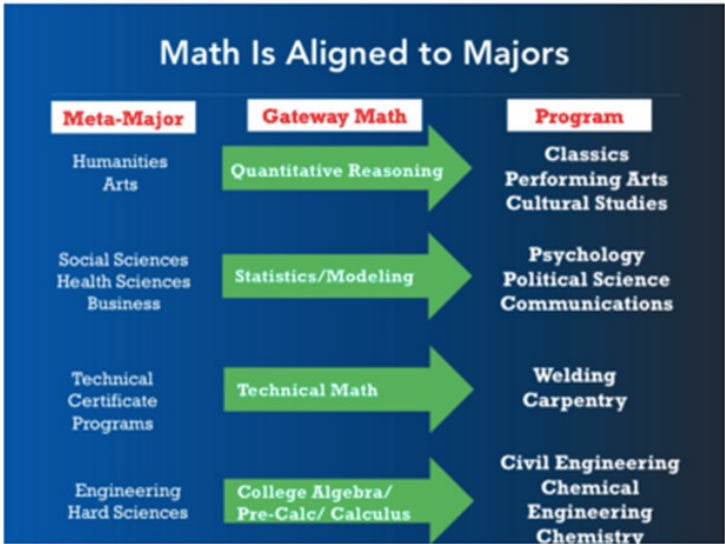
Modernizing mathematics provides “[multiple and flexible curricular options](#)” for all students (AMTE, 2022). This pathway structure allows students to explore different areas of mathematics without closing any doors to future opportunities in another mathematics pathway. For example, if a student chooses to take Introduction to Data Science and Statistics in their second semester of Modern Algebra 2, this choice does not close the door to Precalculus if the student decides they wish to take it in their fourth year. The second semester provides students the opportunity to explore mathematics aligned to their interests and aligned to their fourth year mathematics course choice.

Offering students multiple pathways in high school math with an equivalent Algebra 2 credit has been shown in other states to provide students with more engaging and relevant opportunities to apply their mathematical knowledge as well as set them up for success in post-secondary education or career readiness (Daro & Asturias, 2019). Universities and colleges around the country have begun to implement pathway initiatives to align students’ entry college mathematics courses with their intended major. These initiatives have proven to better prepare students for success in college-level math courses. Students in these pathway initiatives are three to four times more likely to complete a college-level math course than if they took a traditional remedial course ([Burdman, 2018](#)). Modernizing Algebra 2 and including pathways courses will provide students an earlier entry into pathway initiatives and prepare them for success in college math.

Offering students multiple pathways is supported and reflected in post-secondary academic settings as well as in career fields ([Community College Research Center, 2018](#)). In the modern workforce, expectations for new employees are to have critical thinking, problem-solving, and collaboration skills, with a developed sense of responsibility and accountability. Employers are looking for individuals who can work independently, identify a problem, and decide how to work toward a solution. Being a part of a team or company requires a set of collaborative skills. Self-awareness of one’s abilities when working with others enforces accountability and responsibility. The demonstration of competency in these areas has shown a great impact on success in the modern workplace.

This shift towards a focus on data science and statistics in high school is a response to what colleges across the country are doing and the skills needed for careers. Research from Complete College America shows that higher education pathways are prioritizing quantitative reasoning and statistics alongside calculus (Figure 2). Employers are looking to hire individuals that can analyze and communicate data, as shown by research findings by Burning Glass Technologies (Figure 3). However, despite this need, employers are having a hard time

Figure 2: A finite set of Math Pathways aligned to majors (Complete College America)



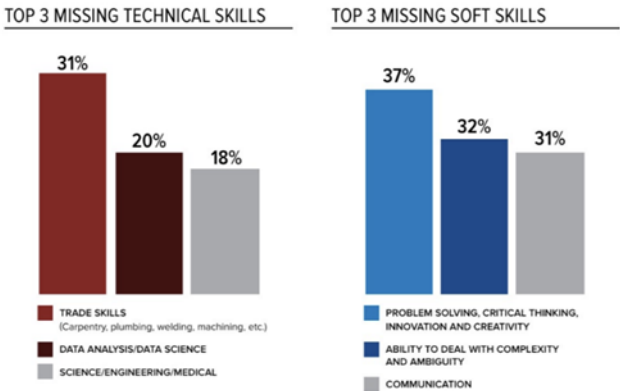
finding candidates with these desired skills including data analysis and interpretation and implementation of data science (Figure 4).

Figure 3: Demand for New Foundational Skills
Employers are Looking to Hire Individuals that can Analyze and Communicate Data

Foundation Skill Area	Total Openings: 2017	Growth: 2012-2017	Share of Openings Outside IT and Analysis Job Families
Managing data	3,527,740	24%	29%
Software development	3,326,192	44%	21%
Computer programming	2,571,728	35%	15%
Analyzing data	1,320,678	68%	58%
Digital security & privacy	895,547	75%	28%
Business process	3,215,648	18%	70%
Project management	2,354,230	21%	68%
Digital design	1,427,981	2%	54%
Communicating data	147,219	323%	32%

Source: The New Foundational Skills of the Digital Economy Report (BHEF, 2018)

Figure 4: What Skills are Missing?
Employers are Having a Hard Time Finding Candidates with the Desired Skills



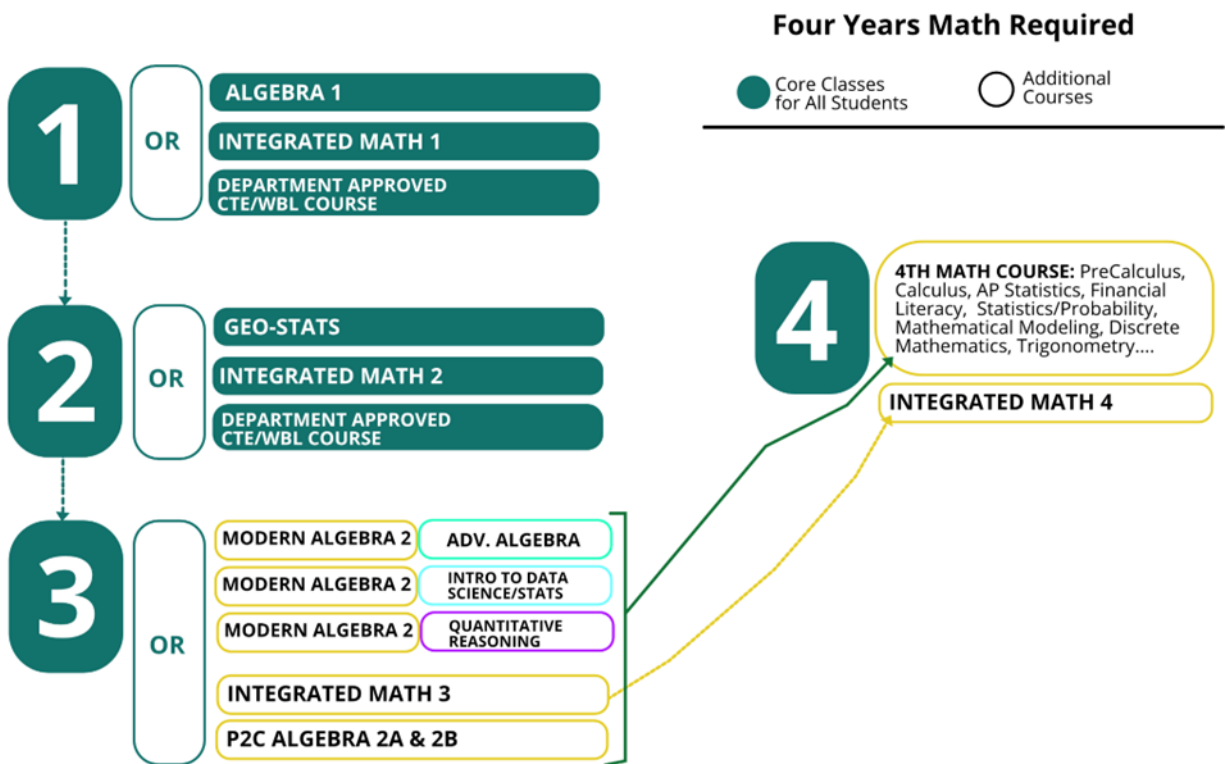
Source: 2019 State of the WorkPlace (SHRM, 2019)

Proposal

Our proposal is to offer a year long Modern Algebra 2 course. In the first semester, students are exposed to essential Algebra 2 content with a focus on understanding the *why* behind the concepts through the use of technology and modeling. During the second semester of the Modern Algebra 2 course, students will select one of the following semester-based pathways to take (Figure 5):

- Introduction to Data Science and Statistics (IDSS)
- Quantitative Reasoning (QR)
- Advanced Algebra Concepts (AAC)

Figure 5: A Model of Potential Pathways for Students with Geo-Stats and Modern Algebra 2 courses.



Source: Re-Envision High School Math Pathways Working Group (2024)

In addition to the year-long Modern Algebra 2 course, we also propose a modernized Geometry course that engages students in relevant geometry content interwoven with essential content in statistics (Figure 4).

The Modern Algebra 2 course allows students to develop these skills necessary for their future aspirations. Students with the intention to enter the workforce after high school or college will have the ability to choose various paths to prepare themselves for the job market. For example, the Quantitative Reasoning pathway focuses on how to use statistics to comprehend mathematical surveys and readings. Students develop real number operations to apply to real-world situations with a refined number sense, including dimensional analysis using fractions, decimals, and percentages. This pathway supports students who are interested in majors and career fields in liberal arts, fine arts, and humanities. The Introduction to Data Science and Statistics pathway provides an overall understanding of data and their trends. This course develops an understanding to critically think and problem solve of data interpretation to make more informed decisions in the workplace. This pathway serves students who are interested in majors and careers in social science, social services, nursing, and other health professions. Finally, students might consider taking the Advanced Algebra Concepts pathway. In this pathway, students study a higher comprehension of algebraic concepts incorporating critical thinking, problem solving, collaboration skills with a developed sense of responsibility and accountability. This pathway enhances a student’s algebra knowledge on their path towards calculus. The modeling of real world problems in all three pathways emphasizes the application of algebraic concepts to model and solve real-world problems. Preparing students for the workforce with the necessary skills and



knowledge, students will successfully navigate and be prepared for the challenges of the professional world.

Currently, the traditional path through Algebra 2 to Precalculus assumes this course sequence fits all students' future goals. Providing pathways allows students of all abilities to have more time built into the curriculum to focus on the content they need to know for their future. In Modern Algebra 2, we take students' career paths into consideration and provide necessary resources to understand what type of mathematics would be most helpful for their future aspirations. The different pathways in the second semester give students the opportunity to be exposed to mathematics that will be directly applicable to their future career. These pathways are also an opportunity for a student to see if they are interested in a different type of mathematics. However, it might be the case that a student takes Quantitative Reasoning and then realizes they actually enjoyed the thinking of algebra and want to continue building to calculus. That is possible! No matter the pathway chosen in their second semester of Modern Algebra 2, students can select a variety of fourth year courses, including Precalculus. Providing students these pathways earlier in their academic career not only better prepares them for their future, it can also excite students and reignite an interest in mathematics and school.

Pathways do not restrict students; they provide a more solid foundation of the math students will need in the future. Regardless of pathway, the first semester of Modernized Algebra 2 provides all needed math skills for students to be successful in college, trades, and on standardized tests, like the SAT.

Potential Challenges

With any changes to courses or the introduction and implementation of a new course, many questions and concerns arise. We acknowledge there are more implementation concerns and discussions to be had, and we look forward to receiving feedback from our communities to focus our discussions on their direct concerns. For now, here are some concerns we surfaced during our discussions and concerns we worked through to ensure Modern Algebra 2 serves not just all our students, but also our teachers and communities.

We recognize teachers' workload will be a concern; however, new courses should not require additional teachers or increased teacher load. The number of new sections will be determined by student choices. Currently, teachers have the expertise to teach the pathways and teachers can volunteer to teach the pathways based on their interest in the different areas.

With the introduction of pathways, there may be questions around how students choose a pathway. Student interest areas and career aspirations can help determine what pathway would best service a student. Math teachers and counselors will have resources to help assist a student in determining what pathway would be best for their future aspirations. Once a student chooses a pathway, they are able to make a different choice in their fourth year. We recognize that students' interests and aspirations may change as they learn more about the world. Therefore, it is important to keep the pathways open and flexible for students. We know that the door to STEM fields can close too early for students, so it was imperative for our design to ensure students who wish to take Precalculus after Modern Algebra 2 would be prepared and able to do so no matter what pathway they chose during their second semester of Modern Algebra 2.



We know there may be concerns about how compacting essential Algebra 2 concepts into a semester might impact students' performance in future courses or the SAT. There is evidence that students can succeed in rigorous college level math courses without showing Proficiency in traditional Algebra 2 high school courses ([ECS, 2020](#)). This Modern Algebra 2 course will not eliminate the opportunity for future mathematics experiences or college opportunities. Algebra 2 and the SAT are not a requirement for admission to New Mexico colleges and universities. Modern Algebra 2 will not create barriers for students. In fact, it dismantles barriers of learning for students and gives them the opportunity to access mathematics that is relevant to their lives.

Modern Algebra 2 Course

Modern Algebra 2 will meet the needs of state graduation requirements while equipping students with the skills needed to succeed on state standardized tests, college entrance exams, and in future endeavors—whether or not they pursue post-secondary education. Modern Algebra 2 is a year-long high school course taught after students take Algebra 1 and Geometry. The first semester of Modern Algebra 2 will provide all students with the foundational knowledge and skills needed for any of the second semester mathematical focus groups, as well as prepare students for additional advanced level mathematics. In the second semester of the course, students will select one of three pathways that align to their goals and aspirations. Students self-select their pathway to better meet their individual needs. These pathways can better support New Mexican students to prepare for their futures, whether they choose to attend a four-year college, join the workforce, and/or plan on a certificate program or trade. Using the structure of Modernized Math Pathways, we can “both adequately prepare students for formative experiences in their college-level STEM classes and provide mathematical avenues that better reflect our society’s changing needs, purposefulness in math learning, and collaboration among students” ([Rios, 2022](#)).

Modern Algebra 2 First Semester

The first semester of Modern Algebra 2 centers around Families of Functions with a focus on contextual applications thereof. Students start with an investigation of linear and absolute value functions and systems of linear functions. They then move into exploring exponential and quadratic functions, and advanced piecewise functions. Finally, student learning of foundational skills culminates in an understanding of higher order polynomial functions. These foundational skills will effectively pave the way for success on any of the three mathematical pathways students choose to embark upon in the second semester of Modern Algebra 2, and in their future career and college endeavors.

Below is the scope with the standards that will be covered in the first semester of Modern Algebra 2.



Table 2: Scope of Modern Algebra 2 Semester 1 with Standards Breakdown

<p>Perform arithmetic operations on polynomials. Understand the relationships between zeros and factors of polynomials Rewrite rational expressions.</p> <ul style="list-style-type: none"> • HSA.APR.A.1 • HSA.APR.B.3 • HSA.APR.D.6 <p>Create equations that describe numbers or relationships.</p> <ul style="list-style-type: none"> • HSA.CED.A.1 • HSA.CED.A.2 • HSA.CED.A.3 • HSA.CED.A.4 <p>Represent and solve equations and inequalities graphically.</p> <ul style="list-style-type: none"> • HSA.REI.D.11 <p>Interpret the structure of expressions.</p> <ul style="list-style-type: none"> • HSA.SSE.A.1a • HSA.SSE.A.1b • HSA.SSE.A.2 	<p>Build a function that models a relationship between two quantities.</p> <ul style="list-style-type: none"> • HSF.BF.A.1 • HSF.BF.B.3 <p>Build new functions from existing functions. Interpret functions that arise in applications in terms of the context.</p> <ul style="list-style-type: none"> • HSF.IF.B.4 • HSF.IF.B.5 • HSF.IF.B.6 <p>Analyze functions using different representations.</p> <ul style="list-style-type: none"> • HSF.IF.C.7.b • HSF.IF.C.7.e • HSF.IF.C.8.a • HSF.IF.C.8.b • HSF.IF.C.9 <p>Perform arithmetic operations with complex numbers. Use complex numbers in polynomial identities and equations.</p> <ul style="list-style-type: none"> • HSN.CN.A.1 • HSN.CN.C.7
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Source: Re-Envision High School Math Pathways Working Group

Modern Algebra 2 Second Semester

The second semester of Modern Algebra 2 is when students have the opportunity to select a math pathway that aligns to their future aspirations and college and career goals. These three pathways allow students the chance to experience a different type of mathematics during the semester. The three pathways are Quantitative Reasoning, Introduction to Data Science and Statistics, and Advanced Algebra Concepts.

Quantitative Reasoning. Technological advances in the 21st century require a quantitatively literate citizenry with the ability to reason and solve sophisticated quantitative problems and communicate at a



substantial level about quantitative issues in everyday life. The Quantitative Reasoning (QR) pathway emphasizes the higher-order reasoning and critical thinking skills needed to understand and create sophisticated arguments supported by quantitative data. This pathway is appropriate for fields in the liberal arts such as political science, history, and English literature.

The following learning outcomes will represent the priority instructional content for the second semester Quantitative Reasoning pathway. Quantitative literacy is often defined as the ability to understand and use numbers and data analysis in everyday life. This semester would focus on statistics, probability, numbers, ratios and proportional reasoning, and modeling. The semester will culminate with a capstone project where students will demonstrate their learning from the semester and how it applies to their lives. The standards to be covered in the semester QR pathway can be found below.

Quantitative Reasoning

“Quantitative reasoning is a habit of mind—seeking pattern and order when faced with unfamiliar contexts. A rigorous quantitative reasoning course recognizes the need for data-driven decision making, and brings to light the dangers inherent in basing decisions solely on anecdotal evidence” ([Dana Center, n.d.](#))

Table 3: Scope of Quantitative Reasoning Semester with Standards Breakdown

<p>Summarize, represent, and interpret data on a single count or measurement variable.</p> <ul style="list-style-type: none"> • HSS.ID.A.1 • HSS.ID.A.2 • HSS.ID.A.3 <p>Create equations that describe numbers or relationships.</p> <ul style="list-style-type: none"> • HSA.CED.A.3 <p>Summarize, represent, and interpret data on two categorical and quantitative variables.</p> <ul style="list-style-type: none"> • HSS.ID.B.5 • HSS.ID.B.6 <p>Interpret linear models.</p> <ul style="list-style-type: none"> • HSS.ID.C.7 <p>Understand and evaluate random processes underlying statistical experiments.</p> <ul style="list-style-type: none"> • HSS.IC.A.1 	<p>From sample surveys, experiments, and observational studies.</p> <ul style="list-style-type: none"> • HSS.IC.B.3 • HSS.IC.B.4 • HSS.IC.B.5 • HSS.IC.B.6 <p>Understand independence and conditional probability and use them to interpret data</p> <ul style="list-style-type: none"> • HSS.CP.A.2 • HSS.CP.A.4 • HSS.CP.A.5 <p>Use the rules of probability to compute probabilities of compound events in a uniform probability model.</p> <ul style="list-style-type: none"> • HSS.CP.B.6
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Introduction to Data Science and Statistics. Introduction to Data Science and Statistics (IDSS) allows third year math students an opportunity to take a deeper dive into priority instructional content around high school data science. The Common Core State Standards focus for this course is “Interpreting Categorical and Quantitative Data” and “Making Inferences and Justifying Conclusions”, with an introduction to conditional probability.

The IDSS pathway introduces students to the mathematics of data, uncertainty, and making inferences and prepares students to read and think critically about the stories being told with data. This pathway sets the stage for students pursuing careers in business, allied health, nursing, and the social and behavioral sciences . Table 4 includes the standards to be covered in the semester pathway of IDSS, found below.

Impact of Data Science

“[High school data science] gives students the opportunity to engage creatively, socially, and rigorously with the world around them and critique it using data. There is no need to look for ways to apply data science to the real world, as it is already a tool for understanding it!” (Rios, 2022)

Table 4: Scope of Introduction to Data Science and Statistics with Standards Breakdown

<p>Understand and evaluate random processes underlying statistical experiments.</p> <ul style="list-style-type: none"> • HSS.IC.A.1 • HSS.IC.A.2 <p>Make inferences and justify conclusions from sample surveys, experiments, and observational studies.</p> <ul style="list-style-type: none"> • HSS.IC.B.3 • HSS.IC.B.4 • HSS.IC.B.6 <p>Summarize, represent, and interpret data on a single count or measurement variable.</p> <ul style="list-style-type: none"> • HSS.ID.A.1 • HSS.ID.A.2 • HSS.ID.A.3 	<p>Summarize, represent, and interpret data on two categorical and quantitative variables.</p> <ul style="list-style-type: none"> • HSS.ID.B.5 • HSS.ID.B.6.a • HSS.ID.B.6.b • HSS.ID.B.6.c <p>Interpret linear models.</p> <ul style="list-style-type: none"> • HSS.ID.C.7 • HSS.ID.C.8 • HSS.ID.C.9 <p>Understand independence and conditional probability and use them to interpret data.</p> <ul style="list-style-type: none"> • HSS.CP.A.4
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Source: Re-Envision High School Math Pathways Working Group

Advanced Algebraic Concepts. The Advanced Algebra Concepts pathway is the bridge to Pre-Calculus and Calculus coursework in the 4th year of high school and the first year of the college experience. The Advanced Algebra Concepts pathway emphasizes modeling through problems relevant to students who plan to pursue

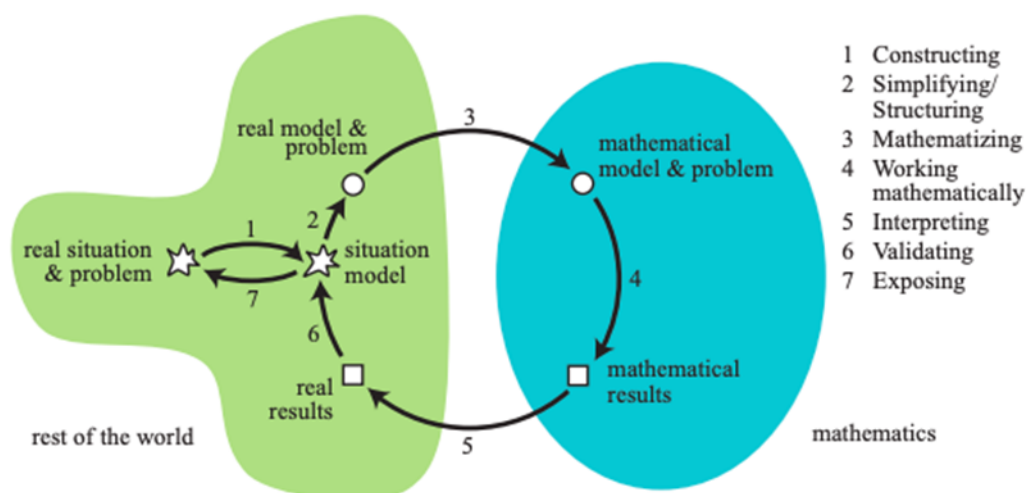


degrees in science, technology, engineering, or mathematics and who plan to take one or more of the traditional Calculus courses.

In the Advanced Algebra Concepts pathway, the focus of the curriculum is on advanced function types. This course will cover logarithmic functions, radical functions, rational functions, polynomial functions, and trigonometric functions. Each of these function types has its properties, graphs, relationships, and applications, and studying them deeply is an integral part of advanced mathematics. They form the building blocks for understanding more complex mathematical concepts and models and are useful in various fields like physics, engineering, and finance.

It is recommended that this course place a strong emphasis on modeling with the advanced function types named above. According to the Common Core State Standards (CCSS) in Mathematics, “Modeling is best interpreted not as a collection of isolated topics but in relation to other standards”. The process of authentic mathematical modeling can best be described with the graphic provided by Blum and Ferri ([2009](#)).

Figure 5: A Typical Modeling Process



Source: Blum and Ferri, [2009](#), pg. 46

Creating a Mathematical Modeling Course for High School

“The course should allow students to deepen their understanding of the modeling process, apply in new contexts mathematical models they have already learned, and learn new mathematics content to solve unique real-world problems. Students with a strong background in mathematical modeling should be able to apply mathematics to understand or solve novel problems in career and college settings. A modeling course should allow students to experience all stages of the modeling process, including problem formation; a model building that incorporates a variety of mathematical models, skills, and tools for solving the problems; and sufficient analysis to determine if the solution is reasonable or if the model should be revised.” (California Curriculum Frameworks Appendix B, [2013, p.806](#)).

Table 5: Scope of Advanced Algebraic Concepts with Standards Breakdown

<p>Build new functions from existing functions.</p> <ul style="list-style-type: none"> • HSF.BF.B.4.A <p>Construct and compare linear, quadratic, and exponential models and solve problems.</p> <ul style="list-style-type: none"> • HSF.LE.A.4 <p>Write expressions in equivalent forms to solve problems.</p> <ul style="list-style-type: none"> • HSA.SSE.B.4 <p>Understand the relationship between zeros and factors of polynomials.</p> <ul style="list-style-type: none"> • HSA.APR.B.2 • HSA.APR.B.3 • HSA.APR.C.4 • HSA.APR.C.5 <p>Rewrite rational expressions</p> <ul style="list-style-type: none"> • HSA.APR.D.6 • HSA.APR.D.7 <p>Perform arithmetic operations with complex numbers.</p> <ul style="list-style-type: none"> • HSN.CN.A.2 • HSN.CN.A.3 • HSN.CN.C.8 • HSN.CN.C.9 	<p>Analyze functions using different representations.</p> <ul style="list-style-type: none"> • HSF.IF.C.7 <p>Understand solving equations as a process of reasoning and explain the reasoning.</p> <ul style="list-style-type: none"> • REI.A.2 <p>Represent and solve equations and inequalities graphically.</p> <ul style="list-style-type: none"> • HSA.REI.D.11 <p>Extend the domain of trigonometric functions using the unit circle.</p> <ul style="list-style-type: none"> • HSF.TF.A.1 • HSF.TF.A.2 • HSF.TF.A.4 <p>Model periodic phenomena with trigonometric functions.</p> <ul style="list-style-type: none"> • HSF.TF.B.5 <p>Prove and apply trigonometric identities.</p> <ul style="list-style-type: none"> • HSF.TF.C.8
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Source: Re-Envision High School Math Pathways Working Group

Geo-Stats

In the last few months of meetings, the working group also wanted to revisit early discussions on Geometry. Members tackled this course by first backwards planning from Modernized Algebra 2 and skills needed for success on SAT.

This course, Geo-Stats, short for Geometry and Statistics, would focus on the essential components of



Geometry and meaningfully incorporate skills and concepts in statistics that all students should engage in to be well-rounded citizens.



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Appendix A—Social Media Postings (Samples)

ATTENTION PLEASE!

ARE YOU INTERESTED IN LEARNING ABOUT IMPROVING OPPORTUNITIES FOR STUDENTS DURING THEIR HIGH SCHOOL CAREER?

Dedicated groups have been working to develop a third year high school course designed to prepare students for future academic and professional success while emphasizing the relevance of mathematics. Modern math pathways provides students with the opportunity to choose a pathway that aligns to their individualized college and career aspirations. Allowing students to select content that connects mathematics to their path will ensure students see the practical value of mathematics in their future endeavors. These potential courses serves students pursuing any major or career field. To learn more, join us at one of our virtual and in person events!

nmpubliceducation

The Math and Science Bureau has engaged a stakeholder group to re-envision high school math pathways. This working group is a collaborative effort between stakeholders in K-12 mathematics, postsecondary, workforce, informal education and national labs. They started their work in March 2023 with the task to create modern and innovative mathematics pathways, aligned with students' goals and aspirations. They are developing recommendations for re-envisioning high school math pathways to present to the PED next year, with opportunity for public feedback.

February 12th, 2024, at 5:00 p.m. - Zoom Link : <https://us02web.zoom.us/j/8888888888>

March 4th, 2024, at 5:00 p.m. - Zoom Link : <https://us02web.zoom.us/j/9999999999>

6 likes

February 2

Add a comment...

Post

Schedule of Events

Re-Envisioning Math Pathways Listening Tour Dates

All listening tour sessions will be from 5:00 to 7:00 p.m. MT. We will start with a 30-minute presentation followed by structured discussion.

2/5 - In Person: Raton - High Plains Regional Educational Cooperative #3 Conference Room; 101 North 2nd St., Raton, NM 87740 5:00 - 7:00pm
2/12 - Virtual Meeting - Link
2/22 - In Person: Portales - Eastern New Mexico University, Student Union Campus, Golden Student Success Center, Room 105, Portales, NM 88130.
2/26 - In Person: Deming - Southwest Regional Education Cooperative #10 Conference Room, 1321 East Poplar Street, Deming, NM, 88030
2/27 - In Person: Ruidoso - Region IX Education Cooperative #9 Conference Room, 143 El Paso Road, Ruidoso, NM 88345
3/4 - Virtual Meeting - Link

nmpubliceducation

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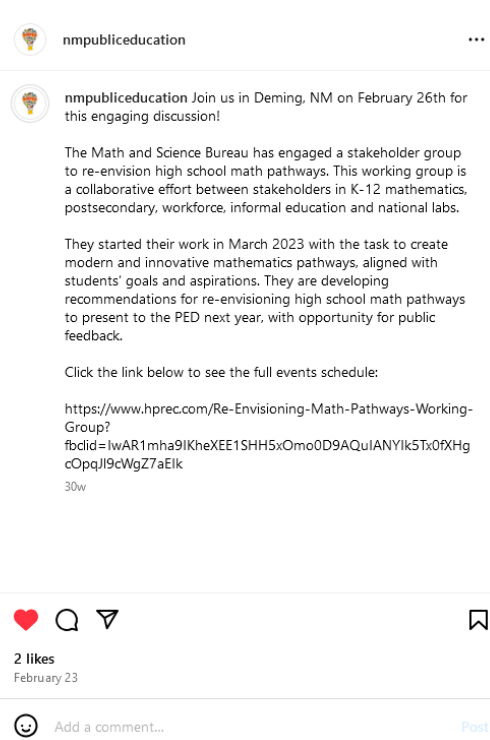
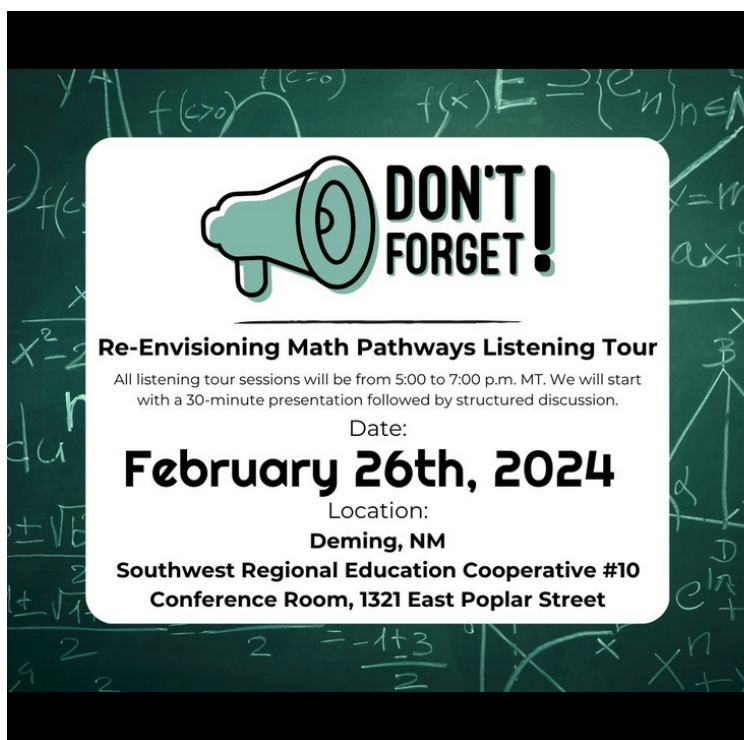
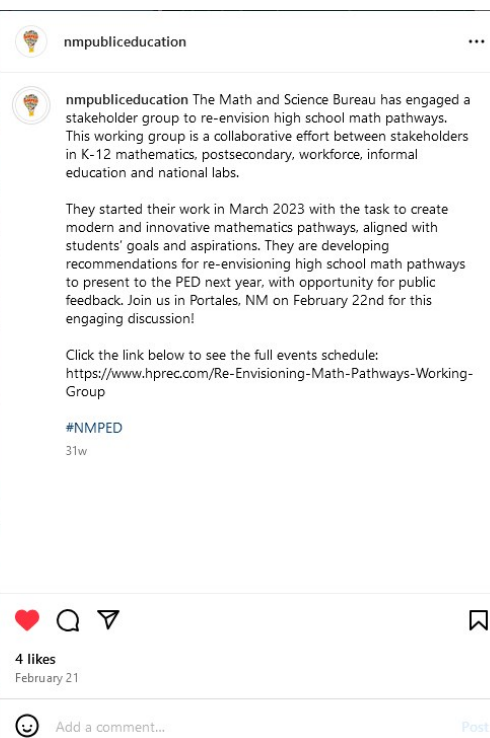
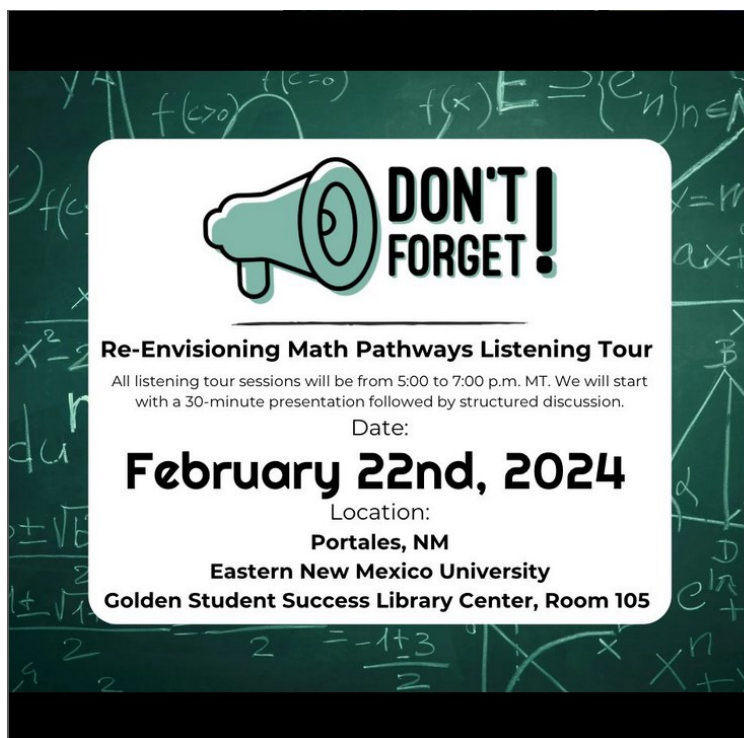
March 4th, 2024, at 5:00 p.m. - Zoom Link : <https://us02web.zoom.us/j/9999999999>

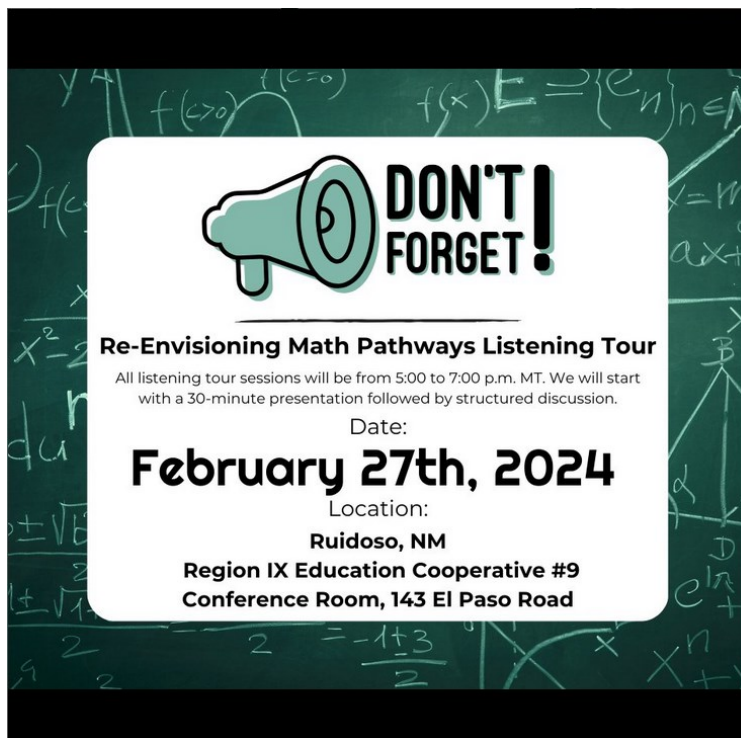
6 likes

February 2

Add a comment...

Post





DON'T FORGET!

Re-Envisioning Math Pathways Listening Tour

All listening tour sessions will be from 5:00 to 7:00 p.m. MT. We will start with a 30-minute presentation followed by structured discussion.

Date:
February 27th, 2024

Location:
Ruidoso, NM
Region IX Education Cooperative #9
Conference Room, 143 El Paso Road

 nmpubliceducation

 nmpubliceducation Join us in Ruidoso, NM on February 27th for this engaging discussion!

The Math and Science Bureau has engaged a stakeholder group to re-envision high school math pathways. This working group is a collaborative effort between stakeholders in K-12 mathematics, postsecondary, workforce, informal education and national labs.

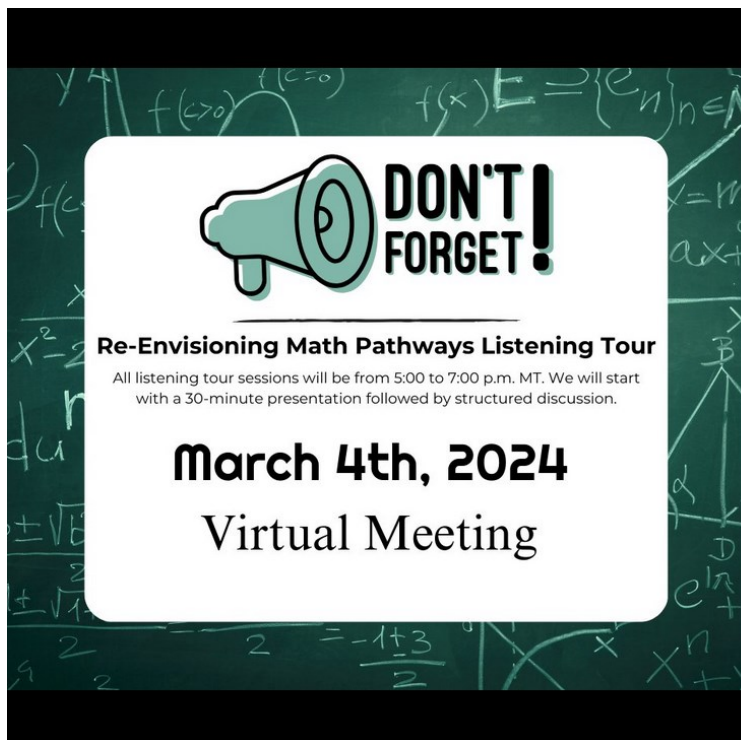
They started their work in March 2023 with the task to create modern and innovative mathematics pathways, aligned with students' goals and aspirations. They are developing recommendations for re-envisioning high school math pathways to present to the PED next year, with opportunity for public feedback.

Click the link below to see the full events schedule:

<https://www.hprec.com/Re-Envisioning-Math-Pathways-Working-Group?fbclid=IwAR1mha9lKheXEE1SHH5xOmo0D9AQuIANYIk5Tx0fXHgCOpqJl9cWgZ7aElk>

30w

1 like
February 26




DON'T FORGET!


Re-Envisioning Math Pathways Listening Tour

All listening tour sessions will be from 5:00 to 7:00 p.m. MT. We will start with a 30-minute presentation followed by structured discussion.

March 4th, 2024

Virtual Meeting

 nmpubliceducation

 nmpubliceducation Join us on March 4th via zoom for this engaging discussion!

The Math and Science Bureau has engaged a stakeholder group to re-envision high school math pathways. This working group is a collaborative effort between stakeholders in K-12 mathematics, postsecondary, workforce, informal education and national labs.

They started their work in March 2023 with the task to create modern and innovative mathematics pathways, aligned with students' goals and aspirations. They are developing recommendations for re-envisioning high school math pathways to present to the PED next year, with opportunity for public feedback.

Click the zoom link below to register:

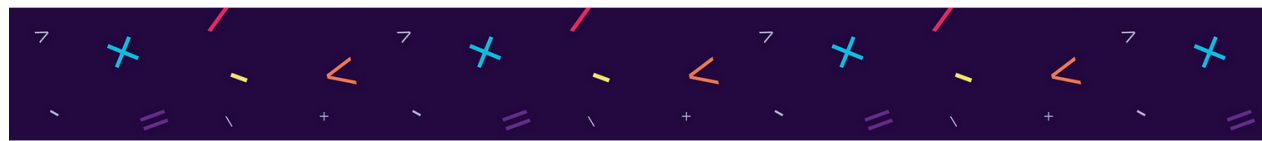
https://us02web.zoom.us/webinar/register/WN_zC1h2kmSTbOJnPOKJwj9tw#/registration

29w

1 like
March 1



Appendix B—Public Website



Re-Envisioning Math Pathways Working Group

High Plains REC is the host of this webpage. High Plains REC had no part in the development of any of the material posted on this webpage.

The New Mexico Public Education Department Math and Science Bureau staff sought to evaluate and interrogate the current state of mathematics education in the secondary (grades 9–12) space. Coming out of the pandemic, it brought to the forefront the inequitable educational system many students, especially historically disenfranchised students. Staff began researching state policies and practices around high school mathematics. Our goal and charge is to modernize and align mathematics pathways to fields of study and address inequities in the system that disproportionately affect historically marginalized students.

[Read More](#)

El personal de la Oficina de Ciencias y Matemáticas del Departamento de Educación Pública de Nuevo México buscó evaluar e interrogar el estado actual de la educación matemática en el espacio secundario (grados 9 a 12). Al salir de la pandemia, se puso en primer plano el sistema educativo injusto de muchos estudiantes, especialmente los estudiantes históricamente privados de sus derechos. El personal comenzó a investigar las políticas y prácticas estatales en torno a las matemáticas de la escuela secundaria. Nuestro objetivo y encargo es modernizar y alinear los itinerarios de matemáticas con los campos de estudio y abordar las desigualdades en el sistema que afectan desproporcionadamente a los estudiantes históricamente marginados.

[Leer más](#)

Public Comment Period

Thursday, January 18 to Monday, March 18, 2024, at 11:45 p.m. (MDT)

Submit Public Comment/
Feedback »

Enviar Comentario/Feedback
Pública »

Listening Tour Schedule

All listening tour sessions will be from 5:00 to 7:00 p.m. MT. We will start with a 30-minute presentation followed by structured discussion.

- **January 22, 2024: Virtual** - [Register Here/Registrarse aquí](#)
- **January 23, 2024: Farmington** - Farmington Municipal Schools Boardroom, 3401 East 30th Street, Farmington, NM 87402
- **January 25, 2024: Albuquerque** - Central Regional Education Cooperative, Semilla Conference Room, 4216 Balloon Park Road NE, Albuquerque, NM 87109
- **January 29, 2024: Las Vegas** - New Mexico Highlands University, Student Union Building Room 322, 905 Boca Avenue, Las Vegas, NM 87701
- **February 5, 2024: Raton** - High Plains Regional Education Cooperative #3 Conference Room; 101 North 2nd Street, Raton, NM 87740
- **February 12, 2024: Virtual** - [Register Here/Registrarse aquí](#)

Quick Links

- [Submit Public Comments/Feedback](#)
- [Enviar Comentario/Feedback Públicos](#)

Contact/Contacto:

If you have trouble accessing the documents or any links, please contact stem.learning@state.nm.us.

Si tienes dificultades para acceder a los documentos o cualquier enlace, por favor, ponte en contacto con stem.learning@state.nm.us.



marginados.

[Leer más](#)

Public Comment Period

Thursday, January 18 to Monday, March 18, 2024, at 11:45 p.m. (MDT)

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Pública »

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- **February 27, 2024: Ruidoso** - Region IX Education Cooperative #9 Conference Room, 2002 Sudderth Drive, Ruidoso, NM 88345
- **March 4, 2024: Virtual** - [Register Here/Registrarse aquí](#)

Light beverages and snacks will be provided during in-person sessions only.



Select Language ▼

Light beverages and snacks will be provided during in-person sessions only.

Discussion Drafts

Making the Case

English/Inglés »

Spanish/Español »

Modernized Algebra 2 Scope

English/Inglés »

Spanish/Español »

Advanced Algebra Scope

English/Inglés »

Spanish/Español »

Introduction to Data Science and Statistics Scope

English/Inglés »

Spanish/Español »

Quantitative Reasoning Scope

English/Inglés »

Spanish/Español »

Select Language ▼

