# 2021 School Counselors' Virtual Conference

# NM READY AND EQUITABLE CAREER TECHNICAL EDUCATION


## DR. JOSEPH GOINS

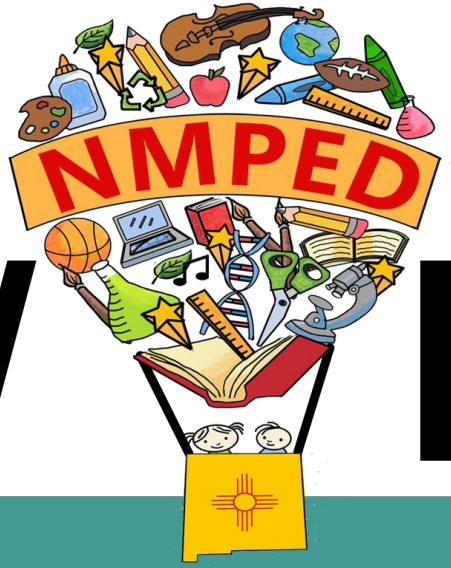

Session Time: 11:00 a.m.

# Dr. Joseph Goins

NS4ed CEO **Dr. Joseph Goins'** career began as a Vocational Educator in the state of Tennessee, where he had the opportunity to develop the foundational skills program for learners with the Tennessee Board of Regents System and systematically helped developed the occupational profiles for the work ready credential. He received a BA from Berea College in Kentucky and earned a Masters of Science Degree in Administration and Supervision from the University of Tennessee. Joseph Goins completed his Ed D. from Vanderbilt University in Educational Leadership and Policy.

Joseph's 20+-year career has brought him to have a deep understanding of the integration of technology into the classroom through resources that promote student achievement, teacher effectiveness, and leadership strategies for administrators. He has led sales, marketing, and professional development efforts in all markets across the U.S. and international markets. Joseph has developed a stellar track record of increasing market share, profitability, and the development of product offerings while at the same time focusing on the needs of learners and educators.

Currently, Joseph Goins is the CEO of an action-based research company, NS4ed, which works closely with companies, schools, teachers, and educators alike to understand how to apply best practices and research into practice. He works with schools across the country helping them to identify the best solution that fits their culture, needs, and ultimately ones that allow learners to be successful.

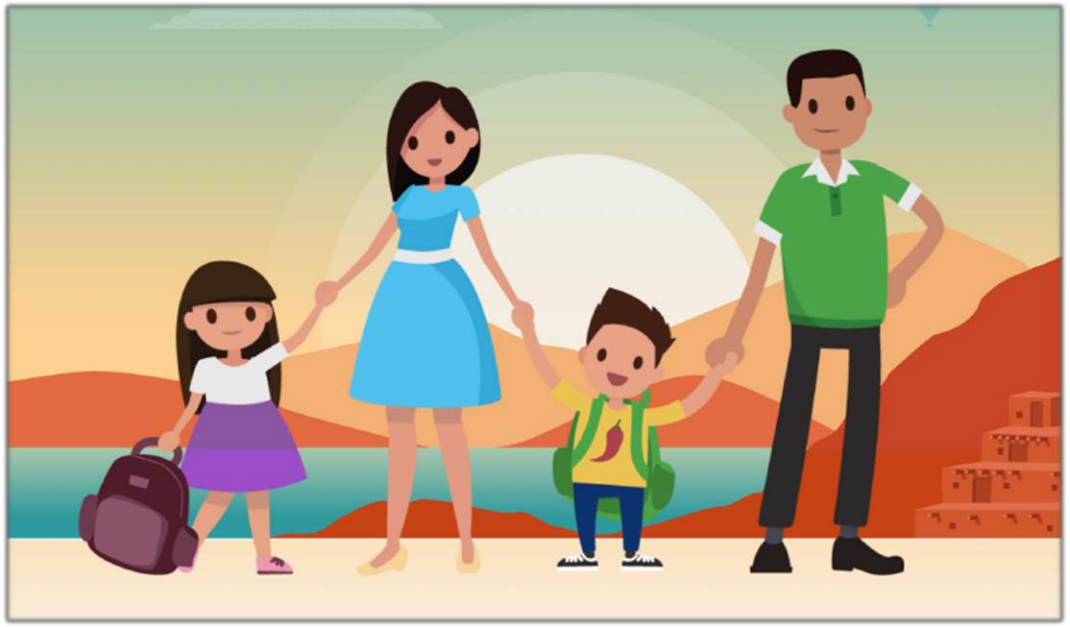



NEW MEXICO

# Public Education Department

## NM Career Ready and Equitable CTE

NEW MEXICO
Public Education Department



# Mission

## *Equity, Excellence, and Relevance*

The New Mexico Public Education Department partners with educators, communities, and families to ensure that all students are healthy, secure in their identity, and holistically prepared for college, career, and life.

NEW MEXICO
Public Education Department

# Vision

*Rooted in our Strengths*

Students in New Mexico are engaged in a culturally and linguistically responsive educational system that meets the social, emotional, and academic needs of all students.

# Goal 1 – An Educational System that Benefits the Whole Child

Initiatives

- Culturally and Linguistically Responsive Education Framework
- Integrated Social and Emotional Learning
- Support for Special Education
- Academic Content Mastery

# Goal 2 – A Vibrant Educator Ecosystem

## Initiatives

- Educator Pipeline
- Educator Preparation
- Educator Quality and Professional Learning
- Educational Leadership

# Goal 3 – Equitable Access to Educational Opportunities For Students and Families

Initiatives

- Extended Learning Opportunities
- Evidence Based Community Schools
- Targeted and Comprehensive Support for Struggling Schools
- New Mexico Multi-layered System of Supports for Students

# Goal 4 – College and Career Pathways Aligned with the Profile of a New Mexico Graduate

Initiatives

- Profile of a New Mexico Graduate
- Universal Prekindergarten
- Family and Community Engagement
- Career and Technical Education Pathways
- Dual Credit, Advanced Placement, and College Pathways

# College & Career Readiness Bureau

## *Vision*

- All NM high school students
- **graduate and are career ready.**

- Graduates will have:

- the academic skills needed to succeed in postsecondary studies,
- the employability skills that are essential in any career area, and
- awareness of the next steps in their career path.

Search...

# Secretary DeVos Announces Student-Centered Grant Awards to Expand Personalized Learning through Course Access, Student-Centered Funding

SEPTEMBER 18, 2020

**Contact:** Press Office, (202) 401-1576, press@ed.gov (mailto: press@ed.gov)

WASHINGTON – Today, U.S. Secretary of Education Betsy DeVos announced new funding for two grant programs focused on meeting students' unique learning needs and improving student outcomes.

The Expanding Access to Well-Rounded Courses Demonstration Grants Program supports school districts' efforts to develop distance-learning opportunities, expand their course offerings, and ensure students have access to a broad range of advanced, career or technical, and other courses. The Well-Rounded Education Through Student-Centered Funding Demonstration Grants Program allows funding to follow individual students so that school districts can allocate resources in a way that provides a customized approach to education that considers individual needs in order to improve academic achievement.

"For more than 30 years, I've advocated not only for funding to follow students but also for students to have access to individualized education options tailored to meet their unique needs," said Secretary DeVos. "These two grant programs allow school districts the opportunity to do just that. Student-centered education—tailored to unique talents, skills, abilities and interests—is the future. I look forward to seeing positive results for students."

The Expanding Access to Well-Rounded Courses Demonstration Grants Program provides $9.6 million this year to six state educational agencies to develop or expand and implement models for providing well-rounded educational opportunities through increased course access for all students, including rural, disadvantaged, or those with disabilities. Potential course options that could be added by participating states include those related to the arts, science, technology, engineering, mathematics, computer science, career and technical education and advanced level coursework.

The Well-Rounded Education Through Student-Centered Funding Demonstration Grants Program provides over $1 million this year to two local educational agencies (LEAs) to demonstrate model programs for providing well-rounded education opportunities through the development and implementation of student-centered funding systems. The goal of the program is to help LEAs develop models for expanding and enhancing delivery of such opportunities for educationally disadvantaged students.

Both grant programs are funded through a required 2% set-aside of funds for technical assistance and capacity building under Title IV, Part A of the Elementary and Secondary Education Act of 1965.



# SEA Demonstration Grant

- The Expanding Access to Well-Rounded Courses **Demonstration Grants** program provides competitive **grants** to State educational agencies (SEAs) to demonstrate models for providing well-rounded educational opportunities through course-access programs

- (a) develop or expand, (b) implement, and (c) widely disseminate information on course-access programs (as defined in this notice) to other State or local education leaders and researchers

- In addition to serving all students, its proposed program would meet the needs of rural students, disadvantaged students, or students with disabilities, and contribute to preparing students to be college and career ready.

| OVERARCHING GOAL: | NM True CTE will make available a series of supports for online Career and Technical Education (CTE) and further students' abilities for a well-rounded education with enhanced career and college readiness upon high-school graduation. |
|---|---|

## INPUTS

Mobilized Resources

- New Mexico Public Education Department (NM PED)
- NM PED College and Career Ready Bureau Leadership
- REC, district and school leaders across 100% of NM's LEAs including:
  --10 Regional Education Cooperatives (RECs) ...representing 68 primarily rural districts.
  --23 LEAs in urban and suburban districts
- Perkins V- Comprehensive Local Needs Assessment (CLNA) Consortia
- CTE Industry Council
- Higher Ed Council
- Early College High Schools
- Multiple course providers:
  - Geographic Solutions (career exploration)
  - The Partnership for Workforce Innovation (soft skills)
  - NS4ed (STEM workforce contextual Algebra 1 and Geometry)
  - Front Porch Studios (business and community career podcasts)
  - Navajo Preparatory School Native American podcasts.
  - Edmentum (CTE Academies for hybrid ECHSs
- NM TRUE online course delivery platform
- MetaMetrics assessment provider
- Principal and Teacher Training Academies

→

## OUTPUTS/OBJECTIVES

Activities and Interventions

**NM PED works with Pathways2Careers to build the NM True CTE platform for online CTE course delivery across the state**

- All proposed courses will be loaded on the platform for virtual access.
- Platform portals allow administrator, teacher, parent, and student access.

**NM PED provides CTE opportunities accessible online to prepare students for college and careers**

- Career exploration
- Rigorous STEM learning through career-focused pre-Algebra, Algebra, and Geometry courses, which meet requirements for graduation.
- Employability Skills (soft skills)
- Multi-ethnic including Native American and Hispanic business and community leader podcasts (electives)

**Course curricula represent learning experiences contextual to CTE and college and career readiness**

- Align all course curricula with state standards
- Articulate courses for college credits and industry certifications.
- Work with business and community leaders to align podcasts with course content and high-demand careers.

**NM True CTE builds partnerships in support of CTE opportunities**

- Ensure college/career pathways mirror regional high-demand careers.
- Engage leaders from businesses, communities, and higher education with parents and schools in all program planning and operations to reflect a true coming together of education, the workforce, and local economies.

**School Districts assures high-need populations served**

- Establish equitable recruitment and enrollment guidelines, with priority for under-represented, high-need rural and other students.
- Provide hardware and software upgrades for participants needing support.
- Make CTE courses accessible both online and onsite to ensure rural students have access to programs not available in their schools.

**NM PED expands its support for ECHSs to include a hybrid online/onsite model**

- Provides additional support to rural and other schools with ECHS state designation process.
- Promotes effective partnerships between "local" colleges and ECHSs.
- Develops policy guidelines for a hybrid ECHS model that combines online and on-site course requirements and electives.
- Phases-in online CTE Academies to give rural students opportunities to build their technical skills online for high-demand careers.

***NM RECTE* enhances program for principal and teacher quality and leadership in support of on-site and online CTE course and pathways opportunities**

- Provide online PD Academy to train educators on how to use Labor Market Information to build their CTE programs.
- Provide online Principal and Teacher Training Academies to build skills in online coaching, mentoring, and administration.

**NM True CTE courses include high-level assessments to monitor student growth**

- Develop start-of-course, mid-course, and end-of course assessments embedded into each course.
- Create a menu of mid-course capstone projects for each course.
- Prepare NM True CTE Policy and Procedure Manual to guide continuous improvement, sustainability, and replicability in other states.

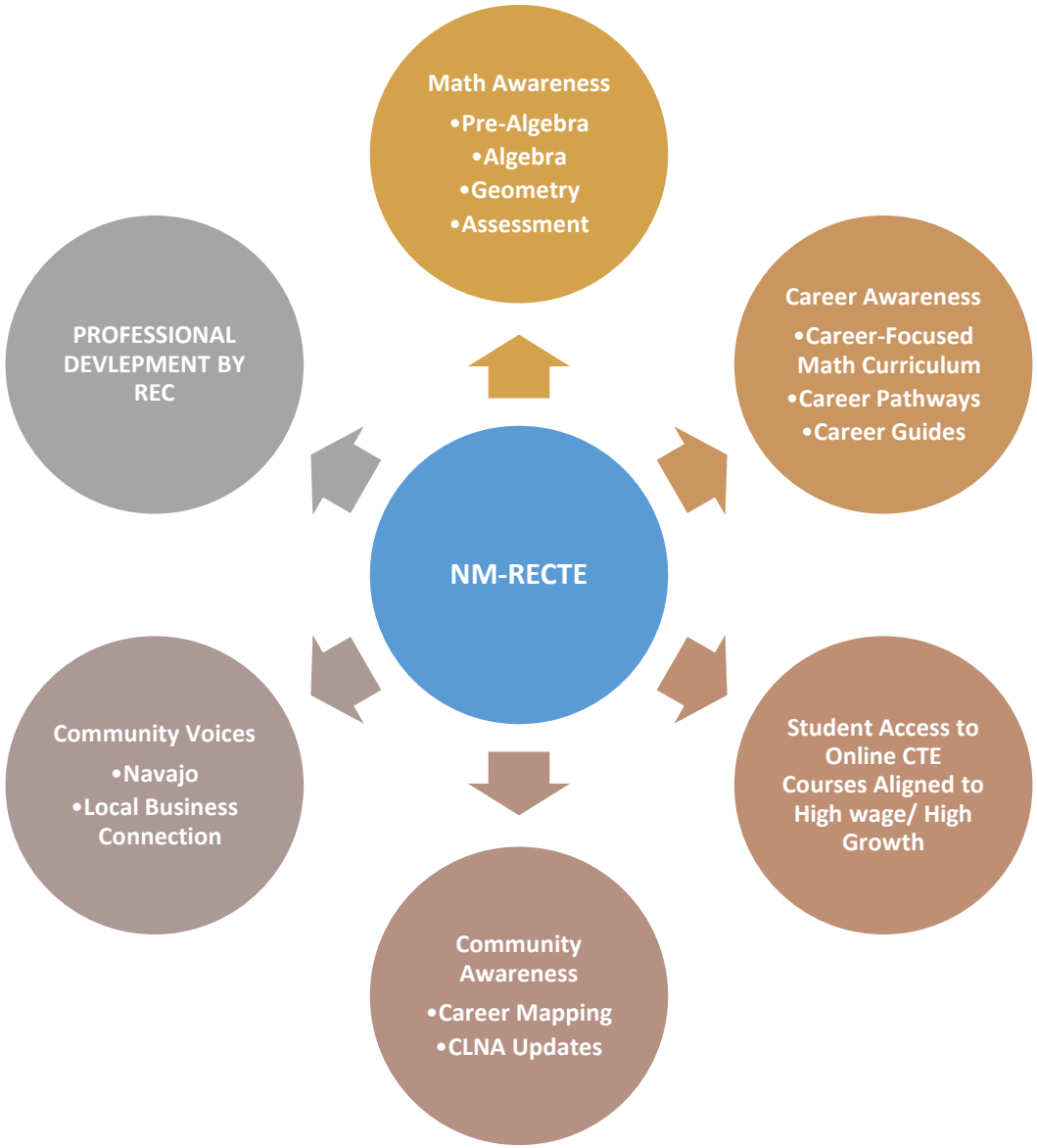
→

## OUTCOMES

| Short-term outcomes and measures | Long-term outcomes reflecting program objectives |
|---|---|
| • Increased awareness of career pathways and skill requirements.<br>• Improved employability skills<br>• Improved alignment of courses with local and regional workplace demand.<br>• Improved mathematics skills through career-focused course design.<br>• Quantile assessments of math coursework to measure skill growth.<br>• Increased course options for high-need students to prepare them for college and careers through CTE pathways.<br>• Increased number of ECHSs.<br>• Increased student outcomes including course completion, and growth in workplace and leadership skills as measured by imbedded course assessments. | • New Mexico's online CTE opportunities increase the preparedness of the State for seamless, uninterrupted teaching and learning.<br>• Online course accessibility increases CTE participation for students across the state, including rural and other under-served and under-represented students in college and high-demand careers.<br>• Completion of industry credentials and college credits increases prior to high-school graduation.<br>• Career and college readiness increases as more students enroll in CTE pathways as a result of greater course accessibility.<br>• Growth in employment outcomes for students transitioning directly into the workforce after high school.<br>• A hybrid ECHS model including onsite and online CTE course opportunities adds to this proven model for engaging underrepresented students in career and college focused learning. |

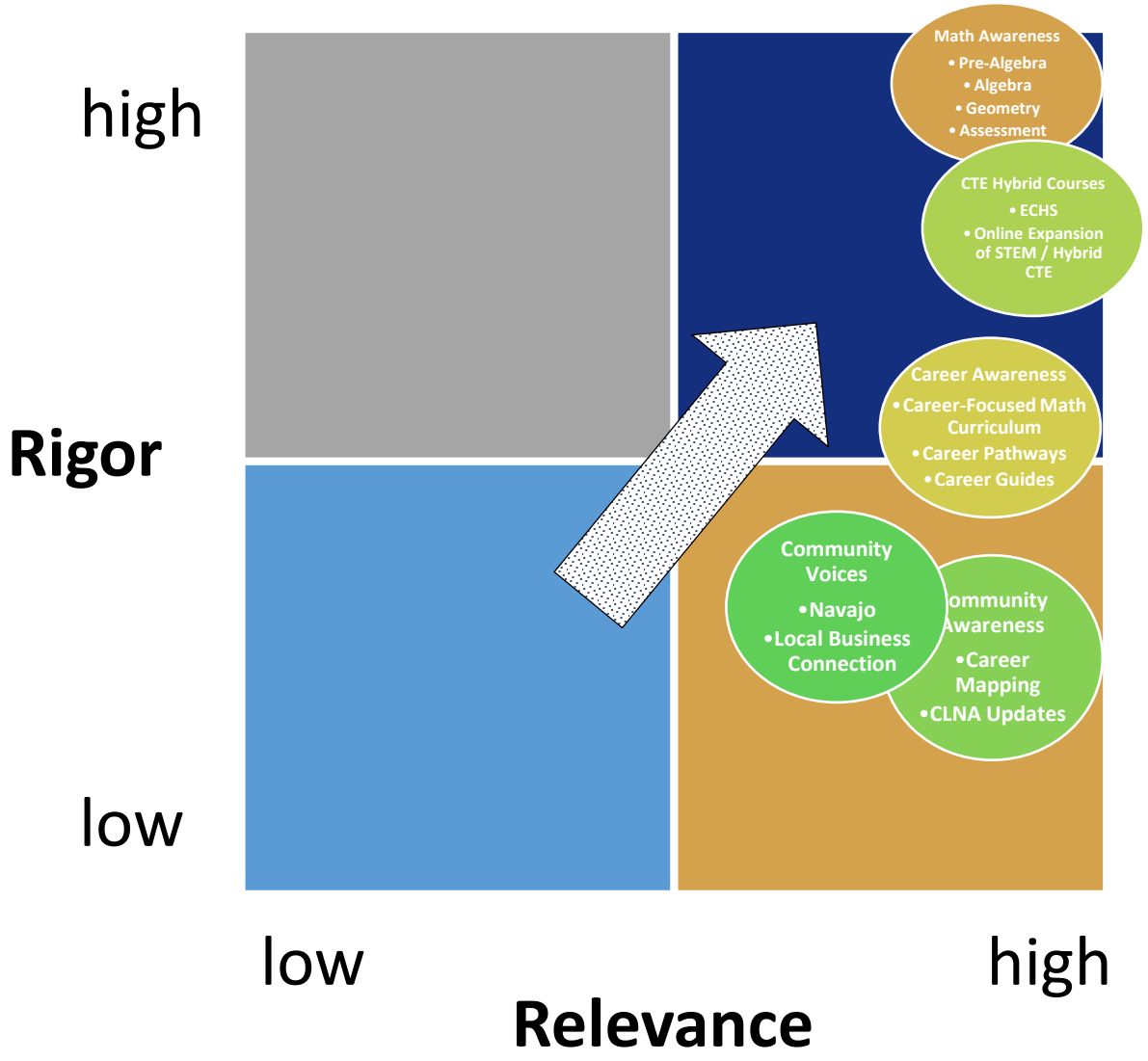
- Scored a 100 on design and approach to SEA Demonstration
- Tentatively funded for five years
- Only Career Based Model approved

# NM Career and Equitable CTE



# NM Career and Equitable CTE

SEA Demonstration Grant



# NM Ready and Equitable CTE Program

# What does our Data Tell us?

# Disconnect between Education to the Realities of Employment

## Education

The official four-year graduation rate for students attending public colleges and universities is 33.3%. The six-year rate is **57.6%**.

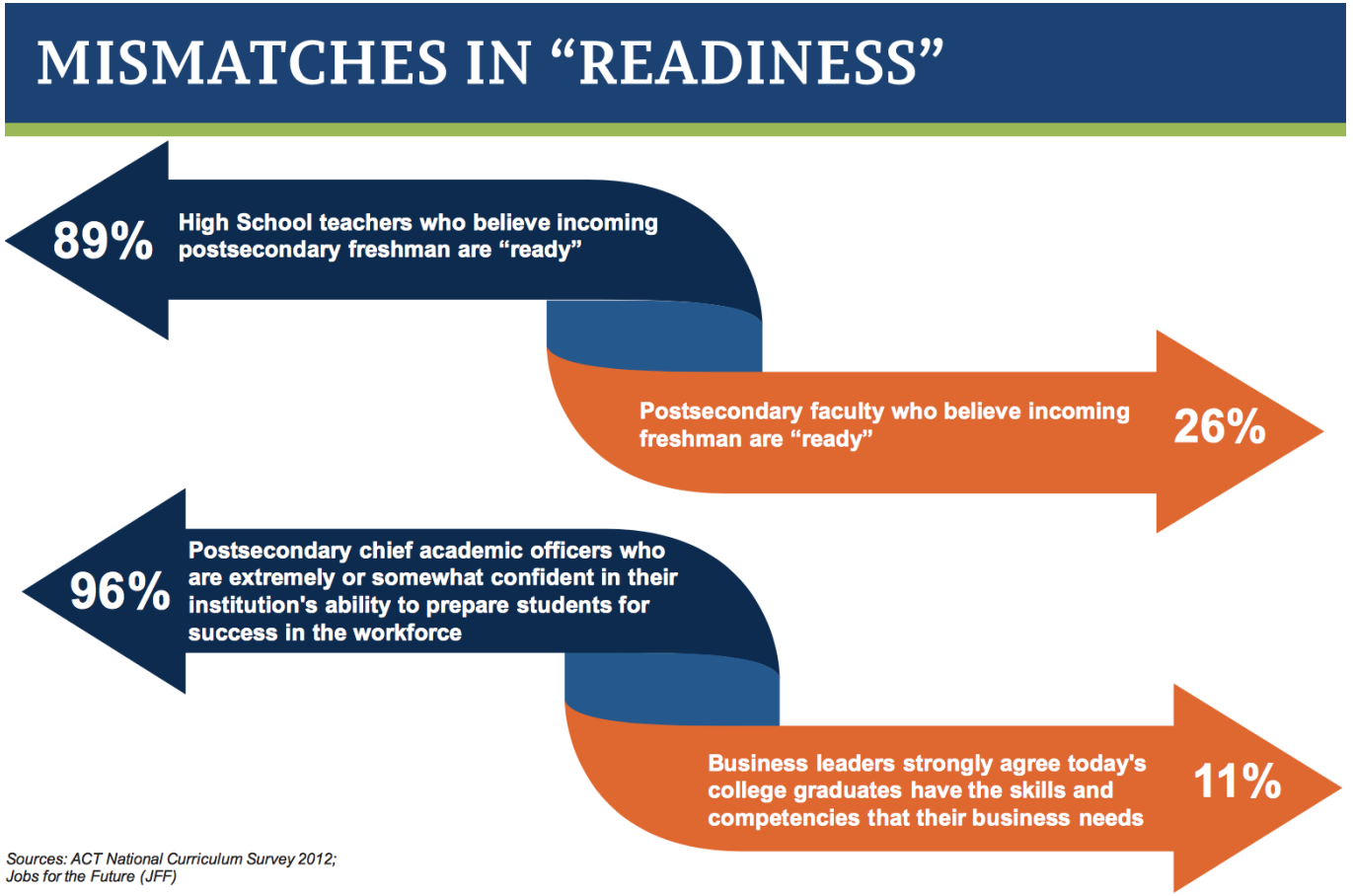
## Employment

43% of **college graduates** are **underemployed** in their first job. Of those, roughly two-thirds remain in jobs that don't require **college** degrees five years later.

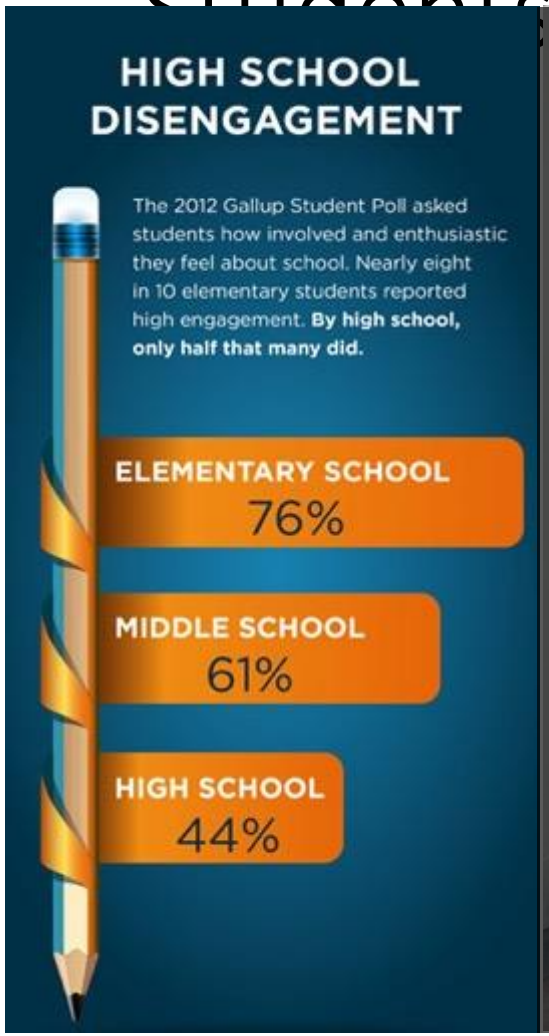
## Economic Development

**Employers** are hiring, but 80% **say they can't find** skilled candidates

# Mismatch in education and business…



# Students Not Feeling Engaged





Source: http://www.ed.gov/highschool (accessed August 24, 2016)

Less than **10 percent** of children born in the bottom quartile of household incomes attain a bachelor's degree by age 25, compared to **more than 50 percent** in the top quartile.

# Understanding Research - Motivators

Table 4

*Strategy effect sizes from meta-regression model.*

| Strategy | Effect size | *p* |
|---|---|---|
| Career Development/Job Training | 0.81 | 0.56 |
| Family Engagement | 0.67 | 0.00 |
| Mentoring | 0.63 | 0.91 |
| Behavioral Intervention | 0.46 | 0.01 |
| Literacy Development | 0.42 | 0.00 |
| Work-Based Learning | 0.26 | 0.01 |
| School/Classroom Environment | 0.25 | 0.00 |
| Service-Learning | 0.21 | 0.00 |
| Health and Wellness | 0.18 | 0.00 |
| Academic Support | 0.11 | 0.00 |

# Benefits of CTE
# Source: Association of Career and Technical Education/NM PED

- For High School Students:
  - Graduate at 94% vs. 71% for non-CTE students
  - 91% with 2-3 CTE credits enroll in college
    - 58% of NM CTE concentrators go to college, advanced training, military service, or employment within six mo. after graduation
  - 81% of HS dropouts say relevant, real-world opportunities would have kept them in school

# Summarizing the Story…

- **It's a fact that 95% of all CTE students graduate high school**.
  - Compared with 80% National Average
- **CTE Has Incredible Career Demand**
  - Between 2012 and 2022, the United States will have 50,557,900 job openings that can be filled by CTE graduates.
- **CTE Students Achieve Better Grades.**
  - **70% of CTE students say that their program helped them earn better grades**.

# Summarizing the Story…Continued

**CTE Has Surprisingly Satisfied Students**

**One of the biggest benefits to CTE is that it can help students appreciate and even enjoy their education.**

- In fact, 85% of all CTE students say they're satisfied with their education and the career prospects that come with it. **Only 45% of these students felt "positively" about college and career readiness**.

**CTE Offers Students Strong Direction in Life**

**In a staggering contrast to most high school graduates and even college students, 82% of CTE students say that CTE helped them "know where they were headed."….**Regardless of the reason, we've already noted that 55% of all high school graduates don't feel prepared for careers or post-secondary education.

# NM Ready and Equitable CTE Program: Career Learning

# Connecting Learning to Careers

## When students experience **purpose** in their learning…

**Motivation to Learn**

(Frymier & Shulman, 1995; Jang, 2008)

**Interest and Engagement**

(Assor, Kaplan, & Roth, 2002; Hulleman, Godes, Hendricks, & Harackiewicz, 2010; Hulleman & Harackiewicz, 2009)

**Effort and Persistence**

(Trautwein & Ludtke, 2007; Yeager et al., 2014)


**Task/Course Completion**

(Fortenberry, Sullivan, Jordan, & Knight, 2007; Zusho, Pintrich, & Coppola, 2003)

**Retention of New Information**

(Perin, 2001; Yeager et al., 2014)

**Performance**

(Hulleman et al., 2010; Hulleman & Harackiewicz, 2009; Malka & Covington, 2005)

# Traditional Approaches to Math Instruction

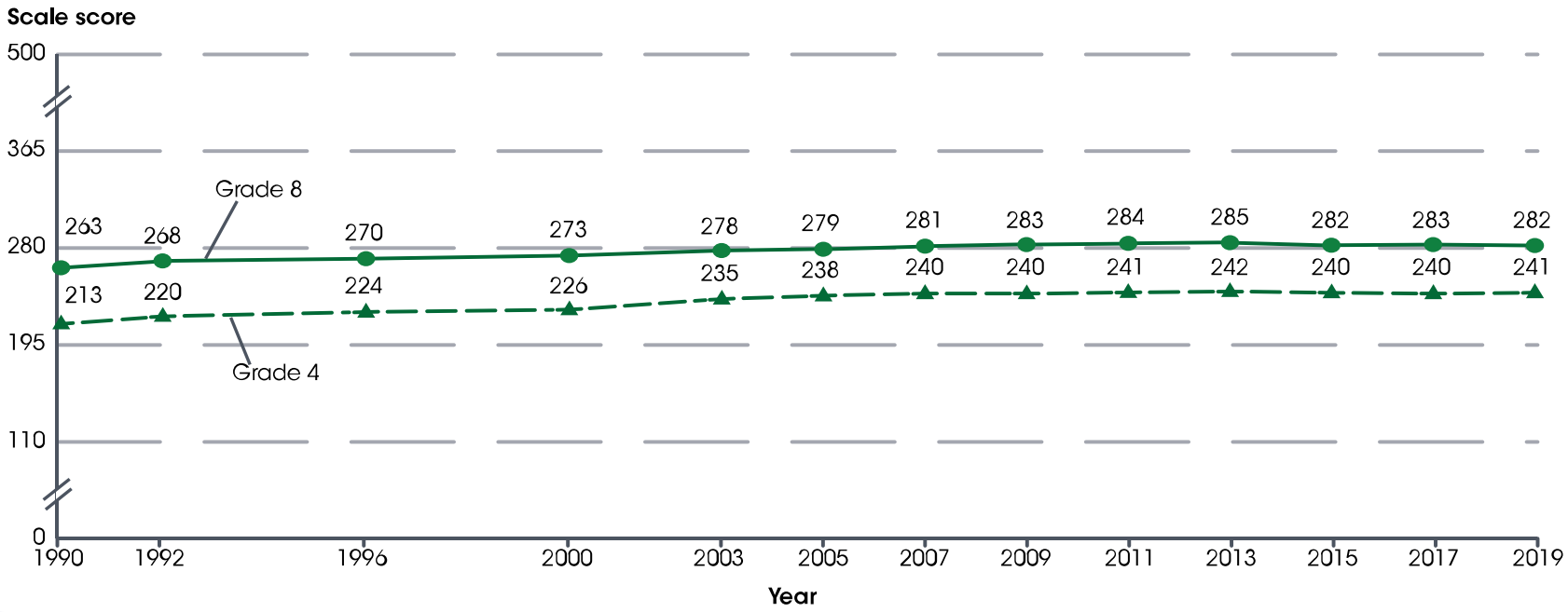
- A dislike for math is commonly reported among students.
- Attitudes toward math generally decline when students enter middle school and the material gets more diverse and abstract (Hannula, 2002; Hiebert et al., 2003; Rice et al., 2012).
- Negative attitudes toward math can translate into poor engagement and course failure (Akin & Kurkanoglu, 2011; Ma & Xu, 2004; Mayes, Chase, & Walker, 2008).
- Students with positive attitudes toward math tend to demonstrate a higher level of achievement (Gottfried, 1985).

**Math attitudes decline as material gets more diverse and abstract.** ▶ **Negative attitudes are associated with poor engagement and course failure.** ▶ **Students with positive attitudes demonstrate higher levels of achievement.**

NS4ed

# Traditional Approaches to Math Instruction

**Average National Assessment of Educational Progress (NAEP) mathematics scale scores of 4th- and 8th-grade students: Selected years, 1990–2019**

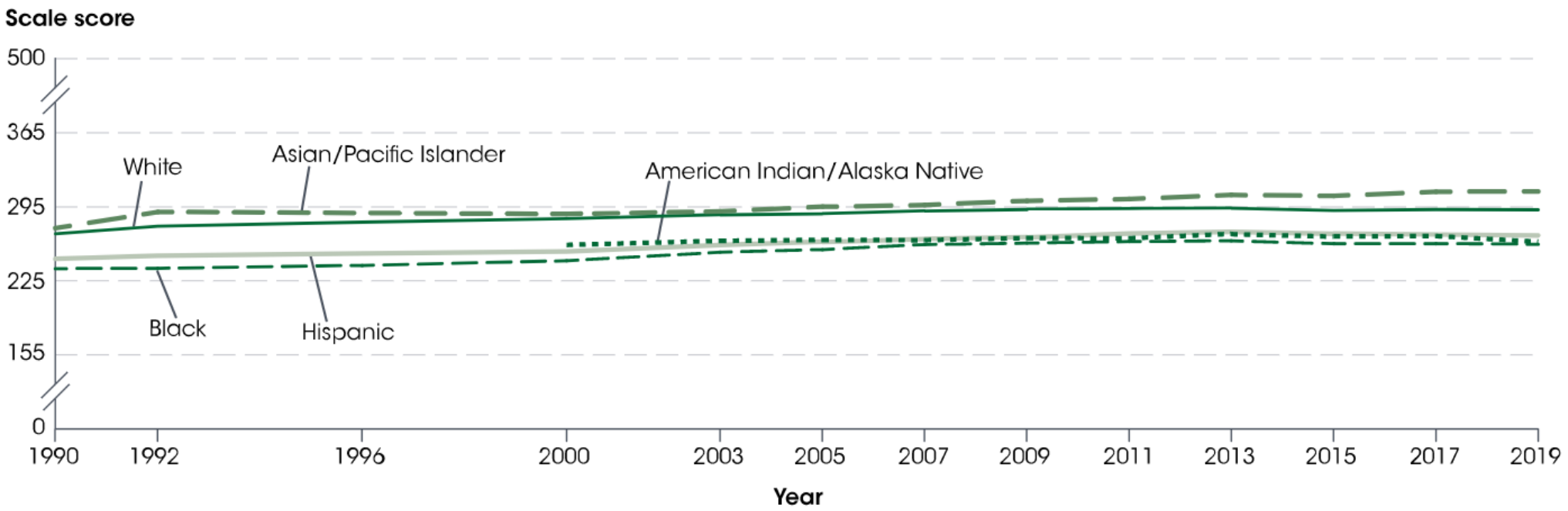



*Note: A similar trend is observed for grade 12 results. Grade 12 mathematics scores are not shown because they are reported on a scale of 0 to 300.*

Source: The Condition of Education 2020

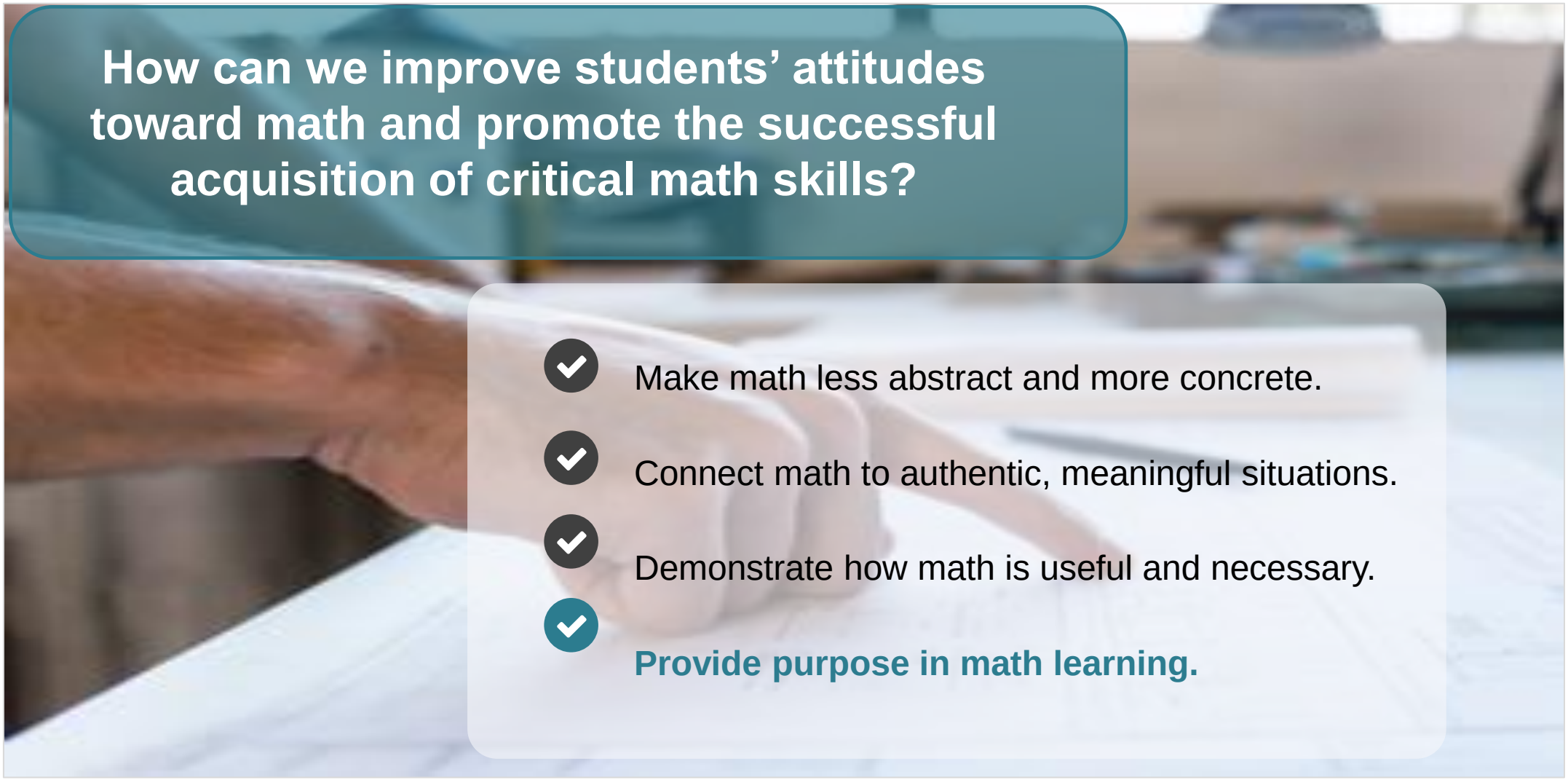
# Traditional Approaches to Math Instruction

**Average National Assessment of Educational Progress (NAEP) mathematics scale scores of 8th-grade students, by selected characteristics: Selected years, 1990–2019**




Source: The Condition of Education 2020

# Traditional Approaches to Math Instruction



**How can we improve students' attitudes toward math and promote the successful acquisition of critical math skills?**

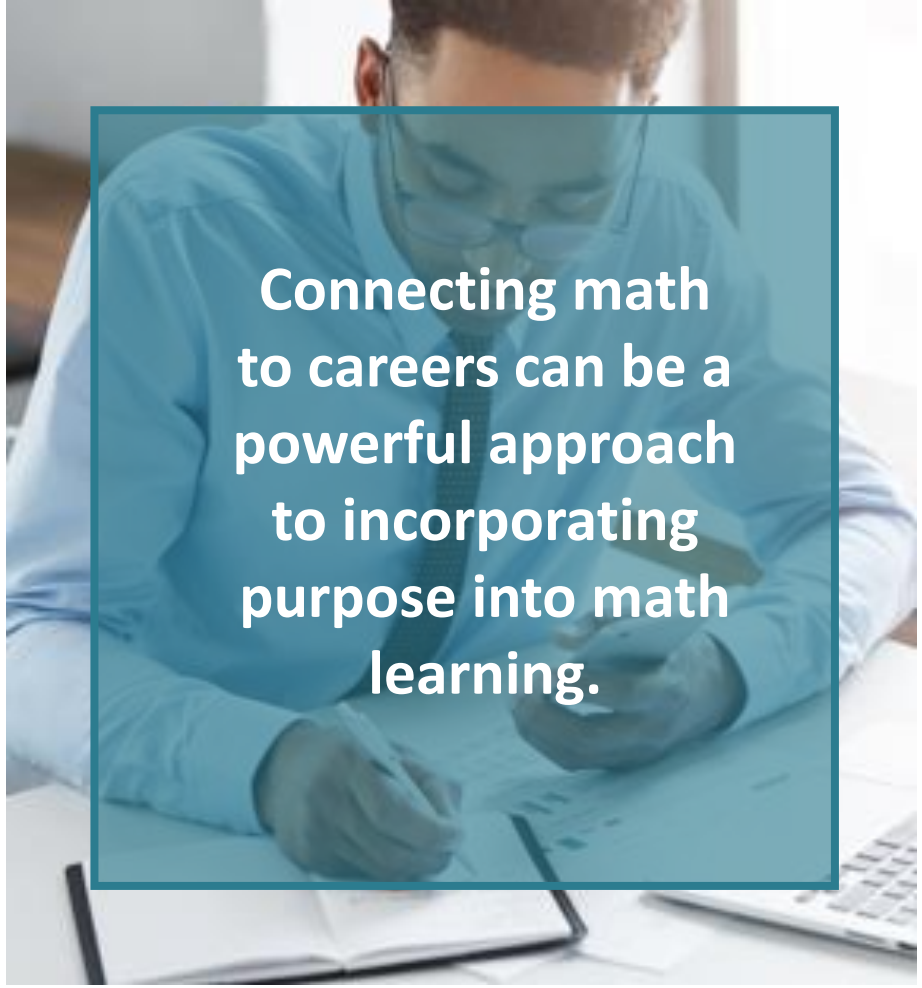
- Make math less abstract and more concrete.
- Connect math to authentic, meaningful situations.
- Demonstrate how math is useful and necessary.
- **Provide purpose in math learning.**

# Traditional Approaches to Math Instruction

**When math is taught in the context of a viable career, students can see…**

- how math is applied in meaningful, everyday tasks.
- the relationship between math proficiency and successful job performance.
- the value in using math to reach job-related goals.

**Bottom Line** – Connecting math to careers brings purpose to math learning. This has the potential to improve students' attitudes toward math and enhance motivation to acquire the critical math skills students will need for employment success.



# A New Approach to Algebra and Geometry

## *Authentic Career Application*


PATHWAY 2 ALGEBRA
Education with Destination


PATHWAY 2 GEOMETRY
Education with Destination

# A New Approach to Algebra and Geometry

- Pathway2Careers has designed new math curricula for algebra and geometry and pre-algebra
- The emphasis is on demonstrating authentic application of fundamental math concepts in meaningful on-the-job examples and exercises.
- **Primary Objective:** Assist students in learning critical math skills and understanding the value of these skills in the workplace.

LESSON 10

Volume of Cylinders, Cones, and Spheres

CAREER SPOTLIGHT: Agricultural Engineer

**Occupation Description**

Agricultural engineers work on the storage and processing of agricultural products. They use computer programs to solve problems and design various systems, structures, and facilities. Their work can involve pollution and environmental issues. They work in various fields of farming, such as aquaculture, forestry, and food processing.

This career is relevant to New Mexico as agricultural engineers are employed in the industry sector of sustainable agriculture and value-added agriculture.

Agricultural engineers who solve design problems involving structure will need to understand and apply concepts involving volume.

**Education**

Agricultural engineers need a bachelor's degree, often in agricultural engineering or biological engineering. Students study advanced calculus, physics, biology, and chemistry.

**Potential Employers**

Agricultural engineers held about 2,600 jobs in 2018. The largest employers of agricultural engineers were as follows:

| | |
|---|---|
| Crop production | 31% |
| Federal government, excluding postal service | 13% |
| Colleges, universities, and professional schools; state | 10% |
| Management, scientific, and technical consulting services | 8% |
| Engineering services | 4% |

**Watch a Video** about Agricultural Engineers: https://www.bls.gov/ooh/architecture-and-engineering/agricultural-engineers.htm

**Career Cluster**

Agriculture, Engineering, Food and Natural Resources

**Career Pathway**

Power, Structure and Technical Systems

**Career Outlook**

Salary Projections:

- Low-End Salary, $46,500
  Median Salary, $77,110
  High-End Salary, $116,850
- Jobs in 2018: 2,600
- Job Projections for 2028: 2,800 (increase of 8%)

**Geometry Concepts**

- Apply volume of solids.
- Apply concepts of density.
- Apply geometric methods to solve design problems.

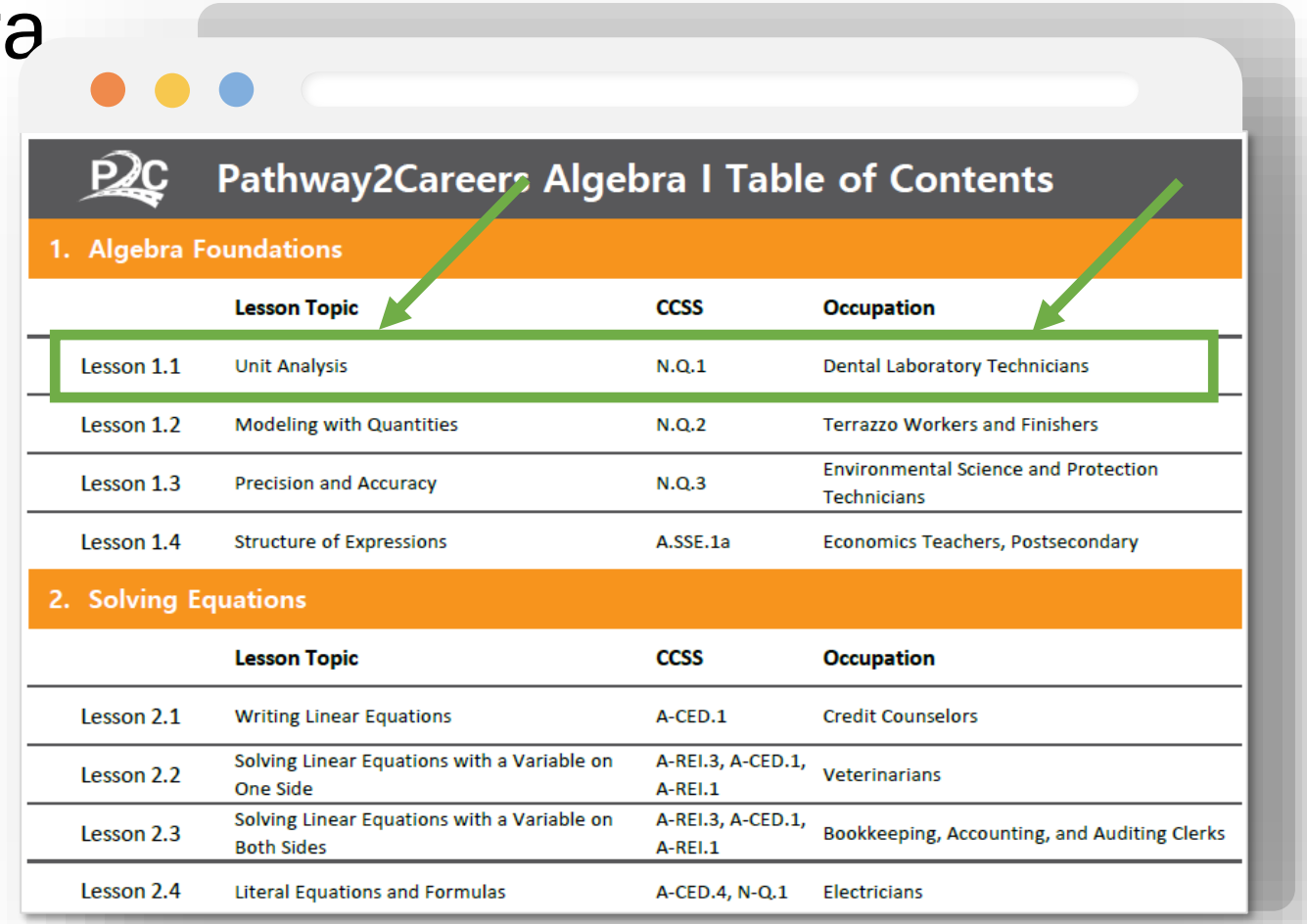
**Is this a good career for me?**

Agricultural engineers tend to:

- Use computers to design equipment, systems, or structures
- Modify factors that affect production
- Test equipment
- Oversee construction and production operations

# A New Approach to Algebra and Geometry

- Over **200 different careers** are featured in the curricula.
- Each lesson offers in-depth exploration of specific math concepts in the context of a spotlighted career.
- Occupations represent **high-value careers** in multiple fields.
  - High-Demand (O*NET Bright Outlook)
  - High-Wage (above $35,000)
  - All 16 Career Clusters



Pathway2Careers Algebra I Table of Contents

**1. Algebra Foundations**

| | Lesson Topic | CCSS | Occupation |
|---|---|---|---|
| Lesson 1.1 | Unit Analysis | N.Q.1 | Dental Laboratory Technicians |
| Lesson 1.2 | Modeling with Quantities | N.Q.2 | Terrazzo Workers and Finishers |
| Lesson 1.3 | Precision and Accuracy | N.Q.3 | Environmental Science and Protection Technicians |
| Lesson 1.4 | Structure of Expressions | A.SSE.1a | Economics Teachers, Postsecondary |

**2. Solving Equations**

| | Lesson Topic | CCSS | Occupation |
|---|---|---|---|
| Lesson 2.1 | Writing Linear Equations | A-CED.1 | Credit Counselors |
| Lesson 2.2 | Solving Linear Equations with a Variable on One Side | A-REI.3, A-CED.1, A-REI.1 | Veterinarians |
| Lesson 2.3 | Solving Linear Equations with a Variable on Both Sides | A-REI.3, A-CED.1, A-REI.1 | Bookkeeping, Accounting, and Auditing Clerks |
| Lesson 2.4 | Literal Equations and Formulas | A-CED.4, N-Q.1 | Electricians |

# A New Approach to Algebra and Geometry

**Each student lesson begins with a comprehensive career overview that introduces students to:**

- Job Duties and Responsibilities
- Education Requirements
- Types of Employers
- Career Cluster and Pathway
- Labor Market Data (wage and demand projections)
- Occupation-Related Math Concepts
- Common Work Tasks

LESSON 10

## Volume of Cylinders, Cones, and Spheres

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# A New Approach to Algebra and Geometry

- Career overviews provide students with information that can help them connect with the career examples in the lessons.
- These overviews also increase students' **exposure** to viable occupations, which can encourage…
  - awareness of a wide range of high-value occupations in various career fields.
  - informed career decisions.
  - interest in additional career exploration.

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**Is this a good career for me?**
Agricultural engineers tend to:
- Use computers to design equipment, systems, or structures
- Modify factors that affect production
- Test equipment
- Oversee construction and production operations

# A New Approach to Algebra and Geometry

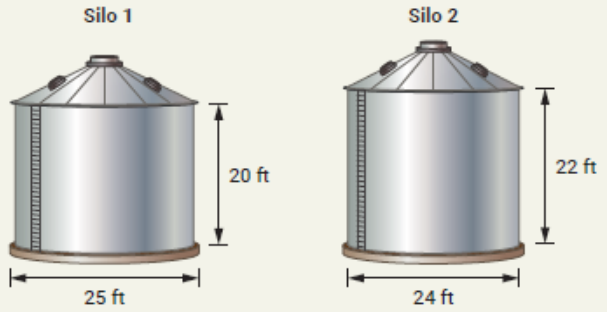
- As students progress through each lesson they are shown “math at work.”
- Targeted concepts are applied to several authentic work tasks.
- Students work through the examples and learn how the specific algebra or geometry concepts are relevant to the work individuals do in that occupation.

**Lesson Objective**

In this lesson, you will look at how an agricultural engineer uses the volume of solids when designing and evaluating structures and systems used in agricultural settings.

## 1 Step Into the Career: Volume of Cylinders

An agricultural engineer is designing a farm storage system that will contain a silo for storing dried, shelled corn. The cylindrical part of the silo should store up to 400,000 pounds of corn. If the corn weighs 42 pounds per cubic foot, then which silo should be used?




**Devise a Plan**

**Step 1:** Find the storage capacity of each silo. The storage capacity is the volume of the cylindrical part of the silo. The formula for the volume $V$ of a cylinder with radius $r$ and height $h$ is $V = \pi r^2 h$.

**Step 2:** Find the weight of corn that can be stored in each silo.

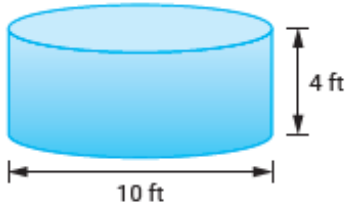
**Step 3:** Determine which silo can store 400,000 pounds of corn.

# A New Approach to Algebra and Geometry

- Multiple student exercises provide opportunities to practice using algebra and geometry in the context of the career.
- These exercises build upon career examples presented earlier in the lesson (i.e., similar concepts and ideas are used).
- Exercises can be completed in class or during independent study.

## On the Job: Apply Volume of Cylinders

**1.** An agricultural engineer is designing a commercial fishery that will raise tilapia. The fishery will have cylindrical aquaculture tanks with the dimensions shown.




**Each tilapia requires 3 gallons of water.**

**a.** What is the volume of a tank? Round to the nearest cubic foot.

**b.** If 1 cubic foot of water is about 7.5 gallons, then what is the capacity of the tank in gallons?

**c.** If each tilapia requires 3 gallons of water, then how many tilapia can be placed in a tank?

# A New Approach to Algebra and Geometry

- Practice is available at the end of each lesson that immerses students in the career.
- This offers the opportunity for students to practice using the lesson-specific algebra or geometry skills in real, work-related problems and exercises.

## Career Spotlight: Practice

**4.** To help with irrigating farmland, an agricultural engineer is planning the transportation of water using tankers like the one shown.


**a.** The cylindrical tank shown has a radius of 3 feet and a height of 38 feet. What is the volume of the tank to the nearest gallon? (Use 1 $ft^3 \approx 7.5$ gal.)

**b.** Due to weight limits, the truck can carry a maximum of 70,000 pounds of water. If the density of the water being transported is 8.3 pounds per gallon, does the truck with a full tank exceed the weight limit? Explain.

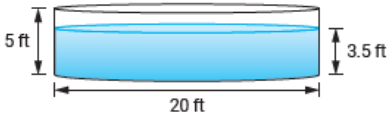
**5.** Onions that are more than 90% water need special handling since they are more susceptible to bruising. The table shows data collected for two onions. Find the percent of water in each onion. Do either of the onions need special handling? Assume that the onions are spheres, and use 1 $cm^3 = 1$ mL.

**QUICK TIP**

The percent of an onion that is water can be found as follows: $\frac{\text{Water Content (mL)}}{\text{Volume of Onion (mL)}} \cdot 100\%$.

| Onion | Diameter (cm) | Water Content (mL) | Percent of Onion That Is Water |
|---|---|---|---|
| Yellow onion | 7 | 160 | ? |
| Sweet onion | 6 | 105 | ? |

**6.** In an irrigation system for a nursery, water is pumped from a well at a rate of 80 gallons per minute and held in a cylindrical tank. Suppose the height of the water in the tank is 3.5 feet. How long will it take to fill the tank to the top? (Use 1 $ft^3 \approx 7.5$ gal.)




**Devise a Plan**

Step 1: Find the volume of the cylindrical tank that does not have water.

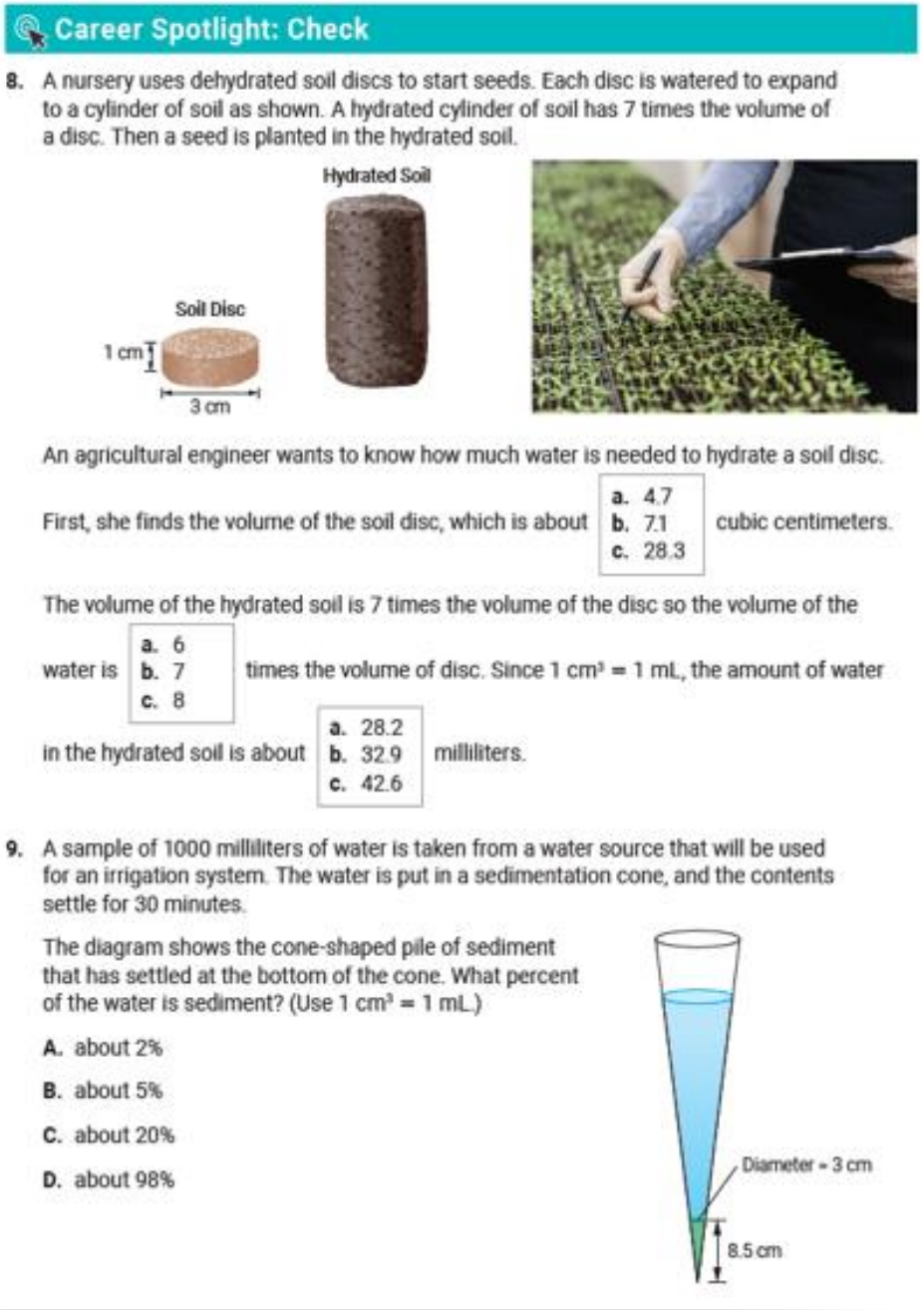
Step 2: ____?____.

Step 3: ____?____.

**7.** A bumper crop of soybeans has been stored in two cone-shaped piles. One pile has a diameter of 36 feet and a height of 8.4 feet. The other pile has a diameter of 24 feet and a height of 5.6 feet. If the soybeans weigh 47 pounds per cubic foot, then how many pounds of soybeans are stored in both piles?

# A New Approach to Algebra and Geometry

- Each lesson concludes with a check for students to complete.
- A variety of question formats are used to evaluate learning. Multiple choice, matching, equation editing, open response…
- These checks can be used as a formative assessment to review students' learning and provide feedback.



**Career Spotlight: Check**

**8.** A nursery uses dehydrated soil discs to start seeds. Each disc is watered to expand to a cylinder of soil as shown. A hydrated cylinder of soil has 7 times the volume of a disc. Then a seed is planted in the hydrated soil.

Hydrated Soil

Soil Disc

1 cm

3 cm

An agricultural engineer wants to know how much water is needed to hydrate a soil disc.

First, she finds the volume of the soil disc, which is about [a. 4.7 / b. 7.1 / c. 28.3] cubic centimeters.

The volume of the hydrated soil is 7 times the volume of the disc so the volume of the water is [a. 6 / b. 7 / c. 8] times the volume of disc. Since 1 $cm^3$ = 1 mL, the amount of water in the hydrated soil is about [a. 28.2 / b. 32.9 / c. 42.6] milliliters.

**9.** A sample of 1000 milliliters of water is taken from a water source that will be used for an irrigation system. The water is put in a sedimentation cone, and the contents settle for 30 minutes.

The diagram shows the cone-shaped pile of sediment that has settled at the bottom of the cone. What percent of the water is sediment? (Use 1 $cm^3$ = 1 mL.)

**A.** about 2%

**B.** about 5%

**C.** about 20%

**D.** about 98%

Diameter = 3 cm

8.5 cm

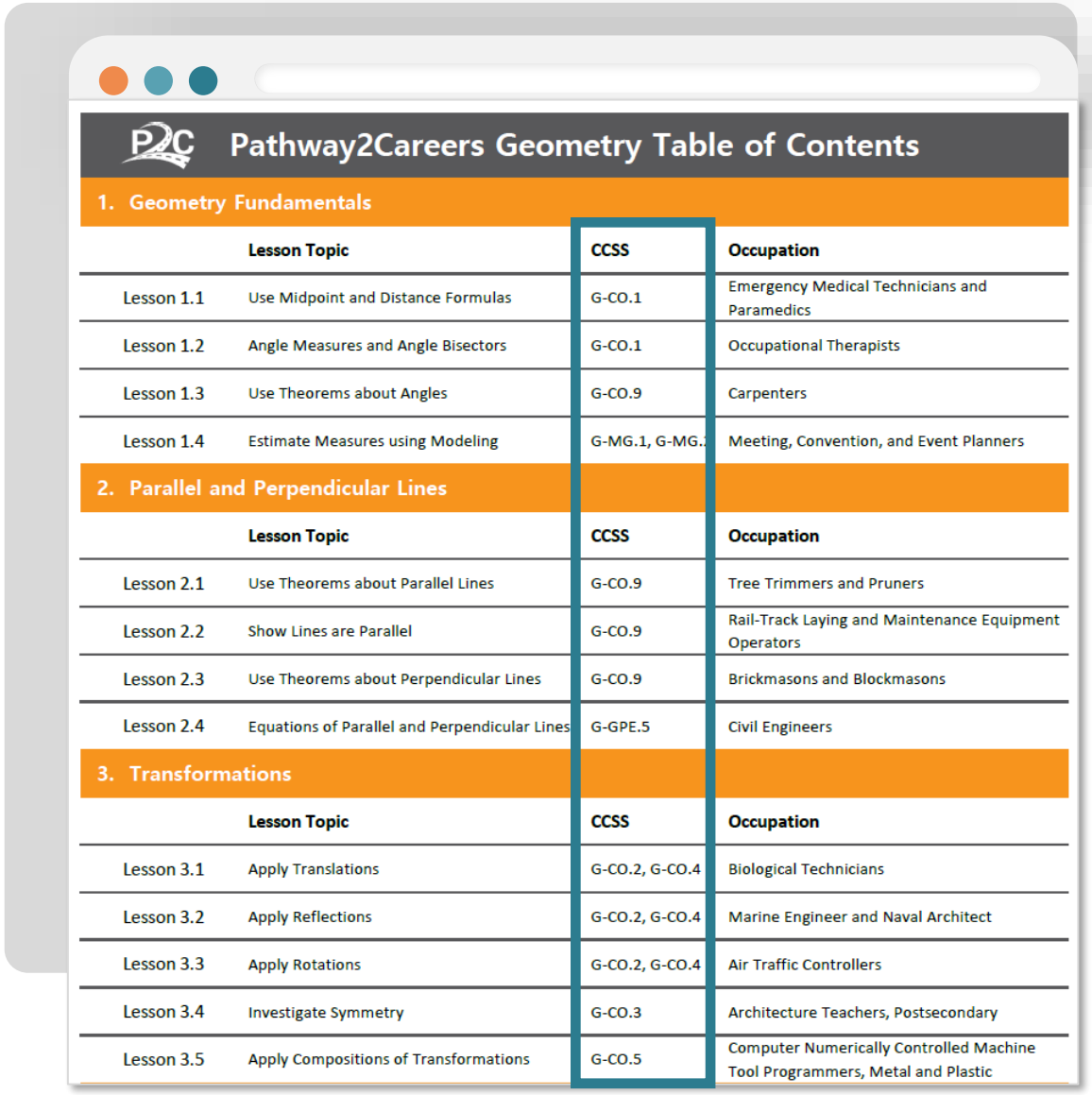
# A New Approach to Algebra and Geometry

## Common Core State Standards

- Lessons have been aligned directly with Common Core State Standards.
- Standards covered within each lesson have been clearly identified.
- This can assist with tracking skills and concepts explored in the lessons.

## Best Practices and Quality Content

- All lessons were written and evaluated by experts in math curriculum development.
- Lesson content is presented using well-established methods that align with best practices in math instruction.



**Pathway2Careers Geometry Table of Contents**

**1. Geometry Fundamentals**

| | Lesson Topic | CCSS | Occupation |
|---|---|---|---|
| Lesson 1.1 | Use Midpoint and Distance Formulas | G-CO.1 | Emergency Medical Technicians and Paramedics |
| Lesson 1.2 | Angle Measures and Angle Bisectors | G-CO.1 | Occupational Therapists |
| Lesson 1.3 | Use Theorems about Angles | G-CO.9 | Carpenters |
| Lesson 1.4 | Estimate Measures using Modeling | G-MG.1, G-MG.2 | Meeting, Convention, and Event Planners |

**2. Parallel and Perpendicular Lines**

| | Lesson Topic | CCSS | Occupation |
|---|---|---|---|
| Lesson 2.1 | Use Theorems about Parallel Lines | G-CO.9 | Tree Trimmers and Pruners |
| Lesson 2.2 | Show Lines are Parallel | G-CO.9 | Rail-Track Laying and Maintenance Equipment Operators |
| Lesson 2.3 | Use Theorems about Perpendicular Lines | G-CO.9 | Brickmasons and Blockmasons |
| Lesson 2.4 | Equations of Parallel and Perpendicular Lines | G-GPE.5 | Civil Engineers |

**3. Transformations**

| | Lesson Topic | CCSS | Occupation |
|---|---|---|---|
| Lesson 3.1 | Apply Translations | G-CO.2, G-CO.4 | Biological Technicians |
| Lesson 3.2 | Apply Reflections | G-CO.2, G-CO.4 | Marine Engineer and Naval Architect |
| Lesson 3.3 | Apply Rotations | G-CO.2, G-CO.4 | Air Traffic Controllers |
| Lesson 3.4 | Investigate Symmetry | G-CO.3 | Architecture Teachers, Postsecondary |
| Lesson 3.5 | Apply Compositions of Transformations | G-CO.5 | Computer Numerically Controlled Machine Tool Programmers, Metal and Plastic |

# A New Approach to Algebra and Geometry

## Accessing the Lessons

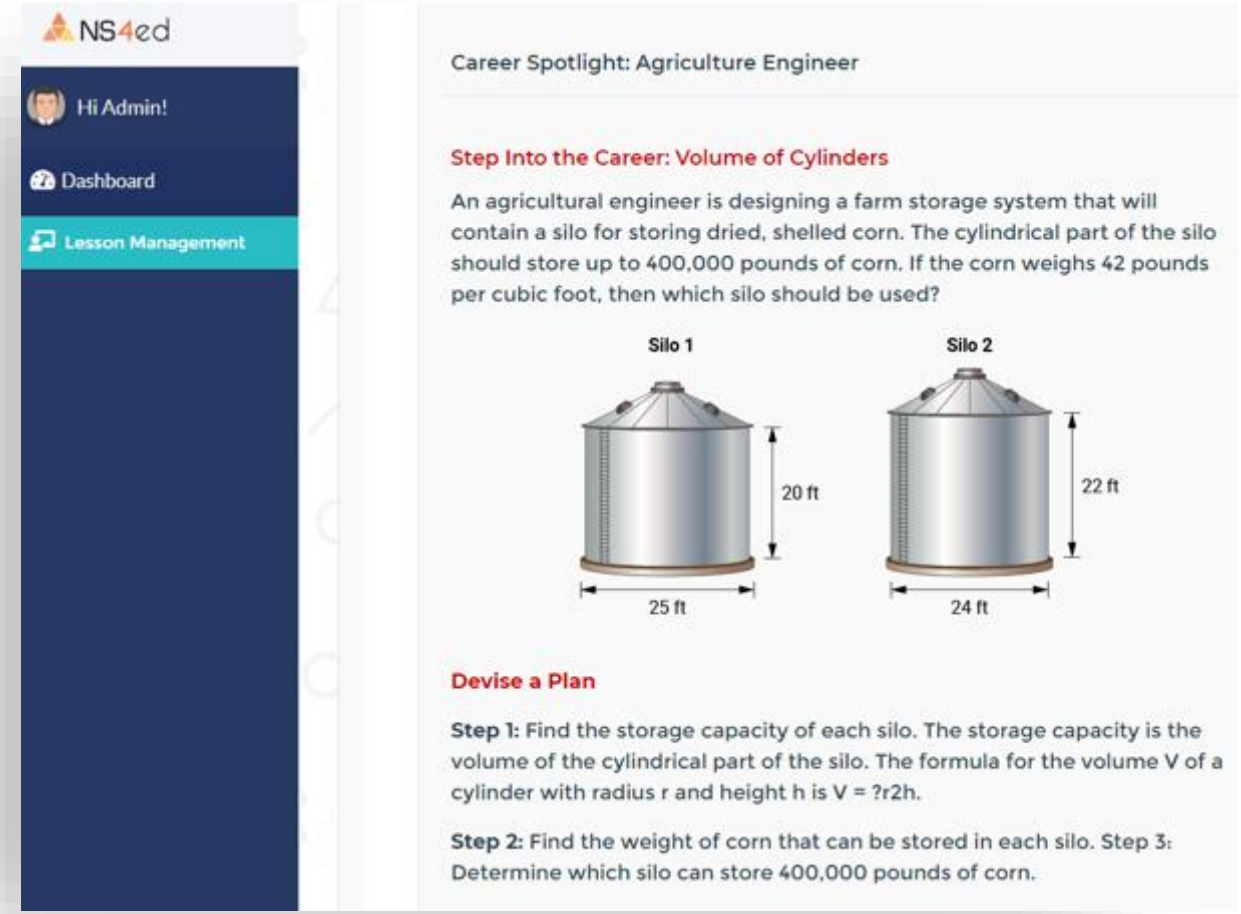
- Lessons are presented in the P2C LMS
- Content can be searched and viewed online
- Print/download PDF copies

## Using the Lessons

- Best implemented alongside core curriculum
- Intended for use in a blended learning model where online content is combined with traditional classroom methods

## Additional Features

- Teacher's edition with guiding questions, enrichment, extension, and answer keys
- Detailed scope and sequence
- Teacher resources including videos and websites

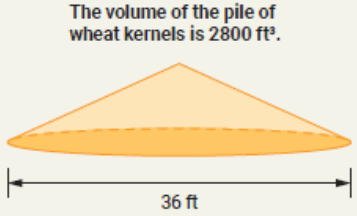


# A New Approach to Algebra and Geometry

## Sample Teacher's Edition Content

### 2 Step Into the Career: Volume of Cones

An agricultural engineer designs an area for temporary storage of 2800 cubic feet of harvested wheat kernels. A cone-shaped pile of 2800 cubic feet of wheat kernels will have a diameter of 36 feet. At what minimum height above the ground should the end of the grain auger transporting the wheat be set so that it clears the pile?




Students may not be familiar with a grain auger. A grain auger is a tube with a spiral shaft in the middle that transports grain. This is not to be confused with an auger that is a type of drilling device.

**Guiding Questions**

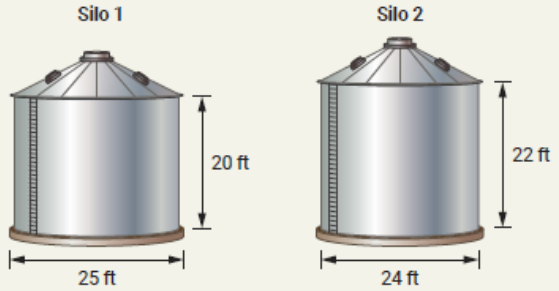
- Could the height be determined if only the volume of the pile was given and not the diameter?
- The height and diameter of a pile of wheat must remain in proportion. Suppose the volume of the wheat increases. Will the height of the pile be greater than or less than 8.25 feet? Explain.

**ENRICHMENT** The shape of a conical pile depends on the material. For wheat, the angle formed by a line from the vertex of the cone to the ground is about 25°. In this example, students can find this angle by calculating $\tan^{-1}\left(\frac{8.25}{18}\right) \approx 25°$. If the grain for this pile is barley, the angle is about 28°. Ask students to determine the height and volume of a pile of barley with diameter 36 feet.

### Teaching Support

### 1 Step Into the Career: Volume of Cylinders

An agricultural engineer is designing a farm storage system that will contain a silo for storing dried, shelled corn. The cylindrical part of the silo should store up to 400,000 pounds of corn. If the corn weighs 42 pounds per cubic foot, then which silo should be used?




**Guiding Questions**

- In Step 2, how can the number of pounds be found using a proportion?
- In Step 3, will a silo that has a diameter of 26 feet and a height of 20 feet hold the corn?

**ENRICHMENT** In this example, both silos can store 400,000 pounds of corn. Ask students to suggest what other criteria an agricultural engineer could consider in designing a silo. Discuss what considerations could be made about the amount of material needed to build the silos. Remind students that the lateral surface area of a cylinder can be determined by the formula $S = 2\pi rh$, where $r$ is the radius and $h$ is the height. Ask students to determine which silo has the greater lateral surface area.

**TECHNOLOGY** Challenge students to think about the dimensions of a cylinder that can hold 400,000 pounds of corn with the least amount of lateral surface area. Have students find the volume needed for 400,000 pounds of corn and then ask for an expression for the height $h$ of a cylinder that can hold the corn in terms of radius $r$. Demonstrate using technology (by graphing or using a spreadsheet) how to determine the radius that results in the minimum lateral surface area.

# Math Skills and Career Preparedness

## LINKING ASSESSMENT OUTCOMES TO CAREERS

NEW MEXICO Public Education Department

NS4ed

# Quantile Framework for Math Assessments



**Pathway2Careers Math Assessment Specifications and Development**

The specifications for the P2A and P2G assessment forms were developed to cover skills in Grade 8 through Algebra I and Geometry that align with the Common Core State Standards for Mathematics (CCSS) (National Governors Association and Council of Chief State School Officers, 2010a, 2010b). Students who take the beginning-of-the-year (BOY) test form for their course level will be administered items that cover the Quantile Skills and Concepts (QSCs) associated with the alignment to the CCSS at the prior grade/course level.

Each form of the P2A and P2G assessments covers the following Quantile Framework content strands that have been aligned with the CCSS:

- Number Sense
- Numerical Operations
- Algebra and Algebraic Thinking
- Geometry
- Measurement
- Data Analysis, Statistics, and Probability

A central element of determining a student's Quantile measure is that the assessments must include items from a majority of the six content strands. This ensures the integration among the content strands into a single measure of mathematical ability.

*Table 17. P2A assessment strand distribution, by test form.*

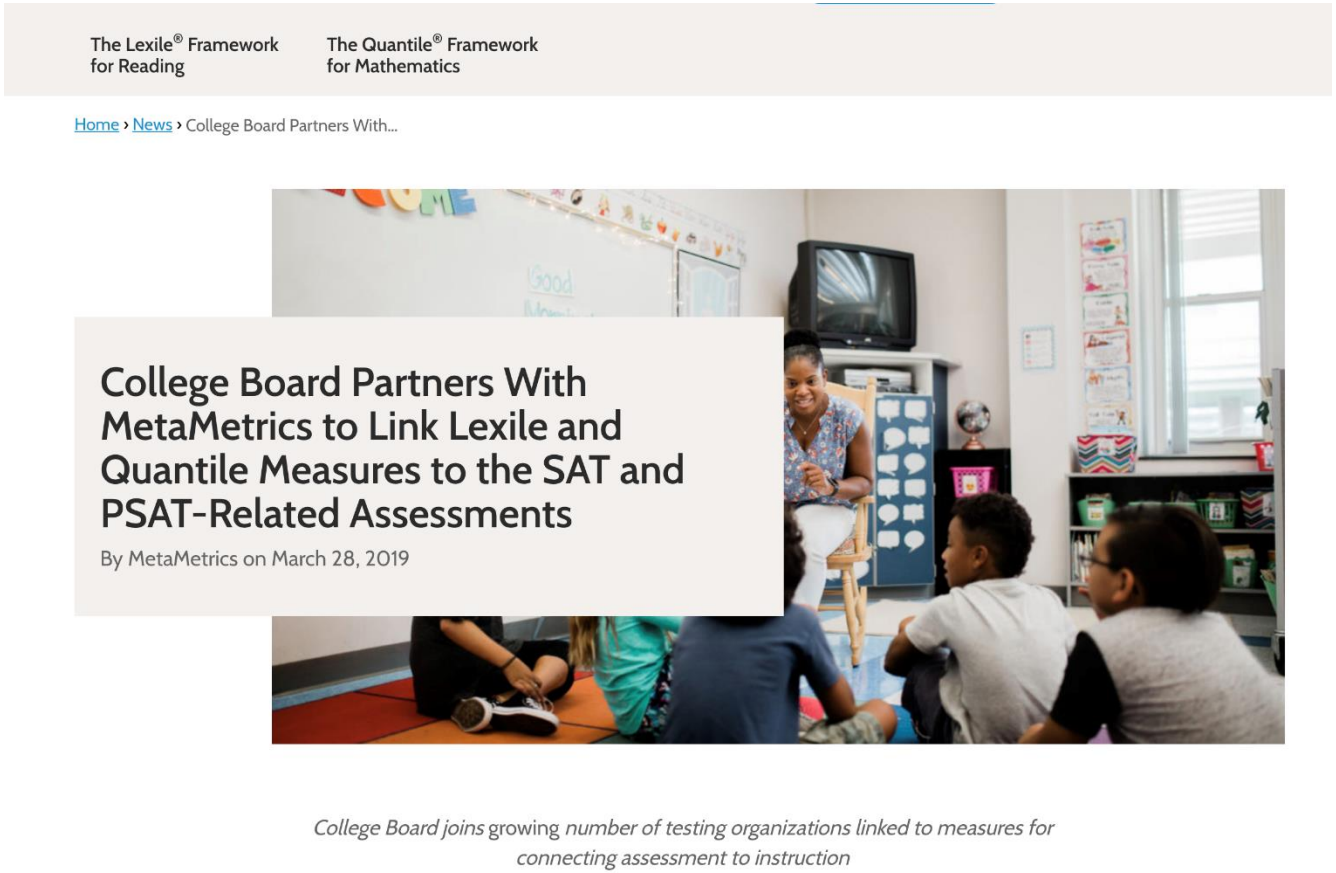
| Strand | BOY | MOY | EOY |
|---|---|---|---|
| Number Sense | 10% | 7% | 3% |
| Geometry | 15% | 10% | 3% |
| Algebra and Algebraic Thinking | 45% | 55% | 57% |
| Data Analysis, Statistics and Probability | 10% | 10% | 20% |
| Measurement | 10% | 15% | 10% |
| Numerical Operations | 10% | 3% | 7% |

*Table 18. P2G assessment strand distribution, by test form.*

| Strand | BOY | MOY | EOY |
|---|---|---|---|
| Number Sense | 3% | 3% | 3% |
| Geometry | 7% | 40% | 57% |
| Algebra and Algebraic Thinking | 53% | 28% | 7% |
| Data Analysis, Statistics and Probability | 20% | 15% | 10% |
| Measurement | 10% | 7% | 20% |
| Numerical Operations | 7% | 7% | 3% |

# Measuring Student Growth

- https://metametricsinc.com/about-us/news/college-board-partners-with-metametrics-to-link-lexile-and-quantile-measures-to-the-sat-and-psat-related-assessments/



# Quantile and Relationships

*Figure 6. Relationship between grade level and mathematics performance on the Quantile Framework field study and other mathematics assessments.*

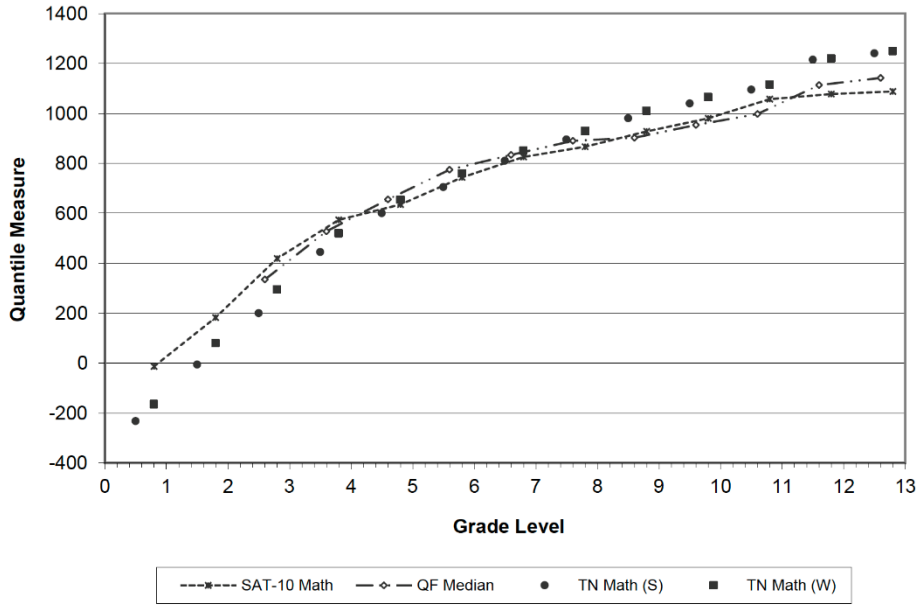
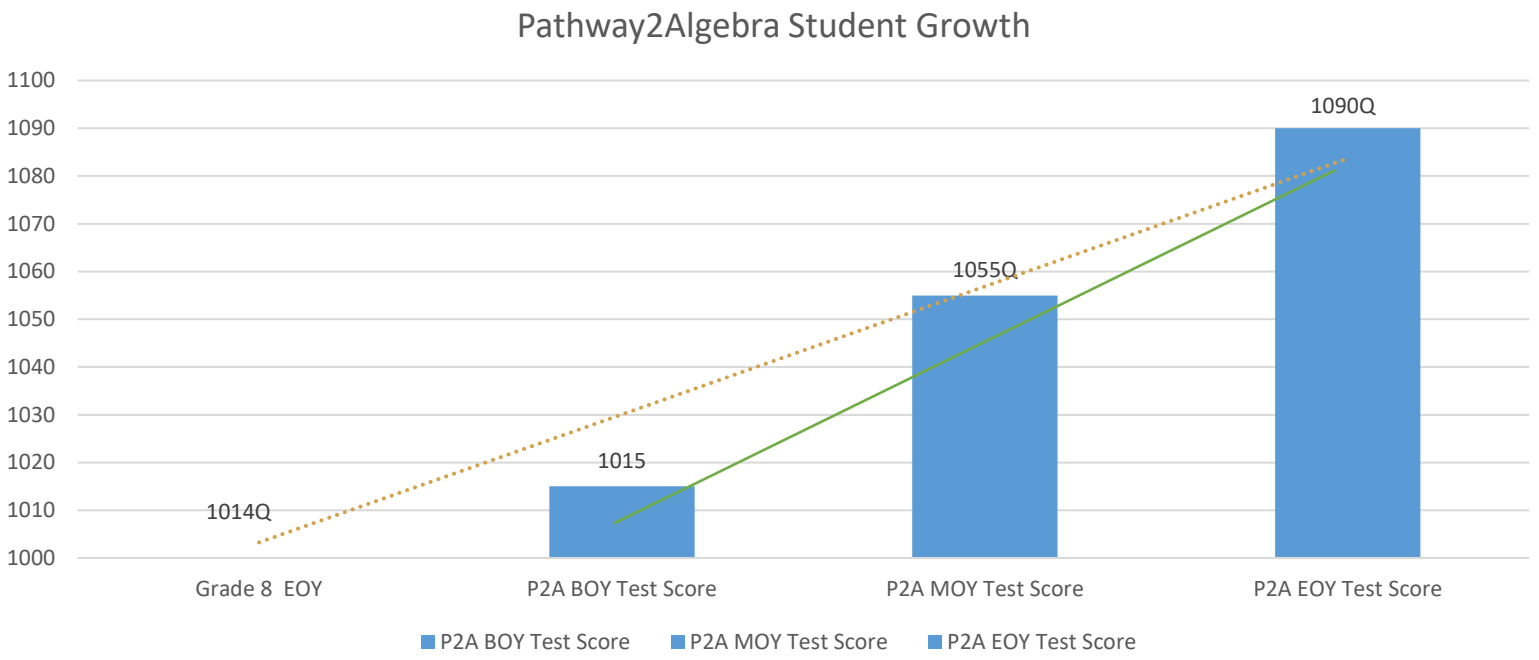


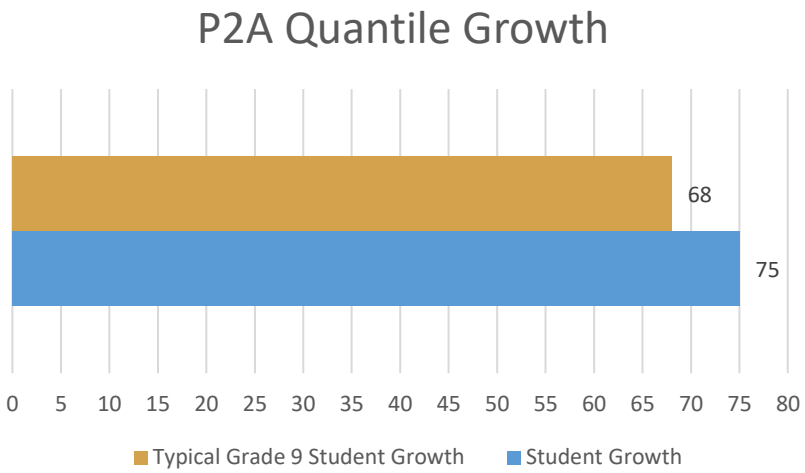

*Table 6. Results from linking studies conducted with the Quantile Framework.*

| Standardized Test | Grades in Study | N | Correlation Between Test Score and Quantile measure |
|---|---|---|---|
| Mississippi Curriculum Test, Mathematics (MCT) | 2 – 8 | 7,039 | 0.89 |
| TerraNova (CTB/McGraw-Hill) | 3, 5, 7, 9 | 6,356 | 0.92 |
| Texas Assessment of Knowledge and Skills (TAKS) | 3 – 11 | 14,286 | 0.69 to 0.78* |
| Proficiency Assessments for Wyoming Students (PAWS) | 3, 5, 8, and 11 | 3,923 | 0.87 |
| Progress Towards Standards (PTS3) | 3-8 and 10 | 8,544 | 0.86 to 0.90* |
| Progress in Maths (PiM – GL Assessments) | 1 – 8 | 3,183 | 0.71 to 0.81* |
| North Carolina End-of-Grade/End-of-Course Tests (NC EOG/NC EOC) | 3, 5, 7, A1, G, and A2 | 5,069 | 0.88 to 0.90* |
| Comprehensive Testing Progressing (CPT 4 – ERB) | 3, 5, and 7 | 953 | 0.87 to 0.90 |
| Kentucky Core Content Tests (KCCT) | 3 - 8 and 11 | 12,660 | 0.80 to 0.83* |
| Oklahoma Core Competency Tests (OCCT) | 3 – 8 | 5,649 | 0.81 to 0.85* |
| Iowa Assessments | 2, 4, 6, 8, and 10 | 7,365 | 0.92 |
| Virginia Standards of Learning (SOL) | 3-8, A1, G, and A2 | 12,470 | 0.86 to 0.89* |
| Kentucky Performance Rating for Educational Progress (K-PREP) | 3 – 8 | 6,859 | 0.81 to 0.85* |
| North Carolina ACT | 11 | 3,320 | 0.90 |
| North Carolina READY End-of-Grade/End-of-Course Tests (NC EOG/NC EOC) | 3, 4, 6, 8, and A1/I1 | 10,903 | 0.87 to 0.90* |
| aimsweb – Math Concepts and Applications (Pearson) | 2 – 8 | 3,262 | 0.87 |

Notes: * TAKS, PTS3, PiM, NCEOC, KCCT, OCCT, K-PREP, SOL, and NC READY were not vertically scaled; separate linking equations were derived for each grade/course.

# Measuring Growth



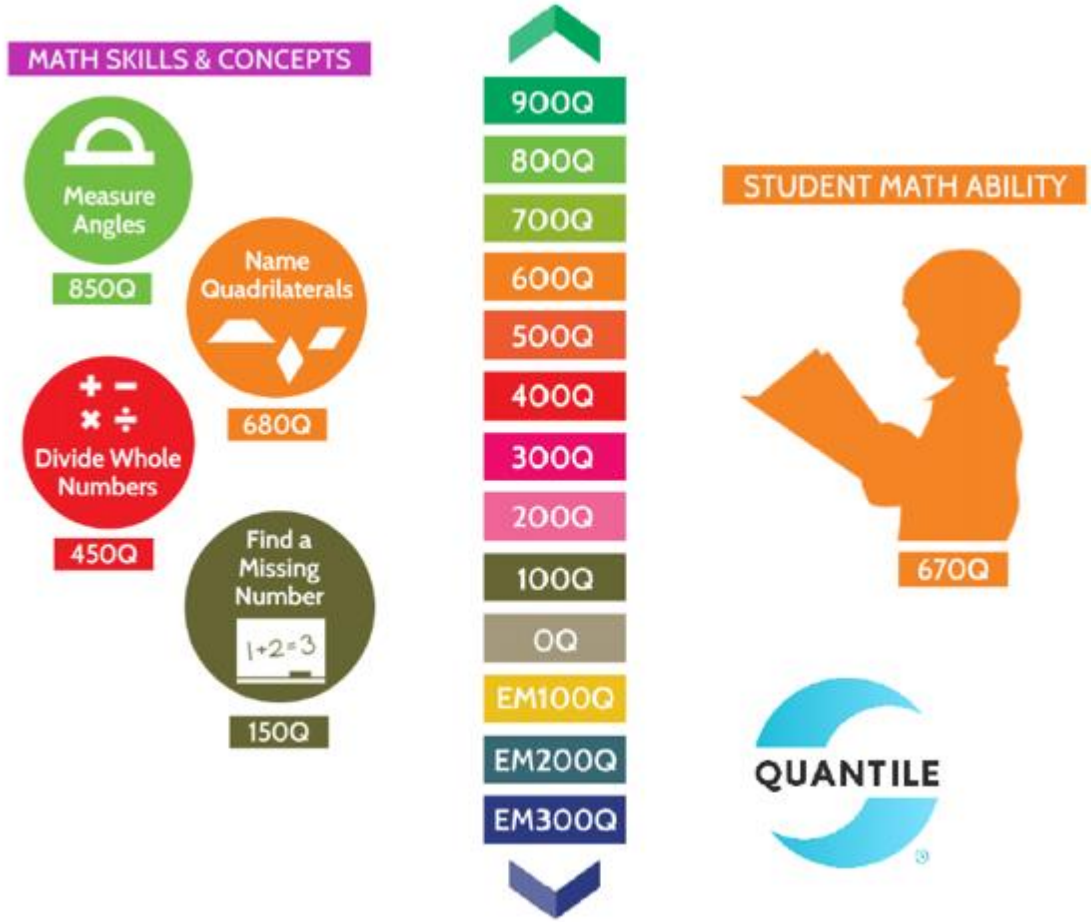

Shows a student's growth during G9 relative to typical growth during G9.

"Is the student where they need to be relative to the typical G9 student?"

# Math Skills and Career Preparedness

## Pathway2Careers Math Assessments

- Created in partnership with MetaMetrics (developer of the widely adopted Quantile® Framework for Mathematics)
- Beginning-, middle-, and end-of-year assessments provide students with a Quantile measure that represents students' mathematical achievement level and indicates the skills and concepts they are ready to learn.
- A student's increasing Quantile measure is an indication of his or her readiness to learn progressively more complex mathematical concepts.

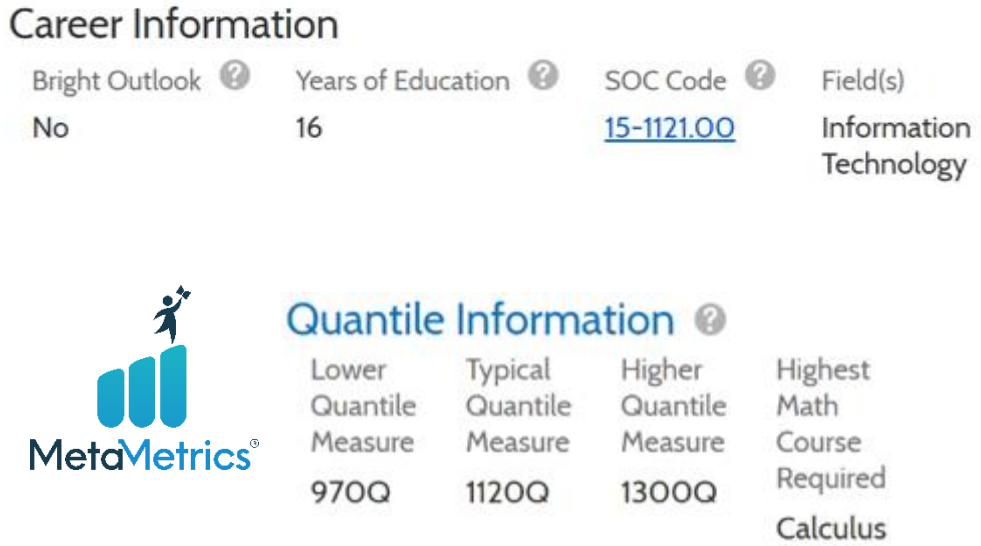


# Math Skills and Career Preparedness

- Student Quantile measures provided by the P2C assessments can be compared to the math demands of different careers in the **Quantile Career Database.**
- The database lists hundreds of careers and their Quantile measures representing the math demand for entry into the career.
- The purpose of the database is to provide a critical point of connection for students, allowing them to **see how their learning applies to their current and future employment potential.**

QUANTILE CAREER DATABASE

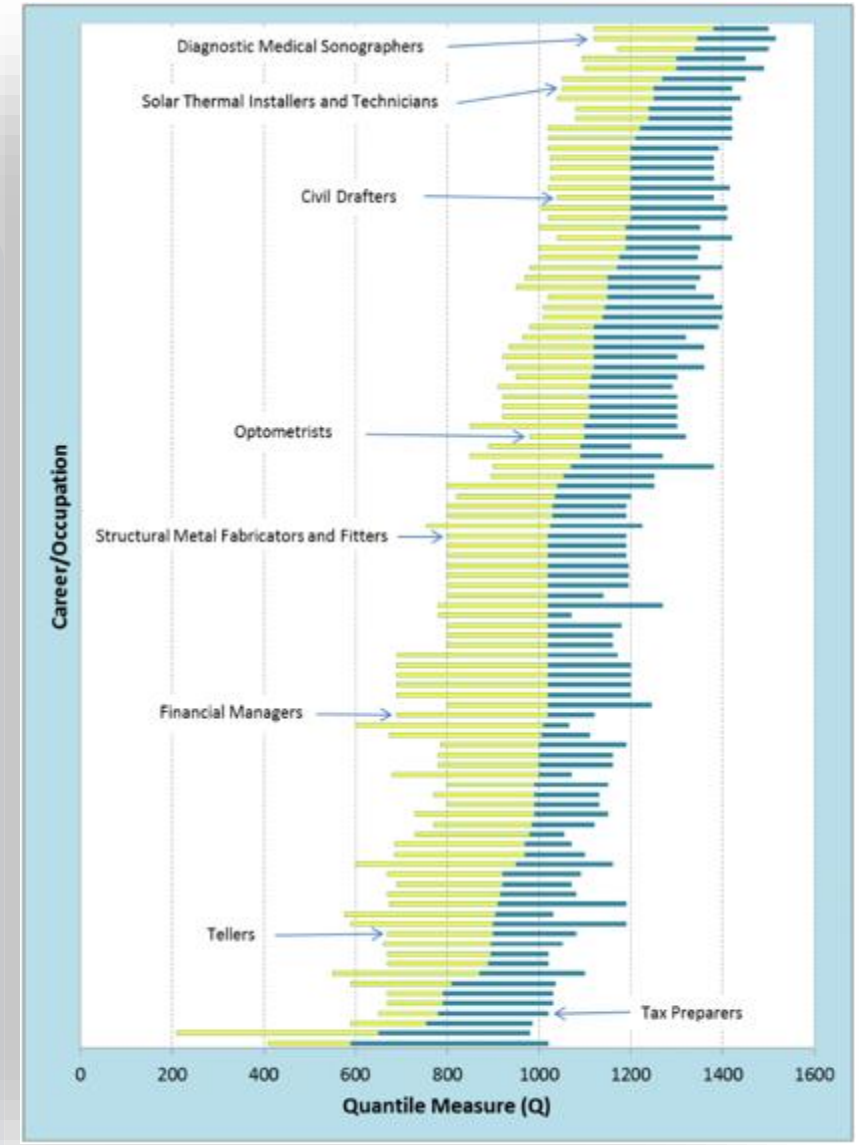
Sample Database Search for *Computer Systems Analysts*



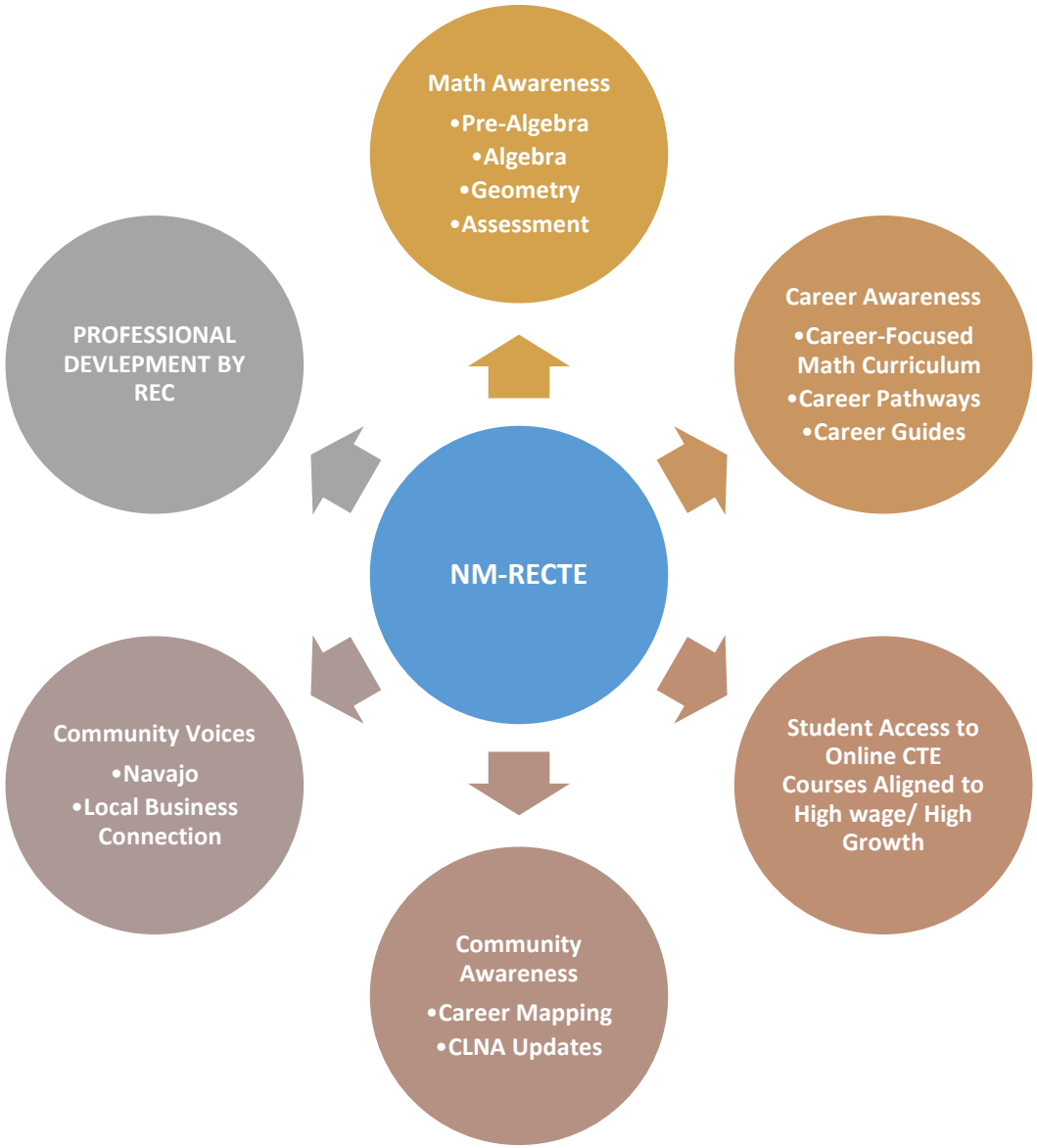
# Math Skills and Career Preparedness

- The **career range** represents the span of Quantile measures for the mathematical demands of tasks and responsibilities related to **common career training materials and early first-year job requirements.**

- With this information, students can gain awareness of the **range of mathematics skills and concepts they will need** in order to successfully complete certificate or degree programs and meet initial employment requirements for specific careers.



# NM Career and Equitable CTE



# Thank You!

Feel free to contact me.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